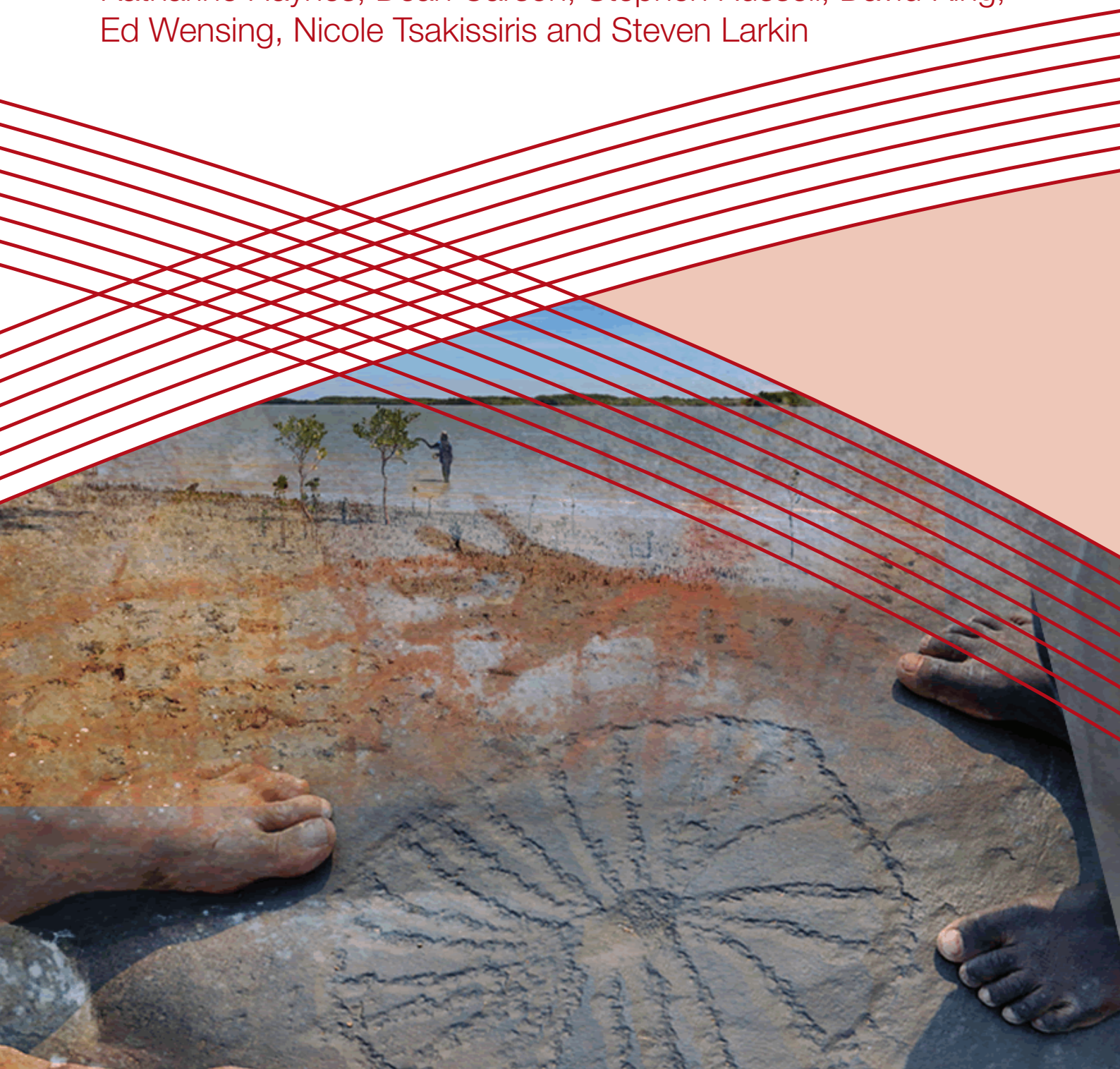


Future change in ancient worlds: Indigenous adaptation in northern Australia

Final Report

Deanne Bird, Jeanie Govan, Helen Murphy, Sharon Harwood,
Katharine Haynes, Dean Carson, Stephen Russell, David King,
Ed Wensing, Nicole Tsakissiris and Steven Larkin



FUTURE CHANGE IN ANCIENT WORLDS: INDIGENOUS ADAPTATION IN NORTHERN AUSTRALIA

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EXECUTIVE SUMMARY

Northern Australia is highly exposed to a number of natural hazards including: cyclones and associated storm surges, riverine and flash flooding, heatwaves, coastal erosion, bushfires and drought – some of which might be exacerbated by climate change. With an approximate population of 160,000 Indigenous people (29% of the total Indigenous population of Australia) it is critical to develop a multifaceted understanding of how climate change will affect Indigenous communities in northern Australia. Moreover, decisions about how to support Indigenous communities to adapt to and reduce their risks from climate change impacts must be informed by greater understandings of their current adaptive capacities, e.g. why they may be vulnerable or resilient, how they have coped with and adapted to past environmental changes, who is likely to leave, stay or return, and how sustainable communities can be maintained.

This report examines the underlying vulnerabilities, adaptive capacities and population movements of Indigenous people in four communities in northern Australia – Broome in Western Australia; Maningrida and Ngukurr in the Northern Territory; and Wujal Wujal in Queensland. The report addresses the following research questions:

- How and why are Indigenous people in northern Australia vulnerable?
- How and why are Indigenous people in northern Australia resilient?
- How do specific populations differ in terms of their current resilience and adaptive capacity to slow onset changes and extreme weather events?
- What role does population movement have as an adaptive response to climate change?
- What changes are needed to enable Indigenous communities to enhance their resilience and adaptive capacities for future extreme weather events and other impacts of climate change?

To address these questions, the following four research approaches were taken:

- **Demographic history and population volatility** – An analysis of population volatility, using demographic variables such as age and sex distributions, mobility and migration, and population density. It is believed that communities with excessive population volatility are likely to experience more dramatic disruption as a result of environmental changes.
- **Land use planning as climate change adaptation** – An examination of the role that land use planning and development controls play in creating disaster-resilient communities. This was conducted by comparing the land use planning legislation, state-level planning policies, statutory planning schemes, property registration systems and emergency management systems in the Northern Territory, Queensland and Western Australia.
- **Indigenous views of change and risk** – An ethnographic and qualitative study of the relationship that individuals and communities have with their ever-changing environment. The investigation examined Indigenous views of change and risk, as well as the broader socioeconomic and political circumstances that impact on their underlying vulnerabilities and capacities to adapt.
- **Children's understanding of weather and seasons in Broome** – A qualitative investigation of children's perceptions to provide a more holistic understanding of how changes in weather and climate affect the younger members of the community.

Specific outcomes

Population volatility was taken to be an indicator of the sensitivity of communities to greater mobility in the event of environmental impacts and the possible effects of climate change. A study of indicators of population volatility was carried out for the towns of Maningrida, Ngukurr and Wujal Wujal. The study showed that Maningrida has a youthful population, significantly unbalanced sex ratios with males predominating, and a high proportion of un-partnered adults, compared with control communities. This suggests that the population as a whole is sensitive to changing its structure in the event of significant environmental stress. Ngukurr does not show the same kinds of population volatility indicators, which implies a more stable population. It does, however, have a relatively high degree of local mobility, suggesting an active exchange of people between the township and surrounding communities. Wujal Wujal has several indicators of high population volatility, which may be attributed to its small size, and its proximity to the much larger town of Cairns.

Since the volatility indicators were drawn primarily from two Census periods, 2006 and 2011, it became clear that the indicators themselves are subject to rapid changes over short periods of time. This may be attributed to the specific circumstances on the different Census dates, for instance, recent weather events, or phase positions in the cycles of in- and out-migration.

The research suggests that in the future there is likely to be more out-migration from Maningrida and Wujal Wujal in the event of environmental stresses, while Ngukurr may remain stable. Broome is likely to grow in importance within the Kimberley region and present a stronger attractor for migrants or visitors from smaller communities.

The examination of the role that land use planning and development controls play in creating disaster-resilient communities revealed that there is no link between emergency management and land use planning in the states and territory of northern Australia. That is, none of the land use planning systems in these three jurisdictions uses their planning legislation effectively to create disaster-resilient communities. Better mechanisms for sharing the data and knowledge accumulated by emergency management systems and for integrating that information into land use planning systems need to be developed as a matter of urgency.

Further, our analysis showed that neither climate change adaptation measures nor climate responsive design strategies are included in key parts of the land use planning and development assessment system. The discrepancy in the application of these measures between urban centres and remote Aboriginal communities is evident and this, in turn, creates significant disparities in terms of equity and amenity. The qualitative research highlighted respondents' aspirations for housing design to consider environmental elements and climate change impacts. However, Aboriginal people are repeatedly denied opportunities for contributing their ideas to the design and construction of housing.

At the community level, climate change and adaptation take place within a much broader context of cultural, environmental, social and governance change. The qualitative component of the research structures each of those areas of change in order to communicate and understand both the changes themselves and the capacity for adaptation. It is not realistic to isolate climate change adaptation from the totality of culture and environment.

Cultural change is observed and commented upon by respondents both in terms of the ongoing importance of Aboriginal cultures and the decline and transformation of many

of its elements. Government and religious policies, past and present, have often prevented people from maintaining their culture and spirituality. There are generational issues that relate both to the passing on and the acceptance of traditions. This loss of culture is particularly acute among younger generations who lack Traditional knowledge of country and language. However, this research demonstrates that children in the tropics respond very positively to seasonal changes in their lives. Although some youth may have lost touch with their culture they are, with appropriate support, considered to be more adaptable than older generations.

The loss of language is widespread, but is transformed by the development of *Kriol*. Art and music, on the other hand, remain powerful means of expression, grounded in culture and values but transforming through cross-cultural and intergenerational dynamics. Respondents express spirituality, but some elements of Traditional spirituality have been incorporated into Christian beliefs.

Leadership is both emergent and grounded in Traditional relationships. In all of these communities, relationships with country and understanding of the environment and all of its components, including climate and its changes, are core to culture. The outstation movement enhances that relationship, providing connection, care of country, a richer diet based on bush tucker and awareness of seasonal and cyclical shifts in the weather and landscape. Adaptation to changing culture and country seems to be deeply embedded in these communities.

In terms of noticing changes, some respondents commented that the change between seasons seems to be less distinct now than it used to be, but there was no perception that cyclone frequency or severity was increasing. The major impact discussed in relation to hazards was biodiversity loss, which included reductions in bush tucker and bush medicine. However, it was noted that although some hazards may adversely impact on biodiversity, events such as fire and flood may have important ecological functions and can regenerate the landscape. Nevertheless, feral species, commercial fishing, tourism and mining impacts further threaten biodiversity. Community members noted a number of negative impacts from sea level rise, including: erosion, salt water intrusion, flooding and a reduction in bush tucker. Some communities are considering relocating inland and have called for more detailed mapping to be undertaken.

There is widespread agreement of the need for recognition of Traditional knowledge and better cooperation between policy makers, scientists and Indigenous communities; more youth education programs; better recognition and protection of vulnerable ecosystems that are of value to Indigenous communities; and, greater focus on remote areas in terms of their vulnerability to extreme events and climate change.

The research found that the most crucial strategy for coping with extreme events and slow onset changes was for the relevant officials to work with local people and use existing local knowledge. Many locals have learned to cope with extreme weather events in the past, and they have endured and adapted to devastating social changes. They are, therefore, the best source of knowledge on resilience and self-reliance. Other important strategies included helping Aboriginal people return to their homelands following a disaster. Barriers to improving resiliencies included: the transient nature of emergency service personnel; the centralisation of services leading to further marginalisation of remote locations; inconsistencies in emergency management procedures in urban compared with remote communities; limited funding from governments for disaster preparedness and mitigation works; and limited access to remote locations and the lack of capability for evacuation from these areas in the event of an emergency.

There was general agreement that the various ranger programs were essential to protect country and thereby protect people. The rangers play a fundamental role in environmental and cultural management, including: managing feral animals and weeds, monitoring illegal fishing, recording and protecting sites of significance, establishing cultural walks and administering public access and accommodation in addition to undertaking management of early season burning.

In many instances, the ranger programs are the only effective means available to Indigenous people to protect country. The rangers work closely with other government services, particularly the Australian Quarantine and Inspection Service (AQIS), in monitoring threats to biodiversity and agricultural industries. Another central role for rangers is the sharing of cultural knowledge between the Indigenous and the wider non-Indigenous community. In addition to sharing knowledge, communication is critical in order to identify and implement sustainable culturally appropriate models for Traditional Owner groups.

All the ranger programs were found to suffer from over-extended resources, which resulted in them being unable to operate effectively on country. Rangers expressed the need for further funding for the use of helicopters, vehicles, boats and other items needed to undertake their work. This is a problem due to the vast areas of country that must be looked after.

A lack of authority was also seen as a problem for rangers, since they have little power to prevent people carrying out illegal activities on Aboriginal land. Rangers are also restricted from carrying out natural resource management activities on other tenures such as leasehold land, which makes it difficult to address problems such as feral animals and weeds that spread to Indigenous lands.

The research demonstrates that there is a strong need to provide sustainable livelihoods for people to enable them to stay on country. This is particularly relevant for large-scale remote areas where resources are required to deal with a significant number of environmental threats. However, apart from ranger programs, there is a significant lack of sustainable livelihood opportunities in remote Indigenous communities.

We believe the real challenge for remote Indigenous communities in Australia is to promote new patterns of economic growth and enterprise development that simultaneously sustain cultural heritage values and deliver social and economic justice. This requires participatory approaches that better integrate the aspirations of Indigenous people who are the focus of many economic development or poverty alleviation initiatives.

In summary, this report puts the issue of climate change adaptation in Indigenous communities into a historical and social context, capturing the complexity of forces that shape Indigenous vulnerability, and, paradoxically, resilience to climate change.

1. INTRODUCTION

Northern Australia is highly exposed to a number of natural hazards including: cyclones and associated storm surges, riverine and flash flooding, heatwaves, coastal erosion, bushfires and drought – some of which might be exacerbated by climate change. With an approximate population of 160,000 Indigenous¹ people (29% of the total Indigenous population of Australia (ABS, 2013)), it is critical to develop a multifaceted understanding of how climate change will affect Indigenous communities in northern Australia. Moreover, decisions about how to support Indigenous communities to adapt to and reduce their risks from climate change impacts must be informed by greater understandings of their current adaptive capacities, e.g. why they may be vulnerable or resilient, how they have coped with and adapted to past environmental changes, who is likely to leave, stay or return², and how sustainable communities can be maintained.

It is therefore the objective of this report to examine the underlying vulnerabilities, adaptive capacities and population movements of Indigenous people in northern Australia in relation to extreme weather events, climate variability and climate change. We envisage that the outcomes of this research will be valuable to Indigenous communities, rangers, conservation groups, policy makers, emergency managers, government and non-government organisations, and researchers across Australia who are actively working to adapt to and reduce the impacts from environmental change.

From a community perspective, much of the research into Indigenous responses to climate change in Australia and elsewhere focuses on socioeconomic and cultural characteristics of Indigenous communities (e.g. Ford, 2009; Pearce et al., 2010; Petheram et al., 2010; Tyler et al., 2007). There has been some interest in the relative vulnerability of communities based on their size, their isolation from other population centres, and levels of mobility (McLeman, 2010). Mobility studies are often centred on the capacity of Indigenous people to move around Traditional territory to adapt their seasonal practices (searching for food, establishing shelter etc.) to changing weather patterns (Cameron, 2012). There is also a substantial literature on communities relocating, and the possibility that communities will relocate from Traditional areas to often quite distant locations as those Traditional areas become less habitable as a result of climate change (Parker et al., 2006). Communities that have stronger ties with potential new residential locations (usually created through past migration and population exchange between old and new sites) are more likely to choose migration as an adaptation and are more likely to have positive experiences of migration (Petheram et al., 2010).

Traditionally, Indigenous people relocate or migrate seasonally and anecdotal evidence suggests that mobility is also used as an adaptive strategy prior to extreme weather events (e.g. cyclones, floods) and in relation to slow onset changes (sea level rise, biodiversity loss). However, there is currently very little research on adaptive strategies employed by Indigenous communities in northern Australia in response to extreme weather events, climate variability and climate change. In particular, the capacities and reasons for mobility and use of relocation are unknown.

¹ In this report we have used the term 'Indigenous' to include Aboriginal and Torres Strait Islander people as the First Peoples of Australia, noting that Aboriginal and Torres Strait Islander peoples retain distinct cultural identities, and that for the most part, the case studies in this report focussed primarily on Aboriginal people on the mainland of Australia.

² Even if Aboriginal people move for climatic reasons, they never give up their Traditional connections and customary custodial responsibilities for their country. For example, see Rose, D.B., 1996. *Nourishing Terrains - Australian Aboriginal Views of Landscape and Wilderness*. Australian Heritage Commission, Commonwealth of Australia, Canberra, ACT.

In light of the above, this report analyses population volatility³ not to deliver a prediction of how communities in northern Australia might respond to increasing climate pressures, but to stimulate thinking about the extent to which demographic adaptation might be dramatic or more measured. We argue conceptually that communities with excessive existing population volatility will be more vulnerable to dramatic change and we hope that insights into this issue can help communities and planners to better understand the demographic context in which future change may occur.

Nevertheless, migration is one of many adaptive strategies used by individuals and communities when faced with the impacts of climate change. It is, therefore, pertinent to examine the broad range of past and present adaptation strategies employed by individuals and communities in order to determine how these might be used in the future. An essential component of this is to promote Indigenous voices and ensure that Aboriginal people are recognised as key stakeholders who are involved through consultation, rather than passive recipients of government policies. In order to provide a medium for their voices, the report documents Indigenous views of change and risk, including broader socioeconomic and political factors that impact on their underlying vulnerability and capacity to adapt. According to Green et al. (2009) the research community has, to date, paid little attention to the vulnerability and adaptive capacity of Indigenous communities in Northern Australia. There is a danger that research with Indigenous people will follow current Western climate change discourse and pre-empt the attitudes and experiences that Indigenous people have towards their environment and the dangers they face (Veland, 2011; Veland et al., 2010). As such, this report attempts to provide an understanding of the relationship that individuals and communities have with their ever-changing environment, and the realities of their everyday existence, without a restrictive preconceived 'climate change' overlay.

Additionally, there is little documented knowledge concerning children's understanding and conceptualisation of climate change in northern Australia. In particular, their current and future capacity to cope with risk and adversity is unknown (Bartlett, 2008). It is, therefore, necessary to document how children perceive and live differently in the changing seasons in the tropics to determine how future changes may impact their everyday existence. Climate education challenges the traditional, subject-based curriculum and, along with many other environmental issues, it calls for bridging personal, social, economic and scientific issues in an integrated whole (Jenkins, 2003). However, for the most part, research is yet to describe what young people understand to be the primary issues and how environmental change affects the communities in which the children live from the child's perspective. Research can only begin to understand these impacts through engaging with young people to identify some of the main challenges to adaptation behaviours and mitigation works. Therefore, this report includes an investigation on the perceptions of youth to provide a more holistic understanding of how changes in climate affect the younger members of the community.

From a government perspective, effective land use planning is critical to reducing a community's vulnerability to climate change impacts and natural hazards, such as bushfire, cyclone and flooding. Moreover, land use planning assists in the creation of resilient communities. The risks and consequences from natural hazards vary depending on the location of the community, the physical characteristics of the land and the type and scale of development. Land use planning, when combined with development controls and building codes, can mitigate the likelihood of loss of life and damage to and/or destruction of property and infrastructure (COAG, 2011a).

³ Population volatility is described in detail in section 8.1.

The land use planning system is fundamental to the creation of safe, resilient and sustainable communities. The location of existing settlements or their planned expansion to accommodate population growth through new development can either create or exacerbate exposure to natural hazards. Land use planning can also be used to reduce the risks of loss of life and damage to property and essential infrastructure assets, even where the risks may not be fully understood. The predicted impacts of climate change, whether through increased frequency and/or intensity of extreme weather events, need to be factored into land use planning and development assessment processes. Good planning can reduce the physical vulnerability of settlements by identifying suitable low-hazard locations for development or by introducing development controls that ameliorate the risks.

This project examines the role that land use planning and development controls play in creating disaster-resilient communities by comparing the land use planning legislation, state-level planning policies, statutory planning schemes, property registration systems and emergency management systems in the three jurisdictions that span northern Australia (Western Australia (WA), Queensland (Qld), Northern Territory (NT)).

In light of the above, this report focuses on four areas:

- Demographic history and population volatility.
- Land use planning as climate change adaptation.
- Indigenous views of change and risk.
- Children's understanding of weather and seasons (Broome case study).

1.1 Chosen case study locations across northern Australia

To address the objective of this report, four case study locations with various exposures to extreme weather events, climate variability and climate change were chosen: 1) Broome, Western Australia; 2) Maningrida and 3) Ngukurr, Northern Territory; and 4) Wujal Wujal, Queensland (Figure 1.1). Their selection came about following discussions with a number of Indigenous and government organisations and key Indigenous stakeholders, including the North Australian Indigenous Land and Sea Management Alliance (NAILSMA), Ngukurr Art Centre, Northern Territory Government, Northern Territory Library and Archives, Northern Land Council (NLC), Nyamba Buru Yawuru Ltd, the Shire of Broome and Wujal Wujal Aboriginal Shire Council. As the research progressed, outlying communities and homelands/outstations⁴ were also included in the analysis.

⁴ Please note that these terms are used interchangeably throughout the report.

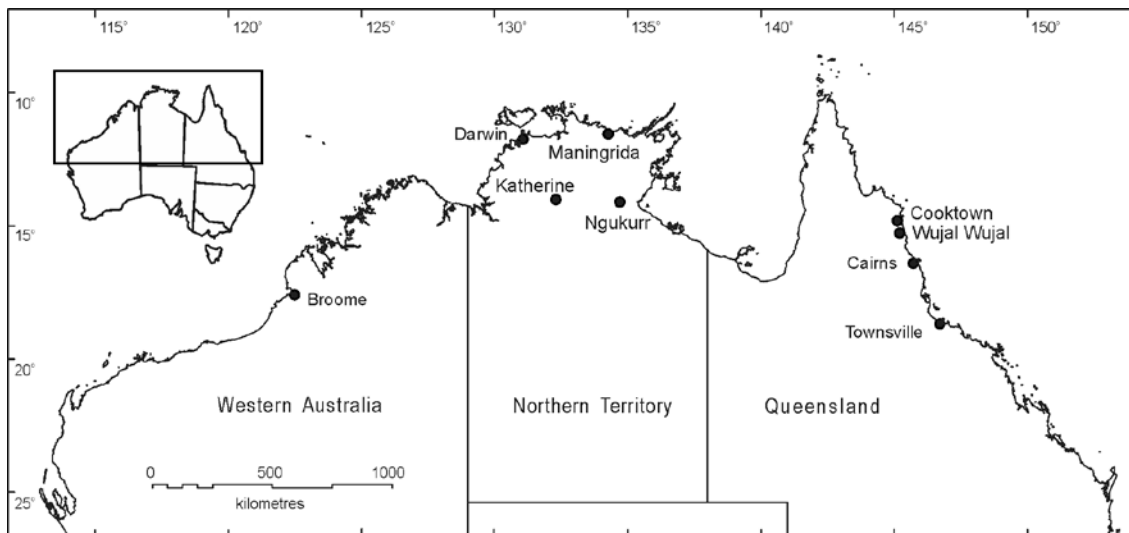


Figure 1.1: The location of the four case study locations across northern Australia. Map produced by Adella Edwards, James Cook University.

The community of Broome was selected on the basis of a number of factors. The National Native Title Tribunal has registered two Indigenous land use agreements (ILUAs) relating to the Yawuru people in Broome, WA: the Yawuru Prescribed Body Corporate ILUA, and the Yawuru Area Agreement ILUA. In the second ILUA, the Yawuru community will receive land valued at about \$140 million for development and cultural and social welfare, and about \$56 million for capacity building for the local Indigenous community, preservation of culture and heritage, economic development, social housing and joint management of a proposed conservation estate. The ILUAs resolve all Native Title and compensation issues over about 5,300km² of land in and around Broome where Native Title had previously been determined, and enable land to become available for tourism, residential and industrial development, and a new airport.

The intention of including Broome in this research was to produce information that will contribute to and support 1) the development of the Yawuru Management Plan, and 2) management of the cultural estate in and around Broome. The report also investigates the movement of people into Broome in search of shelter and, in particular, the impact that this might have on housing.

Maningrida, Ngukurr and Wujal Wujal are considered remote, rural communities and are the focus of state and federal government strategies. By working with these communities, we hoped to generate information that would better inform current and future government initiatives, including emergency management arrangements, land use planning, housing developments and maintenance, etc.

For example, Cyclone Monica, a Category 5 cyclone, impacted Maningrida in 2006. Initial discussions with key stakeholders exposed a marked difference in response between Indigenous and non-Indigenous people. These stakeholders revealed that Aboriginal residents of Maningrida and the surrounding outstations had accumulated knowledge from their ancestors of preparedness and response to extreme hazard events such as cyclones and floods. Veland et al. (2010) investigated the emergency management response and evacuation of the remote island community of Waruwu prior to the passage of Cyclone Monica but no detailed study was conducted in Maningrida after the event. Therefore, our research aimed to capture people's experience of the event and their feelings towards emergency management

arrangements. Similarly, the community of Ngukurr was chosen based on the fact that it is subject to monsoonal rains, impacts from cyclonic events and bushfires. Local people therefore have a very rich history of preparedness and response. By recording and documenting people's knowledge and perceptions, the project aimed to provide an evidence-base (or suggested strategies as defined by the community) on which emergency management policy could be further developed.

The community of Wujal Wujal has been involved in disaster risk reduction research projects with the Centre for Disaster Studies at James Cook University (JCU) and in liaison with Emergency Management Australia (EMA) and Emergency Management Queensland (EMQ). Situated in the Bloomfield Valley north of the Daintree, Wujal Wujal is isolated by floods, cyclones and landslides every wet season, often for weeks. Isolation will increase under predicted climate change scenarios, while major services and employment opportunities in Cairns place pressure on the long-term viability and sustainability of the community. The community of Wujal Wujal was chosen in an effort to complement and extend past and current research undertaken by JCU, EMA and EMQ by investigating vulnerability and resilience in relation to climate change adaptation.

Furthermore, key stakeholders believed that this project would provide a valuable opportunity to document the customary knowledge that Aboriginal people have in relation to extreme weather and slow onset events. At the time of writing the proposal, the Northern Territory Library had commissioned new software to enable communities, including Maningrida and Ngukurr, to establish specific databases for their unique digital collections of local knowledge. Entitled *Community Stories*, the program aims to provide local residents with an opportunity to develop IT skills while recording stories of culture and history. If permission is granted, any stories recorded through this project will be made available for storage within each community's database for future generations to access and use. Recordings of oral history and traditions are considered extremely important to many of the abovementioned stakeholders, as they believe that intergenerational knowledge transfer is declining. At the time of writing, recordings are to be stored within the databases at the Djelk Ranger base in Maningrida, the Ngukurr Art Centre and the Northern Territory Archives. Appropriate places in which to store recordings from Broome and Wujal Wujal will be sought.

1.2 Research questions and report structure

In analysing the underlying vulnerabilities, adaptive capacities and population movements within the four chosen communities, the report addresses the following research questions:

- How and why are Indigenous people in northern Australia vulnerable?
- How and why are Indigenous people in northern Australia resilient?
- How do specific populations differ in terms of their current resilience and adaptive capacity to slow onset changes and extreme weather events?
- What role does population movement have as an adaptive response to climate change?
- What changes are needed in order for Indigenous communities to enhance their resilience and adaptive capacities for future extreme weather events and other impacts of climate change?

In order to provide context to the research, the report provides background information on the Indigenous population across northern Australia (Chapter 2) and how climate change may impact their regions (Chapter 3). The report then considers each case study location in terms of social context, geography, climate and hazards, and emergency management arrangements (Chapters 4 to 7). The approach, methods and

results for each component of the research are then presented (Chapters 8 to 11). The final chapter provides a concluding discussion that includes a summary of our findings and addresses the research questions outlined above (Chapter 12).

As we undertook our research, we were constantly confronted by the complexity of Commonwealth and State/Northern Territory Indigenous policies, programs and initiatives. In order to better inform our research and findings, we compiled a summary of the current Indigenous policy initiatives that are driving many of the programs and activities in our case study communities. This is documented in Appendix A.

Additionally, WA Rangelands NRM⁵ invited the research team to discuss climate change adaptation with their key stakeholders within the Broome community. Our NCCARF researchers used this opportunity to run a short workshop with the captive audience and held a second workshop with a local Yawuru ranger group the following day. Details of these workshops are presented in Appendix B.

The structure of the report is as follows:

- Chapter 1 Introduction
- Chapter 2 Northern Australia demographics
- Chapter 3 Climate, hazards and change in northern Australia
- Chapter 4 Case study: Broome, Western Australia
- Chapter 5 Case study: Maningrida, Northern Territory
- Chapter 6 Case study: Ngukurr, Northern Territory
- Chapter 7 Case study: Wujal Wujal, Queensland
- Chapter 8 Demographic history and volatility
- Chapter 9 Land use planning as climate change adaption
- Chapter 10 Indigenous views of change and risk
- Chapter 11 Children's understanding of weather and seasons in Broome
- Chapter 12 Discussion and conclusion
- Appendix A Commonwealth and State/Territory Indigenous policy initiatives
- Appendix B Climate change workshops in Broome

⁵ Natural Resource Management.

2. NORTHERN AUSTRALIA DEMOGRAPHICS

According to the 2011 Census, there were approximately 160,000 Indigenous people living in 'north Australia' defined as consisting of Statistical Area 3 census regions that were completely or substantially north of the Tropic of Capricorn (see Figures 2.1 and 2.2). Indigenous people accounted for approximately 13% of the total population. While statistical geography changed from the 2006 to 2011 Census, it can be estimated that the 'northern' Indigenous population grew by nearly 14%, which was consistent with the level of overall population growth across the north, but less than the growth of the national Indigenous population (about 21%).

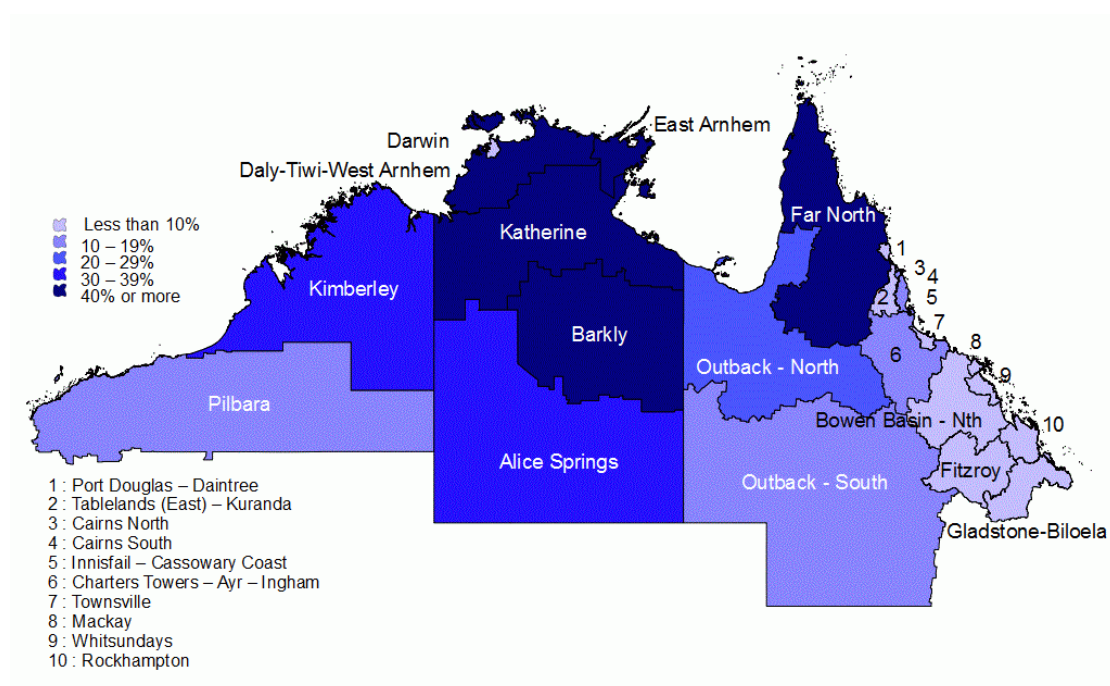


Figure 2.1: Proportion of the total population in each Statistical Area 3 who were Indigenous in 2011 Census.

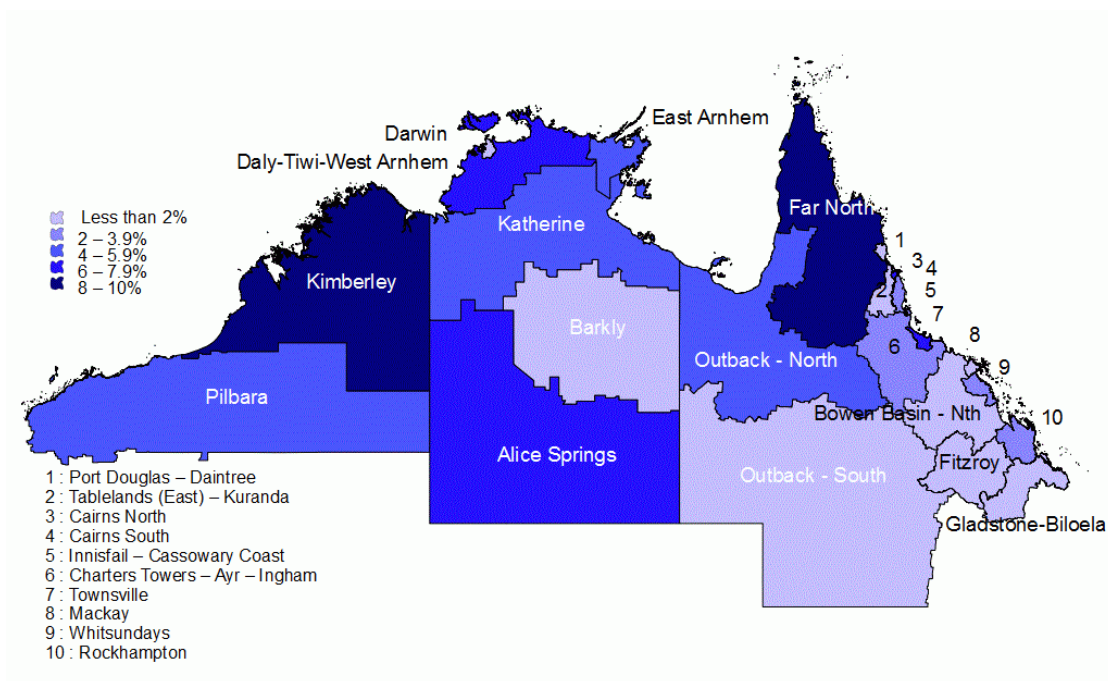


Figure 2.2: Proportion of the northern Indigenous population living in each Statistical Area 3 in 2011 Census.

With the exception of the Darwin region, Indigenous people represented a higher proportion of the total population in the more northern regions. Likewise, the largest Indigenous populations were in the far north of Queensland (16,000 Indigenous residents, or 10% of the total northern Indigenous population) and the Kimberley (14,000 Indigenous residents, or 9% of the total northern Indigenous population).

While there was considerable diversity among Indigenous populations across the north, the total Indigenous population had a substantially different age and sex structure to the non-Indigenous northern population (Figure 2.3). For example, there were 97 Indigenous males for every 100 Indigenous females. In comparison, there were 108 non-Indigenous males for every 100 non-Indigenous females within the overall northern population. The median age of the northern Indigenous population was 22 years, compared with 35 years for the non-Indigenous population. Over 35% of the Indigenous population was aged less than 15 years, compared with 20% of the non-Indigenous population. Just 4% of the Indigenous population was aged 65 years or older, compared with 10% of the non-Indigenous population.

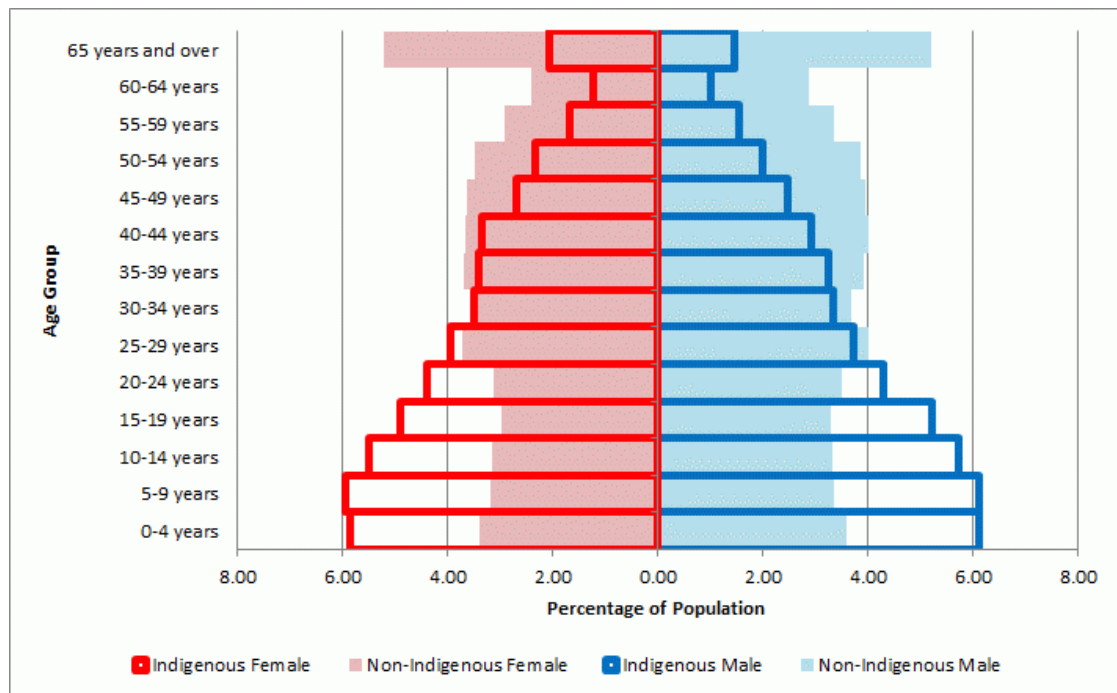


Figure 2.3: Age/sex pyramid comparing northern Indigenous and northern non-Indigenous populations.

Over 85% of the northern Indigenous population were usually resident in an urban centre or locality (a discrete community with 200 or more residents). The average size of urban centres was almost 3,500 people, with the largest being Townsville (approximately 160,000 total population and 10,000 Indigenous population), Cairns (135,000 total and 12,000 Indigenous), Darwin (100,000 total and 10,000 Indigenous), Alice Springs (25,000 total and 5,000 Indigenous) and Karratha (16,000 total and 1,000 Indigenous). The largest Indigenous populations were in Cairns, Townsville, Darwin, Alice Springs, Rockhampton (4,000), Mackay (3,500) and Mt Isa (3,000). The largest Western Australian Indigenous population was in Broome (3,000). Indigenous people represented over 50% of the total population in 105 of the urban centres, and in excess of 75% of the population in 93 of the urban centres (see Figure 2.4). The largest of these Indigenous communities were Yarrabah (2,500 Indigenous population), Palm Island (2,400), Maningrida (2,000), Wadeye (2,000), Galiwinku (2,000), Nguiu (1,400), Aurukun (1,200), Doomadgee (1,100) and Halls Creek (1,000).

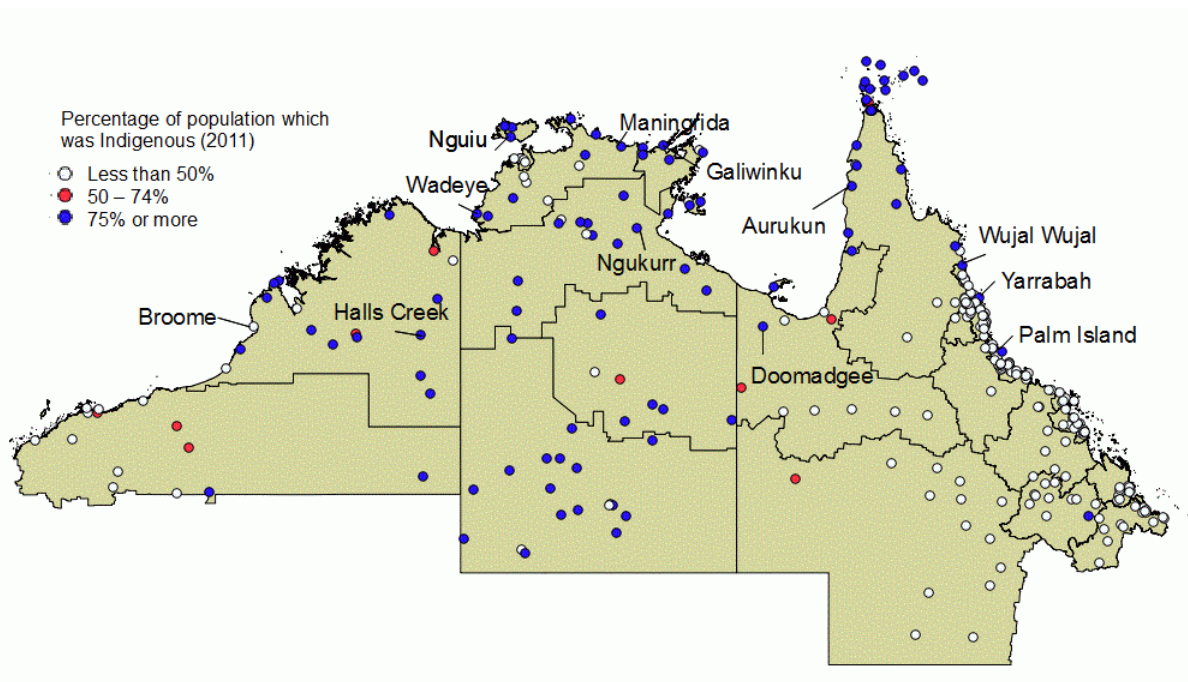


Figure 2.4: Urban centres and localities in which Indigenous people lived in northern Australia.

Along with diversity in the size of urban centres in which Indigenous people lived and the proportion of the population that was Indigenous, there was also diversity in the age and sex profiles of Indigenous urban populations across the north. While the average sex ratio, for example, was 97 Indigenous males for every 100 Indigenous females, a number of larger communities (over 200 Indigenous residents) had sex ratios in excess of 110 males for every 100 females. These included the Indigenous communities (over 75% Indigenous population) of Warmun (138), Erub Island (124), Waruwi (112), Gapuwiyak (112), Minjilang (112), Hope Vale (111), and Palm Island (110). On the other hand, approximately 100 communities had sex ratios of fewer than 90 males for every 100 females, including large Indigenous communities like Titjikala (65), Kaltukatjara (72), Wutungurra (75), Walungurru (77), and Umagico (78). Median age and overall age distribution also varied substantially, with around 30 communities recording the median age of the Indigenous population as less than 15 years, and 60 communities with a median age of the Indigenous population greater than the average total population median age across the north.

As a final emphasis of the point that Indigenous populations across the north are diverse and that little attention should be paid to 'average' characteristics when working with individual communities, there was great variation in the extent of residential mobility recorded among Indigenous people at the 2011 Census. The Census asked people to specify their place of usual residence in 2011, and their place of usual residence in 2006. While there are well recognised issues in collecting and interpreting these data (see for example, Taylor, 2009), it is nonetheless illustrative of diversity that communities such as Umbakumba, Ramingining, Aurukun, Wadeye and Injinoo, among many others, had fewer than 5% of the Indigenous population change address, while communities such as Halls Creek, Binjari, Laramba, Horn Island and Paraburdo had greater than 20% of the Indigenous population change address.

In summary, while it is 'typical' for Indigenous populations in northern Australia to be younger, more female, and less residentially mobile than non-Indigenous populations, there is substantial diversity between different communities, and it would be unwise to make vulnerability and adaptability assessments for individual communities based on regional averages.

3. CLIMATE, HAZARDS AND CHANGE IN NORTHERN AUSTRALIA

In general, many people recognise that the northern Australian tropical climate has a dry season and a wet season, with temperatures and storms causing typical variations within each. The winter dry season is characterised by clear, mild and dry conditions. The end of the dry and beginning of the wet is determined when rainfall accumulation reaches 50mm from 1st September (BoM, 2011; see Figure 3.1). Monsoonal rains, thunderstorms, occasional tropical cyclones and hot humid weather typify the wet season. Bushfires are fairly common within the Northern Territory at the commencement of the wet season (October to November), when lightning from dry, gusty thunderstorms ignites dry foliage (BoM, 2012c). Monsoonal rains bring about regional flooding, which is exacerbated by the occurrence of cyclones and storm surges. Indigenous Australians, however, identify more subtle and diverse seasons, although these vary between communities and homelands.

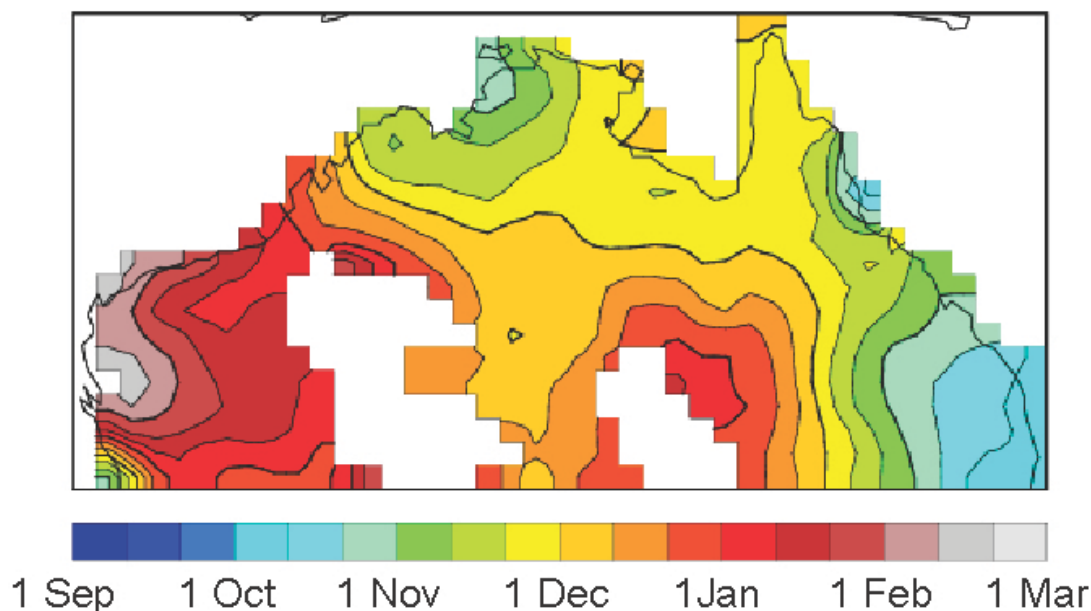


Figure 3.1. Mean onset date of wet season as determined when rainfall accumulation reaches 50 mm from 1st September (BoM, 2011).

In terms of management of the abovementioned hazards, all communities abide by a layered approach, whereby the Commonwealth provides overall direction and strategy, along with the most significant resources for controlling disaster situations (COAG, 2011a). The next level is the state, which is administered from the capital city and includes its own lexicon of formal names for the significant people, places and resources in emergency planning. However, the particular names are largely equivalent in responsibility and function. The third level of emergency management is the district or regional level, which is usually administered from either the largest town in the region or the most appropriate in terms of geographical location (Maningrida and Ngukurr are both administered by Katherine rather than Darwin). The final level is local, which includes people and resources in the community in question.

With respect to emergency management arrangements, of the four communities under consideration only Broome is responsible for a district. Maningrida and Ngukurr are under the authority of the district administered by Katherine, and Wujal Wujal is

administered by Cairns District Management Group. All case study locations have outlying communities and outstations to administer in case of an emergency or disaster.

Research has demonstrated that climate change is already impacting northern Australia in various ways (e.g. see Green et al., 2009). Threats to biodiversity are heavily impacting Indigenous communities and continued changes to temperatures and seasons will cause future effects. Due to strong cultural connections between Indigenous Australians and their land and sea country⁶, changes in biodiversity or biodiversity loss are likely to affect the well-being of Indigenous communities (Green et al., 2009). The following sections describe the predominant effects of climate change in terms of rapid (cyclones, floods, heatwaves) and slow (drought, sea level rise) onset events. These sections also provide a brief overview of some of the associated ecological and social impacts. For more detailed information please see Green et al. (2009).

3.1 Rapid onset events and associate impacts

3.1.1 Cyclones

Northern Australia is already vulnerable to intense cyclones (categories 4 and 5), with recent examples occurring in Far North Queensland (Cyclone Yasi, 2011; Cyclone Larry, 2006), the Maningrida region (Cyclone Monica, 2006) and the Broome region (Cyclone Rosita, 2000). Currently, there is no discernible change in the total numbers of tropical cyclones or in the occurrence of the most intense tropical cyclones in northern Australia. Nonetheless, it is expected that there will be fewer tropical cyclones as the climate changes, while the proportion of cyclones with greater intensity will increase (CSIRO and The Australian Bureau of Meteorology, 2012).

Possible impacts of more frequent intense cyclones are:

- Increased disturbance and physical damage to habitats.
- Increased sand movement, which may smother or erode some plants, animals, habitats, burrows and nests.

3.1.2 Floods

The most recent IPCC report (2012), suggests that it is *likely* that the frequency of heavy precipitation or the percentage of total rainfall from heavy falls will increase during the 21st century. However, the CSIRO caution that it is unclear how these projected changes will impact on average rainfall over northern Australia (CSIRO and The Australian Bureau of Meteorology, 2012).

Nevertheless, Green et al. (2009) provide specific predictions for changes in rainfall patterns during the wet seasons in northern Australia. By 2030, there is a predicted 4-8% increase in wet season rainfall around the Maningrida, Ngukurr and Wujal Wujal regions, and a 0-4% decrease in wet season rainfall around Broome. By 2070, there is a predicted 8-10% increase in wet season rainfall around the Ngukurr region, a 4-8% increase around Maningrida and a 0-4% increase around the Broome and Wujal Wujal regions (Green et al., 2009).

⁶ "‘Country’ is a term Indigenous people use that can be described as the lands with which Indigenous people have a Traditional attachment or relationship. Care for this country is based in the laws, customs and ways of life that Indigenous people have inherited from their ancestors and ancestral beings." Indigenous people see themselves as having responsibilities and rights across both land and sea. From: 'The Benefits Associated with Caring for Country: Literature Review', (2011) Weir, Stacey and Youngetob, Canberra, AIATSIS, p.1.

An increase in the frequency of heavy precipitation or the percentage of total rainfall from heavy falls will increase the likelihood of flash flooding events, which could have significant impacts on the Wujal Wujal community due to the steep topography of the surrounding area. Moreover, an increase in wet season rainfall will add to the current pattern of regional, wet season flooding throughout northern Australia. In addition to flooding, increases in rainfall may cause changes in estuarine fish catches (Meynecke et al., 2006) and increased run-off causing:

- Sediment to smother seagrass and coral.
- Nutrients to increase seaweed growth, which may smother seagrass and coral.
- Pollution, which may harm particular species.
- Increases in harmful algal blooms (Edwards and Krockenberger, 2006; Valerie, 2008).
- Decreases in salinity in estuaries, mangroves and other trapped tidal water.
- Increases in stratification, where layers of water don't mix.

3.1.3 Heatwaves

It is expected that Australia will experience an increase in the number of hot days and warm nights as temperatures increase 0.6-1.5°C by 2030 from the 1980-1999 climate mean (CSIRO and The Australian Bureau of Meteorology, 2012). This will result in longer heatwaves (IPCC, 2012), where temperatures reach or exceed 35°C over three or more consecutive days. The Department of Climate Change and Energy Efficiency (2012) report that for coastal areas in the Northern Territory, such as Darwin, the current number of days over 35°C will increase from 11 to 69 per year by 2030 and up to 308 per year by 2070.

In terms of human health, the elderly, the very young and the chronically ill are most at risk from extreme heat. In particular, the occurrence of heat stress and dehydration is expected to increase, along with respiratory illnesses and increased transferability of disease (Green et al., 2009).

3.2 Slow onset events and associated impacts

3.2.1 Drought

In the dry season, it is expected that the Ngukurr region will experience a 0-4% increase in rainfall in 2030 and this will remain consistent to 2070 (Green et al., 2009). However, fluctuations are expected in other regions. Dry season rainfall will increase in the Broome region by 4-8% in 2030 but this will change to a decrease of 0-8% by 2070 (Green et al., 2009). Dry season rainfall will decrease from 0-4% in 2030 and 4-8% in 2070 around the Maningrida region, while the Wujal Wujal region will experience a 4-8% decrease in 2030 and a 0-4% decrease by 2070.

The IPCC (2012) found that droughts in north-western Australia have become less frequent, less intense, or shorter. However, with the predicted dry season rainfall changes, certain impacts on normal water use should be expected. As defined by the BoM (2012d), "drought is a prolonged, abnormally dry period when the amount of available water is insufficient to meet our normal use." Based on the predictions highlighted by Green et al. (2009), it is not expected that the Ngukurr region will experience drought in the coming decades but it is possible that a decrease in dry season rainfall by 2070 in the Broome, Maningrida and Wujal Wujal regions will impact on the amount of available water for normal use.

3.2.2 Sea level rise

There are two processes that lead to sea level rise: the melting of land ice, and the thermal expansion of water in the oceans (Milne et al., 2009). Glaciers and ice sheets hold up to 75% of the Earth's fresh water. Over the past decades, this ice has been melting at an increasing rate. The ice that was stored above the sea will join the oceans, increasing the amount of water. As water warms, it takes up more space; this thermal expansion is thought to contribute to a rise of 1.6mm each year (Solomon et al., 2007).

Sea levels have been steady for the past 7,000 years, following the melting of glaciers during the last ice age. Before this time, sea level rose at approximately one metre per century (Fairbanks, 1989). The sea level began to rise in the mid 19th century and has continued since then (CSIRO and The Australian Bureau of Meteorology, 2012; Donnelly, 2006; Solomon et al., 2007). There is still great uncertainty as to the effects of sea level rise and they are thought to be locally specific (Nicholls and Cazenave, 2010). However, increased sea levels may:

- Increase the extent of flooding events from storm surges, tsunamis and king tides (FitzGerald et al., 2008).
- Increase coastal erosion (Leatherman et al., 2000).
- Increase salt water in coastal habitats.
- Increase wetland loss (Leatherman et al., 2000).
- Alter sandy beaches and barrier island coasts (FitzGerald et al., 2008).
- Change the connectivity of estuarine areas.
- Increase depth and therefore decrease the light available for sea grass and coral.
- Cause changes to turtle nesting beaches (Fuentes, 2010).

In northern Australia, sea level rose 6-8mm between January 1993 and September 2011 around the coastal region of Wujal Wujal in Far North Queensland, while the Broome and Maningrida regions experienced an 8-9mm increase, and the Gulf of Carpentaria (east of Ngukurr) recorded up to a 12mm increase during the same period (CSIRO and The Australian Bureau of Meteorology, 2012). It is expected that sea level rise will continue at global levels, with an average increase of at least 790mm by 2100, and when combined with king tides and storm surges, it will have the most significant short to medium-term impacts in northern Australia (Green et al., 2009). Sea level rise will pose further threats to infrastructure within the coastal communities of Broome and Maningrida while impacting on coastal and estuarine ecosystems important to each of the four case study locations. As salt water encroaches upon fresh water sources, residents' safety will be compromised with increased movement of saltwater crocodiles and drinking water supplies will be jeopardised.

4. CASE STUDY: BROOME, WESTERN AUSTRALIA

Prior to European settlement, the Dampier Peninsula was inhabited by the Yawuru, Jugun, Ngumbarl, Jabirrjabirr, Nyulnyul, Numanburru, Warrwa, Bardi, Jawi and Karrajarri peoples – each of whom moved throughout the area in accordance with Traditional laws and customs (Sickert, 2003). Today, this region forms the Shire of Broome with the largest population (Aboriginal plus non-Aboriginal people) located in Broome. Outside of Broome, the Shire's population is concentrated in and around five permanent remote Aboriginal communities: Ardyaloon, Djarindjin, Lombadina and Beagle Bay in the northern part of the Dampier Peninsula and Bidyadanga to the south (Figure 4.1). Service provision is concentrated within Broome and these five larger communities. There are, in addition, a total of 87 remote communities across the Shire (Shire of Broome, 2010).



Figure 4.1: Region around the Shire of Broome. Map produced by Adella Edwards, James Cook University.

The Traditional Owners of the region encompassing the township of Broome are the Yawuru people. Hence, the focus of our study is the Yawuru people and their land. However, other Aboriginal groups were also taken into consideration in this study due to their use of Yawuru Country and reliance on Broome since European interventions.

4.1 The Yawuru people and their ever-changing environment

4.1.1 Social context

“For thousands of years our ancestors have lived along the foreshores of Roebuck Bay, across the pindan plains, as far inland as the Walan-garr, the Edgar Ranges, and along the fringes of the Great Sandy Desert. Our country is land and sea moulded by the cycle of seasonal change. We live by the seasons, reading the signs to know when and where we should go to harvest the riches of our country. When the first south-east winds start to blow across Roebuck Bay, bringing the cold weather, we head to the beaches and tidal creeks to fish for salmon. When the weather warms and the winds blow from the west, we head for the reefs to fish for bluebone and the myriads of other reef fish (Yawuru RNTBC, 2011; p. 28).”

Before contact with Westerners, life for Aboriginal people across the Kimberley was driven by the changing seasons and mediated by traditions and the natural resources and conditions that prevailed. Family groups moved to where the best food resources might be found and according to the needs of ritual practices (Yawuru RNTBC, 2011).

The Yawuru recognise six seasons – the Wet (Man-gala), Changing (Marrul), Cooling (Wirralburu), Cold (Barrgana), Warming (Wirlburu) and the Hot (Laja) (Yawuru RNTBC, 2011). During the Cooling and Cold seasons, between May and August, the temperatures are cool at night and there is little rain. Traditionally, Yawuru people stayed close to the coast, where they could catch salmon, mullet and dugong, but would also forage inland for bush honey, native seeds, fruit and kangaroos.

The most critical time for food supplies was the Hot (Laja), when temperatures rose from late September before the onset of rains in December (Yawuru RNTBC, 2011). Food was sought in the sea, where reef fish, stingrays and shellfish were taken. Once the wet season broke, more food became available. The coming of the Wet (Man-gala) with the north-east monsoons brought oppressively humid weather, some 180mm of rain in an average month (BoM, 2012b) and a high risk of cyclones (*wangal jarrangu*). Yawuru people moved inland to avoid the cyclones, hunt abundant game and collect plentiful bush fruits (Yawuru RNTBC, 2011). Some Aboriginal groups moved to rock shelters and built more substantial huts on higher ground, seeking shelter from the rains and high winds (Yawuru RNTBC, 2011).

The first time Europeans are known to have visited the area was in 1616, when Dirk Hartog made accidental landfall on the west coast and drew maps of the coastline (Australian Heritage Council, 2011). However, the maps were haphazard and inaccurate, such that Dutch ships plying the spice routes with Indonesia continued to be wrecked on the coast of ‘New Holland’ (Pearson, 2005). Later, Abel Tasman made landfall in 1644 just north of the current town of Broome. While adopting a more systematic effort to map the coastline, he encountered hostility from local Aboriginal people (McGonigal, 1990).

The next European of note to arrive in the area was William Dampier on board the British privateer, the *Cygnat*. While his ship was laid-up for over two months for careening at Karrakatta Bay, Dampier compiled notes on the local animal and plant life, including dingoes and dugongs (Australian Heritage Council, 2011). He published his account of the voyage in a book, *A New Voyage around the World* (1699), which proved to be popular. Indeed, Dampier is credited as being the first to suggest that the British should explore New Holland (Bach, 1966). While the Dutch carried out the bulk of exploration of the north, west and south coasts of Australia during the seventeenth

and eighteenth centuries, they saw no value in establishing permanent settlements on the continent. It was only when the British and French sought strategic advantage one over the other, that it was deemed worthwhile to establish colonies in Australia in the late eighteenth century.

In order for these colonies to survive, it was believed that Europeans had to settle the Australian landmass. To this end, the Western Australian Government, from 1863, offered twelve months' free pasture in the north of the colony and up to 100,000 acres to those who stayed and wished to take up a 'run', with three years of free rent (Edwards, 1991). This motivated pastoralists to attempt to establish sheep and cattle stations in the area. Though the early attempts in 1863 and 1864 failed, by 1882 there were 77 leases held by Europeans over 45 million acres of land in the Kimberley (Bolton, 1958). Many Indigenous people were forced off their ancestral lands and waters during this time and conflicts were marked by massacres. The period was known locally as the "killing times" (Griffiths and Kinnane, 2011).

When transportation of convict labour ceased in 1867, pearlers and pastoralists resorted to using Aboriginal men and women as unpaid slaves (in various places across the north of Australia) with only "sporadic issues of food, clothing, tobacco and medicine" (Sickert, 2003; p. 22 – from The Roth Report following Government Royal Commission in 1904). A few years later, conditions only slightly improved with the *Pearl Fisheries Act 1871* (WA) barring women from boats and passing legislation for a fixed amount of rations per season for Indigenous workers. Moreover, luggers were required to drop Indigenous employees on country at the cessation of the pearling season. However, this was often ignored (Sickert, 2003).

As the pearling industry boomed, workers were recruited from islands north of Timor. Broome was proclaimed a town in 1883, town lots went up for auction in Perth in 1886 and the area underwent intensified development following a cyclone in 1887 (Sickert, 2003). During the 1890s, pastoralists set up leases on Yawuru land. Yawuru people provided the labour and they soon became highly skilled stockmen (Yawuru RNTBC, 2011). Broome was proclaimed a municipality in 1904 and by 1910 the population consisted of 257 Europeans, 2,038 Asians and 183 mixed race – Indigenous people were not considered in the count (Sickert, 2003).

Indentured Asian workers were an integral part of the workforce but the White Australia Policy of 1901 forced them to leave their families back home (Sickert, 2003). As a consequence, they sought the company of local Aboriginal women, which resulted in further racial mixing and, in turn, moulded the character of Broome (*ibid*). However, strict laws prohibiting cohabitation between certain groups were enforced. As a result, many women concealed the heritage of their children, even from their own families. Sickert (2003; pp. 76-77) reports that these "acts and the moralistic imaginings of the European masters were responsible for much pain and anger which lives on in Broome today."

In 1906, Aboriginal people were prohibited from entering certain areas unless they were gainfully employed (Yawuru RNTBC, 2011). In 1907, this area encompassed the township of Broome and extended to the whole of the peninsula almost to Cape Latrielle and east of Dampier Creek (*ibid*). Tighter restrictions in regards to work and racial mixing were also used to control the Indigenous population, forcing them to become more dependent on Europeans, but as labour became scarce during World War I, Aboriginal people were begrudgingly allowed back into Broome to work as servants and labourers (Sickert, 2003). It has been suggested, however, that prohibition unofficially continued in Broome until after the *Native Welfare Act 1954*

(WA) was enacted, which removed the power to administer prohibited areas (Yawuru RNTBC, 2011).

Like other Aboriginal groups throughout the Kimberley, many Yawuru children were forcibly removed from their families and placed within the Beagle Bay Mission from 1907 to 1978 (Yawuru RNTBC, 2011). During the bombing of Broome in 1942, Aboriginal people (adults and children) were forcibly relocated to this same mission in Beagle Bay after Broome was evacuated (*ibid*).

Despite these cruel times, Aboriginal people remained strong “in maintaining their identity, culture, heritage, languages and traditions” (Griffiths and Kinnane, 2011; p. 23). These strengths resulted in the ‘outstation movement’, where large areas of land were returned to their ancestral owners through the purchase of pastoral leases and the gazettement of land for new reserves and communities. During the 1980s and 1990s, this move back to country was associated with a resurgence of Aboriginal Law and customs, helping old and young people to understand their obligations to country, their family and their people (*ibid*). Griffiths and Kinnane (2011; p. 24) report that:

“Being on Country has helped to close the gap between Aboriginal and non-Aboriginal life expectancies and aspirations, strengthening people’s Liyan—their spirit and improving people’s physical and mental health.”

In order to formalise their ancestral rights within the modern Western legal system, the Yawuru people embarked on a journey to claim Native Title of their land. Following an 18-year process of Native Title claim preparation, mediation, litigation and negotiation, a formal resolution was registered in August 2010 between Yawuru Native Title Holders Aboriginal Corporation RNTBC and Nyamba Buru Yawuru as the prescribed body corporate, the State of Western Australia and the Shire of Broome (Nyamba Buru Yawuru Board, 2011). The resolution of the Native Title claim included two Indigenous Land Use Agreements (ILUAs) between the Yawuru PBC, the State and its various agencies and the Shire of Broome. The combined land and financial package, valued at \$196 million, encompasses a total payment package of \$50.5 million over five years and 616km² of land and water within the vicinity of Broome, as per the Yawuru Prescribed Body Corporate ILUA (atns, 2011). This agreement also ensures that Yawuru people will be provided employment and training opportunities on Conservation Estates and development projects related to the agreement (*ibid*). However, there are currently only four Yawuru Rangers to cover over 100,000 hectares of jointly managed land and sea parks.

4.1.2 Geography

The traditional range of the Yawuru people extends 20km north and south of Roebuck Bay and up to 40km inland. Within this region, Yawuru people recognise two broad environmental categories, inland (*birra*) and coastal (*nagula*), each of which consists of distinct sub-environments (Yawuru RNTBC, 2011). The coastal environment includes the seawater itself, the reefs, tidal creeks, beaches, coastal sand dunes, mangroves, mud flats and saline grasslands. The inland environment consists of vine thicket areas behind the coastal sand dunes, pindan plains, rocky country, wetlands and stands of paperbark. The pindan plains are extensive grasslands that extend to the rangelands and desert sand dunes on the far eastern side of Yawuru country. Scattered throughout the pindan plains are diverse varieties of bush, eucalypts, wattles, acacias, springs, clay-pans, lakes and permanent water holes or ‘soaks’.

In the seawater, the Yawuru catch salmon between May and August, while in the Hot they catch barramundi and mulloway on the reef. However, there are many other fish caught seasonally, including catfish, trevally, shovel shark, queen fish, mullet and

stingray. They take a few dugongs in what remains of the seagrass meadows, chiefly for special occasions.

Holocene white sand dunes run parallel to the coast along and to the north of Cable Beach, while pink Pleistocene dunes rim Roebuck Bay. The dunes are sparsely vegetated on the seaward side, but have dense shrub-lands on the back slopes. The mangroves harbour important marine life, such as shellfish, oysters and crabs. Further inland the paperbarks shelter wallabies, goanna and blue-tongue lizards from the heat. The pindan bushlands are where Yawuru hunt most of their game and collect most of their bush food according to the seasons. This country becomes arid and flammable in the Dry, and needs to burn in the right way for safe regeneration of the ecology.

4.1.3 Climate and hazards

January is the wettest month with a mean rainfall of 179.6mm, while September and October are the driest with only 1.4mm of rainfall (BoM, 2012b). Broome's mean monthly maximum and minimum temperatures are 34.3°C (April) and 13.7°C (July), respectively (*ibid*).

The Shire of Broome Local Emergency Management Arrangements (Shire of Broome, 2008; p. 15) lists earthquake, cyclone/severe storm/flooding, tsunami and bushfire as:

- "Earthquake – Broome lies in a Zone 1 earthquake risk area. The annual probability of a severe earthquake occurring is 1:300."
- "Cyclone/severe storm/flooding – Can be expected to affect the Broome coastline and inland areas at any time between November and April each year, with March being the peak month."
- "Tsunami – the north west coast of Western Australia is more susceptible because of its proximity to Indonesia and other countries in the region which are prone to significant earthquake and volcanic activity."
- "Bushfire – Historically, bush fires and wild fires have always been a major problem within the Shire. The fires are usually very large, inaccessible and generally out of control."

Cyclones and associated flooding and storm surges are common in the Broome area between December and April each year (Jones, 2004). On average, two cyclones cross the coast between Onslow and Broome each year. The history of Broome features many instances of severe cyclones (see Figure 4.2), which devastated the pearling fleets in and around Roebuck Bay. Particularly severe cyclones in 1887, 1908 and 1935 caused hundreds of deaths and wrecked many vessels (Sickert, 2003). In more recent times, a severe Category 5 cyclone, Tropical Cyclone Rosita, crossed the coastline 40km south of Broome on 20 April 2000 (Anderson-Berry, 2000). The radius of maximum winds of 290kph was 10km, with very destructive winds extending to 25km from the centre. The town of Broome itself experienced maximum gusts of 153kph – equivalent to a Category 3 cyclone. As a result, the town suffered only relatively minor structural damage. There was, however, damage to the power infrastructure of Broome, so that it took up to 11 days for power to be restored to the majority of users (Anderson-Berry, 2000). Even with modern port facilities in Broome and extensive warnings from the Bureau of Meteorology, four boats were lost in the storm. Damage to the jetty and port facilities was estimated at \$1.3 million (Anderson-Berry, 2000).

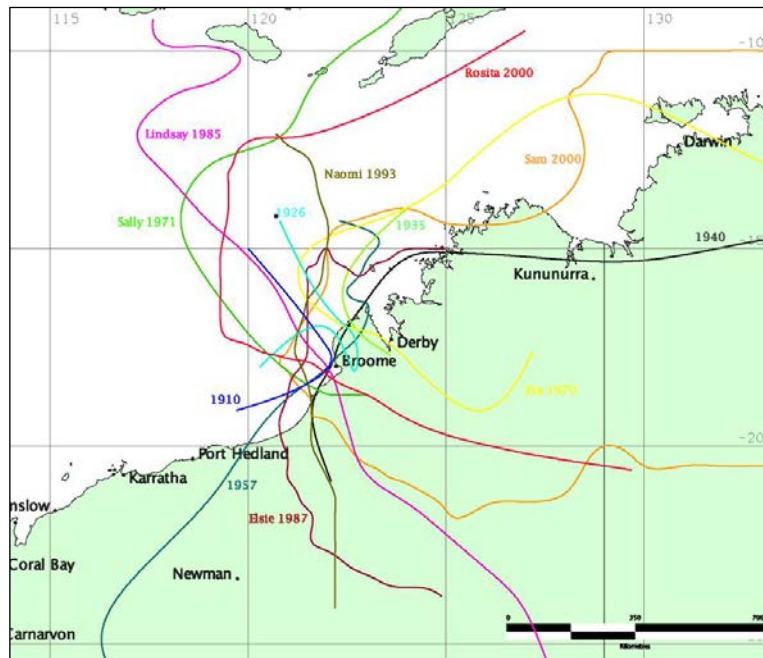


Figure 4.2. Cyclone tracks around Broome (BoM, 2013).

Officers from the Western Australian Department of Family and Children's Services coordinated the evacuation to two of the three evacuation centres in Broome. About 180 people gathered at Broome Senior High School Gym, mostly tourists and caravan park residents, with a few local residents. Another 100 people gathered at Cable Beach Primary School, although it was prematurely advised via radio that it had reached capacity. The Police and Citizens Youth Club was not used on this occasion due to its location near Roebuck Bay and the threat of a storm surge.

South of Broome, 78 residents of Bidiyadanga were evacuated, most to Port Hedland and some to Broome (Anderson-Berry, 2000). Those that stayed in the community sheltered in the church or their family homes and remained safe. Staff and guests were evacuated from Eco Beach Resort in good time, which was fortunate, since the tourist facility was completely devastated by the storm (Anderson-Berry, 2000).

The responsibility for managing natural hazards belongs to the Western Australian Department of Fire and Emergency Services (formerly known as FESA – Fire and Emergency Services Authority). However, disease control, another significant hazard, is the responsibility of the Western Australian Department of Health and the Kimberley Health Service. The Western Australian Department of Environment and Conservation (DEC) takes control of fires burning on or near DEC or Crown Lands. They are also responsible for “managing fire on Unallocated Crown Land and Unmanaged Reserves outside the Broome town site (Shire of Broome, 2008; p. 20).” The Western Australian Department of Indigenous Affairs provides a point of information, reference and guidance with respect to Indigenous issues.

Support is also provided, as required, by the Western Australian Water Corporation, Broome St John's Ambulance, the Waters and Rivers Commission, the Western Australia Police, and Horizon Power.

4.1.4 Emergency management arrangements

Hazard Management Agencies, designated either by legislation or through State-level Emergency Management Arrangements, are responsible for ensuring that all

emergency management activities in relation to their specified hazard are undertaken (Shire of Broome, 2008). This includes all activities involving prevention, preparedness, response and recovery. Though many types of hazard are considered, the chief hydro-meteorological hazards, being cyclones, floods, storm surges and fires, are under the authority of the Western Australian Department of Fire and Emergency Services as the nominated Hazard Management Agency. Of note, heatwaves or extreme heat events have not been allocated a specific Hazard Management Agency (State Emergency Management Committee – Western Australia, 2012).

In the event of an emergency situation, the Hazard Management Agency appoints an Incident Manager to manage the response to an emergency under their area of responsibility (Shire of Broome, 2008). The Local Emergency Coordinator, who is the police officer in charge of the police District, assists the Incident Manager by helping to coordinate resources and monitoring the situation at a strategic level. An Incident Management Group is formed to assist the Hazard Management Agency in managing the response, and the Hazard Management Agency establishes a Forward Control Centre and, if necessary, an Emergency Coordination Centre at the Department of Fire and Emergency Services headquarters in Broome.

Response planning is carried out by the Local Emergency Management Committee, which comprises representatives of all relevant stakeholders in emergency management in the Shire of Broome, including Indigenous representation from the remote communities (Shire of Broome, 2008). The detailed plans, entitled Hazard Response Plans, are developed for each type of hazard under the direction of the relevant Hazard Management Agency. These plans are structured according to the frameworks provided by the State Emergency Management Plans for each hazard, which are called 'Westplans' in Western Australia (see, for instance, (FESA, 2007)). While no Hazard Response Plans were available at the time of writing, regular exercises take place each year to familiarise people with emergency procedures.

In the case of Western Australia, the guides for individual members of the public are specified in a range of brochures produced by the Department of Fire and Emergency Services, e.g. the 'Cyclone Smart – Brochure' (FESA, 2012). While these are detailed and useful documents, they are not written in 'simple English' and are, therefore, less accessible to Indigenous readers for whom English is not their first language.

5. CASE STUDY: MANINGRIDA, NORTHERN TERRITORY

The Traditional land owners of Maningrida are the Gunavidji people and, according to the Northern Territory Administration – Welfare Branch, “only a small number of these people live in the area (1959; pp. 1-2).” Other groups also inhabited this area, including the Bureras, Gungoragoni, Gumanwurk, Rembarrnga, Gunwinggu and the Nakara (Welfare Branch Northern Territory Administration, 1959). Some of these groups live on outstations in the West Arnhem Land region (Figure 5.1).

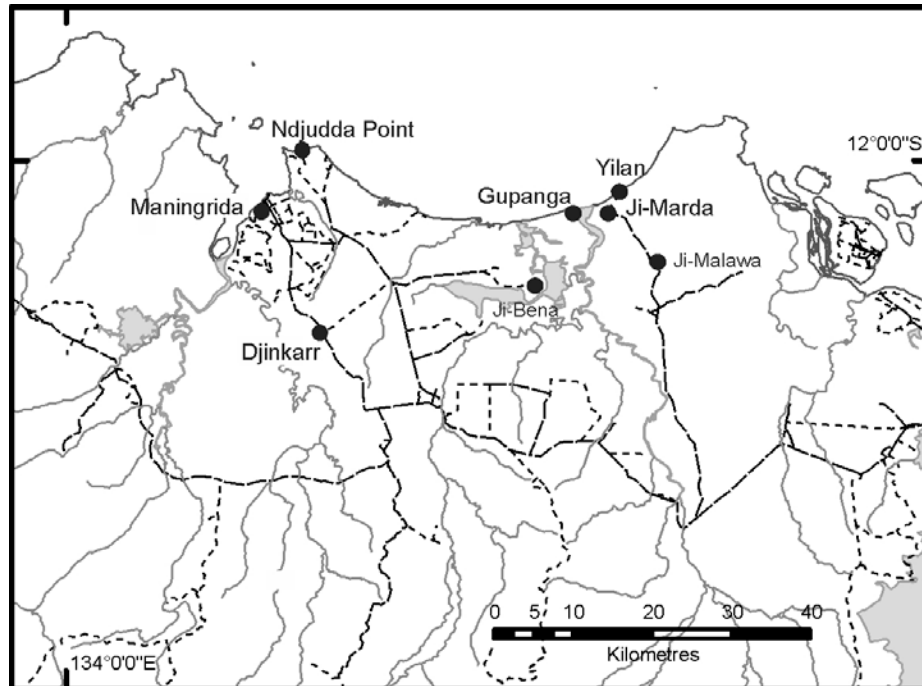


Figure 5.1: Maningrida in West Arnhem Land. Map produced by Adella Edwards, James Cook University.

The alternative spelling of Gunavidji is ‘Kunibidji’, used by Maningrida Arts and Culture (Bawaninga Aboriginal Corporation, 2012). It is believed that the name Maningrida is an “anglicised version of the Kunibidji name Manayingkarirra, which comes from the phrase ‘Mane djang Karirra’, meaning ‘the place where the dreaming changed shape’ (Bawaninga Aboriginal Corporation, 2012).” Today, languages used in Maningrida are Rembarrnga, Djinang, Gurrgoni, Burarra, Kriol, Guninggu, Yanyangu, Nakkara, Djambarrpuyngu and Ndjebbana (Northern Territory Department of Housing Local Government and Regional Services, 2011).

5.1 *The people of Maningrida and their ever-changing environment*

5.1.1 *Social context*

Aboriginal groups from the vicinity of the Liverpool River visited the Goulburn Island Mission in the pre-war years to work on the gathering of sea trepang. However, with the outbreak of World War II, this market was lost to China (Welfare Branch Northern Territory Administration, 1959). The community of Maningrida was established in 1957 as a trading post and rations depot by the Native Welfare Branch and staffed by Patrol Officers. This was partly due to the fact that in the 1950s, local Aboriginal groups were known to be trading in buffalo and crocodile skins. The trading post was established to restrict groups travelling into Darwin for trading skins and supported the government’s

work in establishing Maningrida as a trading centre for the Arnhem Land region (General Practice Network NT, 2008). In 1958, the Welfare Department established a permanent settlement, which resulted in other clan groups surrounding Maningrida choosing to reside permanently (Northern Territory Government, 2008).

In 2006, the Northern Territory Government announced the amalgamation of 'Community Government Councils' and that a new set of Local Government boundaries would be established as Shires. The West Arnhem Shire Council was created in 2008, covering an area of 49,698.26km². West Arnhem Shire Council is made up of Four Wards, of which Maningrida is called the 'Maningrida Ward' (West Arnhem Shire Council, 2011).

5.1.2 Geography

The township of Maningrida is located approximately 520km east of Darwin and 300km north-east of Jabiru on the estuary of the Liverpool River in north-east Arnhem Land (Northern Territory Government, 2008). The road is sealed from Darwin to the Border Store, across the tidal East Alligator River Crossing and then becomes gravel road. The East Alligator River crossing is only accessible in the dry season, as the river depth can vary and travel is only possible by 4WD. The trip from Darwin to Maningrida can take six to eight hours (Remote Area Health Corps, 2009). The community also has an all-weather airstrip that is serviced daily (except Sunday) by Airnorth (Airnorth, 2011).

The country surrounding Maningrida ranges from coastline sea level, to the Arnhem Land escarpment, with the highest point of approximately 400m located in the south-western corner. The Liverpool, Caddell, Mann, Blyth and Goomadeer Rivers drain the escarpment to the western boundary and the Goyder and Glyde Rivers to the eastern boundary. Vegetation varies from light to medium woodlands to mangroves and sandy soil on the coastal fringes (Northern Territory Emergency Service, 2009c). This region is managed by the Djelk Rangers.

The Djelk Rangers, based in Maningrida, have been operating since 1991 and manage approximately 7,000km² of north-west Arnhem Land. The rangers work closely with a number of government partners, including NT Fisheries, Australian Customs, and the Australian Quarantine and Inspection Services. They are part of the Central Arnhem Fire Abatement project and West Arnhem Fire Abatement project and run a junior ranger program with Maningrida High School.

Djelk Indigenous Protected Area (IPA) Liaison Officer, Wayne Campion, outlines how the Djelk Rangers maintain and improve their land and keep culture and people strong by using Traditional and non-Traditional approaches to care for country: "Land Rangers control bushfires, feral animals and weeds and Sea Rangers patrol our coast and protect our fisheries and sacred sites from foreign fishing vessels. The Rangers provide training to supplement Traditional knowledge of land and sea country management and link with ranger groups in other communities to share ideas and knowledge (Bawanninga Aboriginal Corporation, 2010; p. iv)."

Djelk is a Gurrgoni word for "land" and "caring for land" (Bawanninga Aboriginal Corporation, 2010) and the Djelk logo depicts the land management approach taken by rangers with support from clan groups within this country. The Djelk Rangers area of responsibility covers the recent status of the IPA, achieved in September 2009. Land owners from 102 clan groups were consulted and endorsed the declaration of the IPA and for Djelk Rangers as the managers of the IPA (Bawanninga Aboriginal Corporation, 2010).

Djelk Rangers also work in partnership with the Warddeken IPA and the Northern Territory Government's Biodiversity Unit "in implementing biodiversity benchmarking and monitoring to assess the impacts of our management activities (Bawaninga Aboriginal Corporation, 2010; p. 1)." They are also in partnership with the Carpentaria Ghostnets Programme (CGNP), which monitors and collects marine debris thrown into the ocean, most likely from fishing trawlers and illegal fishing boats (Bawaninga Aboriginal Corporation, 2010).

The Djelk Rangers have adopted CyberTracker as their primary tracking and recording tool. The software allows rangers to record the culling of buffalo, spraying of weeds and unauthorised entry of people into sacred cultural sites. The stored information can be used as evidence in the prosecution of illegal trespassing and fishing on country (Bawaninga Aboriginal Corporation, 2010).

Cane toads entered this region in 2001 and Traditional Owners believe that many freshwater crocodiles have died after eating them. Feral buffalo and wild pigs have a negative impact on country, causing damage to culturally important sites such as rock art, wetlands, springs and monsoonal rainforests. However, these feral animals provide an alternative meat source for people living on country and are often valued (CAEPR, 2011). The management of buffalo remains a difficult issue for Djelk Rangers and was an area of concern raised during the scoping trip.

The Djelk Rangers established a dedicated sea unit in 2002, which covers an approximate area of two million hectares of ocean and offshore islands surrounding the coastline. These are significant breeding habitats for marine turtles and dugong and provide a resting, feeding and breeding ground for seabirds. The Rangers work with NT Fisheries to monitor and report illegal fishing vessels and participate in patrols with Australia's Customs Unit to provide border and bio-security protection of this north shore coastline. However, there has been limited research on the impact inshore fisheries and recreational fishing has on mud crabs, barramundi and trepang numbers in these waters (CAEPR, 2011).

5.1.3 Climate and hazards

The 'wet' season, from November to May, is characterised by threats from cyclones and heavy rainfall, causing roads to be impassable (Northern Territory Emergency Service, 2009c). A good wet season can encourage the growth of vegetation, which increases the threat of bushfires during the dry season. Djelk Rangers burn country for land management purposes to prevent late large and devastating dry season fires (Bawaninga Aboriginal Corporation, 2010). Weather conditions associated with the dry season are cool days and crisp, cool nights and low average rainfall.

Cyclone Monica affected Northern Australia from 17 to 26 April 2006 and was one of the strongest tropical cyclones ever recorded in the Southern Hemisphere (Science Daily LLC, 2012). While the community suffered the full impact of the Category 5 cyclone, only light to moderate infrastructure damage was recorded. However, local vegetation suffered severe damage with 50-70% of all trees completely snapped or uprooted (BoM, 2006). Making landfall 35km to the west of Maningrida, Cyclone Monica highlighted the need for Indigenous communities to plan their emergency management protocols well in advance of a crisis (Veland et al., 2010).

5.1.4 Emergency management arrangements

The communities of Maningrida and Ngukurr are subject to the Northern Territory All Hazards Emergency Management Arrangements (Northern Territory Emergency Service, 2011). Under these arrangements, counter disaster preparedness, response and recovery planning is carried out by the Local Counter Disaster Planning Committee, which is headed by the Local Counter Disaster Controller. This controller answers to the regional head, based in Katherine.

For each of the major risks particular to the area, the Local Counter Disaster Plans of Maningrida and Ngukurr (Northern Territory Emergency Service, 2009c, b) detail the actions to be taken in each case. For instance, in the event of a cyclone, the plans address the actions to be taken by each of the major stakeholders relevant to the hazard. These include the Local Counter Disaster Controller, the second in charge of police, and representatives from the Shire Council, the Northern Territory Department of Education and Training, the Northern Territory Department of Health and Families, the local Progress Association, Resource Centres, Telstra and the Essential Services Officer. Each stage of activation is related to the potential risk of a cyclone, as notified by the Bureau of Meteorology (Northern Territory Emergency Service, 2009c, b):

- Stage 1 – Alert occurs when the Bureau warns of a ‘Cyclone Watch’ for the District, where a cyclone may approach within 48 hours.
- Stage 2 – Standby is called when the Bureau warns that a cyclone may approach within 24 hours.
- Stage 3 – Activation is called when active counter measures are required and destructive winds are likely in the next six to twelve hours.
- Stage 4 – Stand-down is called when active counter measures are no longer required.

The procedures at the various levels of readiness involve communicating the status of emergency level to the Local Counter Disaster Planning Committee, the public and regional controller. During the Activation stage, the local controller decides whether to issue the ‘Take Shelter’ advice to the affected community and ensures that personnel are assisted in taking shelter if necessary. In the Stand-down stage, damage assessment and clean-up operations take place.

There are special instructions for Milngimbi, in the Maningrida District, because buildings in the town are only three to six metres above sea level and particularly vulnerable to storm surge. An order to evacuate may require Ministerial approval. The local controller is, therefore, charged with immediately determining the likelihood of a storm surge if a cyclone of Category 3 or higher enters the region. To achieve this, information is acquired through the BoM and the Duty Office of the Northern Territory Emergency Service and advice is provided to the regional controller and the Milngimbi community.

6. CASE STUDY: NGUKURR, NORTHERN TERRITORY

Yugul Mangi are the people belonging to the Indigenous language groups of the lower Roper River and Gulf of Carpentaria regions of south-east Arnhem Land (Figure 6.1). 'Yugul Mangi' is a collective term meaning "we all one" (Normand, 2009; p. 277). The Yugul Mangi area has a rich history, as Aboriginal groups have inhabited the region for more than 40,000 years (Australian Government, 2011a).

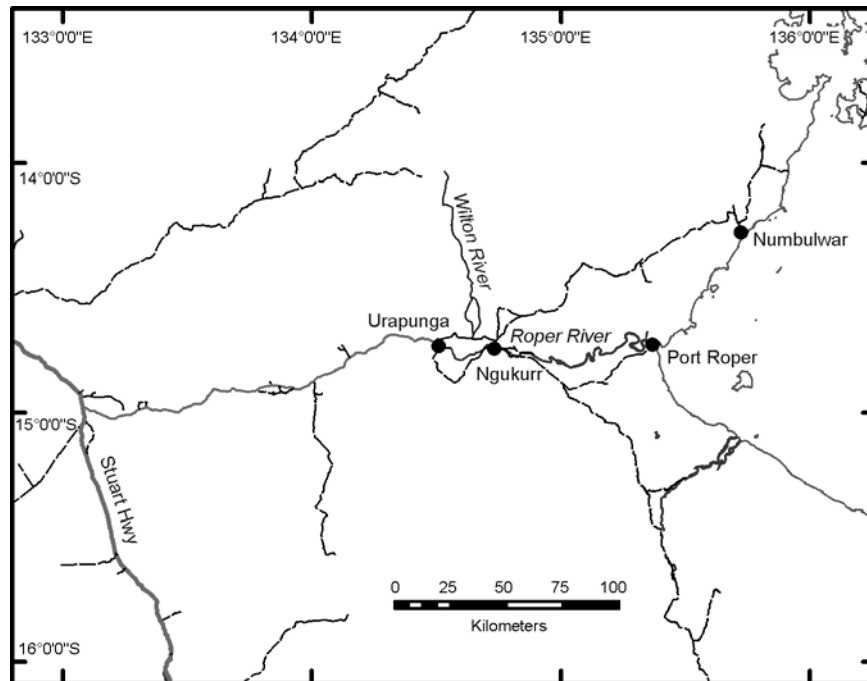


Figure 6.1: The Roper River region including Ngukurr. Map produced by Adella Edwards, James Cook University.

6.1 *Yugul Mangi people and their ever-changing environment*

6.1.1 *Social context*

The Traditional language groups for the Ngukurr region are Alawa, Marra, Warndarrang, Ngalakan, Ngandi, Wubuy (Nunggubuyu), Rembarnga, and Ritharrngu/Wagilak, consisting of 21 clan groups. Kriol, an Indigenous language that incorporates English words, is also commonly spoken throughout the region (Sandefur, 1985).

The first European exploration of the Roper River was in 1845 and led by Ludwig Leichardt, who named the river after a member of his expedition, John Roper (St Matthew's Anglican Church, 2008). In 1871, Europeans accessed the Roper River to build the Overland Telegraph – a wire from Adelaide to Darwin. The Roper Bar Crossing was built in the early 1900s, initially as a supply route for the establishment of the Overland Telegraph line (St Matthew's Anglican Church, 2008).

Due to atrocities committed against Aboriginal people during the violent pre-settlement period, and attempts of cultural suppression, the Church of England established the original Mission as a refuge in 1908. This was known as the Old Mission, or Milijbarrawarra, and came under the guidance of The Church Missionary Society (CMS) of Australia and Tasmania (Sandefur, 1985).

Missionaries were embraced by some members of the community and those Aboriginal people shared their local knowledge of Traditional hunting and gathering practices (Sandefur, 1985). Local foods included rock and river kangaroo, plain wallaby, emu, turkey, wild duck, possum, echidna, crocodile, snakes, lizards, turtle and turtle eggs. Fish and crustaceans of all kinds were harvested from both freshwater and saltwater sources, while yams and lilies were collected from freshwater billabongs. Nuts (including wild coconut and those from palm and nutwood trees), wild figs, black and green plums, and wild bananas were staples of the Traditional diet (Joynt, 1918).

The CMS handed over administration of the Roper River Mission to the Welfare Branch of the Northern Territory on 1 October 1968 (Sieffert, 2011). A message was sent from the Director of the Welfare Branch of the Northern Territory in Darwin, to the Department of Interior in Canberra saying:

“Following discussions in Sydney with the Director of Social Welfare on future administration of the Roper River Mission, the Secretary for Aborigines of Church Missionary Society advised administration on 9 April that because of a lack of suitably qualified staff and other impending staff problems they no longer can carry responsibility for administration of the mission. They have now asked that [the Northern Territory] administration assumes responsibility for station as from 1 July 1968 (Sieffert, 2011; p. 178).”

In 2006 the Northern Territory Government announced a local government restructure, with the amalgamation of local and community government councils resulting in the formation of approximately 60 Aboriginal Councils in eight shires (Sanders, 2011). Ngukurr Community and surrounding outstations then came under the auspices of the Roper Gulf Shire Council, encompassing an area of approximately 186,000km² on the eastern side of Katherine (Roper Gulf Shire, 2012). Community leaders from these groups were involved in local decision-making relating to the future of their community and the surrounding homelands and outstations.

6.1.2 Geography

The Ngukurr community is located 330km south-east of Katherine on the Roper Highway and approximately 70km inland from the Gulf of Carpentaria in the Northern Territory. Situated on the banks of the Roper River and set amongst stony hill country, the word ‘Ngukurr’ means “place of many rocks” (Normand, 2009; p. 276). The Roper River has low banks with thick vegetation in places. During heavy wet seasons, the Roper River system swells beyond capacity, causing severe erosion of soil and vegetation. At those times, the community and surrounding homelands are cut-off due to flooding and access is only by plane, via the all-weather bitumen airstrip, or barge. Currently, there is no commercial air service in and out of Ngukurr. However, the Roper Bar Store operates a commercial barge service twice a day, six days a week when the river is flooded.

The vegetation ranges from grassed plains, salt flats and dense to medium wooded regions with some areas of black soil plains. There are hilly outcrops on the drive into Ngukurr, rising 190m leading to the Arnhem Land escarpment (Northern Territory Emergency Service, 2009b). Land management developed in the early 1990s between landowners and an Indigenous Land Management Facilitator (CAEPR, 2010). In 2002, local women established the Yugul Mangi Women Rangers, which then led to the development of the Yugul Mangi Land and Sea Management Corporation in 2008. Commonly called the Yugul Mangi Rangers and consisting of both male and female ranger groups, they manage approximately 20,000km² of south-east Arnhem land, including sea country and the Roper River (CAEPR, 2010).

The Rangers' work includes fire programs (as part of the Central Arnhem Land Fire Abatement program), feral animal management, quarantine matters with Australian Quarantine and Inspection Service (AQIS), coastal and inland patrols, and weed management through monitoring of waterways. The Rangers clean up debris, such as ghostnets from illegal fishing boats and participate in the research of strains of exotic mosquito viruses that are contained within discarded containers and boat timbers and washed up onshore (CAEPR, 2010).

6.1.3 Climate and hazards

The Australian Bureau of Meteorology has been collecting weather data in this region since 1910. Initially, this information primarily related to rainfall. Temperature recordings began in 1965. The highest temperature recorded in Ngukurr between 1965 and 2012 was 44.5°C on 29 October 2003 and the coldest was 5.6°C, recorded on 20 July 1965 (BoM, 2012e).

Weather during the dry season (May – November) is characterised by cool days and crisp, cool nights with virtually no rainfall. As this time, the width of the Roper River extends to approximately 150m in parts. The bulk of annual rainfall occurs during the wet season (November – May), when the weather is hot, humid and muggy. During this period, the Roper River expands to over 20km in width and reaches a height of 20m. Floodwaters make it difficult for people to move freely and isolation is an annual occurrence in this region (Seiffert, 2008). When the floodwaters recede, the fish become plentiful and people can move more easily around country (CAEPR, 2010).

According to the St Matthews Anglican Church (2008; p. 29), the Roper River Mission's first major flood was in 1916. Floodwaters were "three feet over the roofs of buildings" and people were evacuated from the Mission to higher ground. By the 1930s, the Old Mission had some 100 permanent residents and an additional 200 regular visitors. According to reports, the next significant flood occurred in 1940 when, once again, people were evacuated to higher ground (Seiffert, 2011). In 1986, Dinah Garadji recorded her recollection of this flood, during which it "rained for 11 days and nights" (Garadji, 1986). Despite Aboriginal people recognising early indications of the flood, their warnings were not taken seriously by the missionaries. Ultimately, the CMS people from Sydney built a new Mission on higher ground, which is where the Ngukurr community is located today (St Matthew's Anglican Church, 2008).

In stark contrast to the flood of 1940, the 1950s saw the Roper River Mission impacted by the most severe drought on record. Salt water was pushed up the Roper River to the Roper Bar Crossing by the ocean tides resulting in the depletion of fresh water at the Mission by early July. This created havoc for residents and stock; water for growing fruit and vegetables was scarce and a number of deaths resulted from the poor quality of the drinking water. Further severe droughts were recorded in 1961 and 1962. However, due to past experience, they did not impact as heavily (Seiffert, 2011; p. 135).

6.1.4 Emergency management arrangements

Ngukurr and Maningrida are subject to the *Northern Territory All Hazards Emergency Management Arrangements* (Northern Territory Emergency Service, 2011) and general details about emergency management arrangements for Ngukurr are provided in section 5.1.4.

7. CASE STUDY: WUJAL WUJAL, QUEENSLAND

The Aboriginal community of Wujal Wujal is comprised of three Traditional groups of Kuku Yalanji people: the Kuku Nyungkal from the upper Annan Rivers, Kuku Yalanji from the upper Bloomfield River, and the Jalunji from the coastal areas around the Bloomfield River mouth (Figure 7.1). Therefore, the study area for this project encompasses the Aboriginal Shire Council of Wujal Wujal in addition to surrounding areas, including Shipton's Flat to the north, and China Camp to the south.

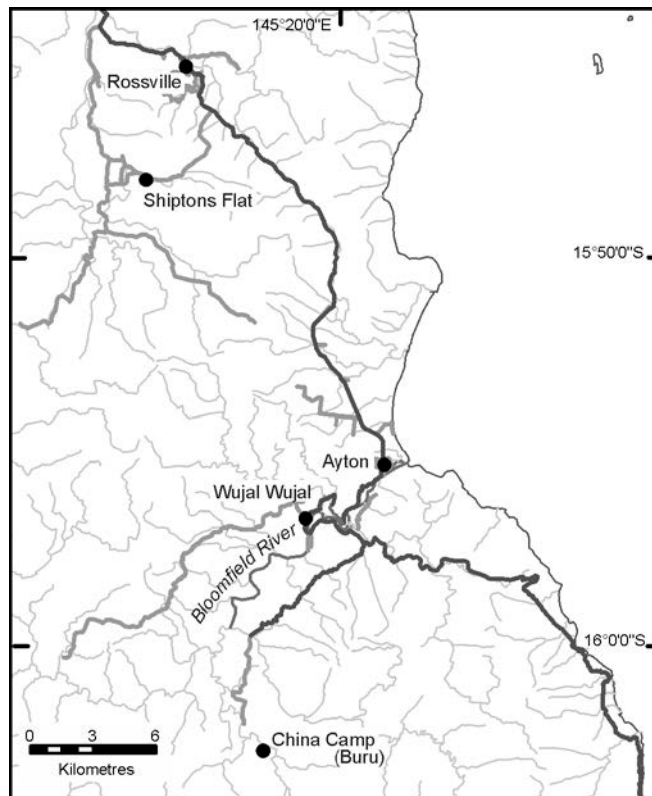


Figure 7.1: Region around the Bloomfield River, including Wujal Wujal, Buru (China Camp) and Shipton's Flat. Map produced by Adella Edwards, James Cook University.

7.1 *The Kuku Yalanji people and their ever-changing environment*

7.1.1 *Social context*

The mobility of Kuku Yalanji Aboriginal people in pre-European times was influenced primarily by their patterns of resource gathering, as well as their organisation into clan estates. For example, the Kuku Nyungkal people lived in nine patrilineal clan estates, each based on a specific part of the Annan River drainage basin. Members of the estate, sharing the same distinctive culture and language, were able to move around and use resources within any of the nine estates through rights acquired through one's relatives. By marrying clan members from "genealogically distant but ... geographically close" patrilineal clan estates, Kuku Nyungkal men were generally able to stay close to their own estate (Anderson, 1983; pp. 476-477).

The Kuku Yalanji had a hunter-gatherer subsistence economy that meant they moved over the land in search of food. In pre-occupation times, the density of occupation was approximately one or two people per square kilometre. Generally, an estate would host

about 20-50 people hunting and gathering throughout the year (Hill and Baird, 2003). Thus, within the estate system, land using groups were formed in order to carry out subsistence activities. These groups, formed from particular extended families, would establish semi-permanent camps in specific areas of country that became associated with them. Each group was formed around a male majamaja or boss with high status, power and authority, who determined camp composition as well as the location, size and resource base of the camps (Anderson, 1989). These camps were the primary land management units and their existence governed mobility.

Prior to European contact, the Kuku Nyunkgal used the cool, dry season to search for a variety of foods, including fruits, seeds, yams and fish. Creek banks were optimal places to live in the rainforest, providing access to clean water, fishing, travel and open camping areas. However, in the cool, dry season, people were free to travel widely across open country in search of a variety of food. In the wet, mobility was restricted by swollen rivers and heavy rains. To get through this lean season, people moved to semi-permanent camps on high ridges close to remaining food sources (Anderson, 1983; p. 477).

The influx of Europeans into south-east Cape York Peninsula was driven by the discovery of resources such as timber, tin and marine resources and the desire to exploit them. Miners rushed into the region with the discovery of gold in the Palmer River (200km south-east of the Annan River) in 1872. However, as gold production fell in the mid-1880s, miners searched for alternative sources of income, which led them further south. By 1886, there were 800 miners in the Annan River drawn by the recent discovery of tin (Anderson, 1983; p. 479). China Camp and the Annan River regions quickly became major tin production centres, forming part of the larger Cooktown Mining Field gazetted in 1889 (Anderson, 1989). The area also became a focus of the pearling and beche-de-mer industries, as boats started to call at Bloomfield port for fresh water and Aboriginal labour. Other industries, such as logging, sugarcane growing and associated support industries sprang up, aided by government initiatives to encourage small settlers to occupy and use the land. By 1890, with mining leases, timber reserves, and sugarcane farms, nearly all of the land in the region "was designated according to European economic potential and classified alienated, selected or occupied on this basis (Anderson, 1989; p. 25)."

By the turn of the century, it was apparent that hopes for the widespread growth of European population and industry in south-east Cape York were not to be realised. A combination of factors, such as a decline in gold production, reduction in cedar stocks, failure of agriculture and the Queensland depression in 1890 led to a sharp decline in the European population. By World War II there were an estimated 400 to 500 Europeans in the Annan/Bloomfield district, mainly supporting themselves through tin mining. By the 1960s, this population had fallen to fewer than 200 (Anderson, 1989). The trend was somewhat reversed in the 1970s, as the area began to attract alternate life-styles, followed by tourism entrepreneurs. Today, the major tourist attractions are the Bana Yirriji Art and Cultural Centre, which exhibits works by local artists, and guided tours to the Bloomfield Falls.

There are two ranger groups in the region: the Bana Yarralji Rangers and the Jabalbina Yalanji Rangers. The Jabalbina Yalanji Rangers are due to start operations in 2013, while the Bana Yarralji Rangers, based at Shipton's Flat near Wujal Wujal, began operations in 2009. Current government funding is through the Working on Country program and is limited to June 2013. The rangers are responsible for the Upper Annan River catchment, an area of the northern wet tropics of approximately 64,000 hectares. The rangers undertake crucial climate change work, including monitoring the tin mining tailings dam located near the ranger base, which is prone to overflowing in heavy rains;

creation of a mountain to coast wildlife corridor along the Annan River; and collaboration with scientists on country to investigate changes in seasonal indicators. Given uncertainties with future funding, the rangers hope to access different funding pools to allow them to continue operations. They are currently in negotiations for a long-term lease and planning approvals to develop a caravan site at the ranger base to provide an alternate income stream.

Natural resource management is carried out by Dabu Jajikal Corporation in and around Weary Bay and Cedar Bay in partnership with a variety of organisations, such as Terrain NRM, Cape York NRM and the local land trust Jabalbina. A number of Jajikal people have completed Conservation and Land Management certificates at Tropical North Queensland TAFE and undertaken land and sea management planning. Additional activities have included cultural heritage recording at Cedar Bay and Weary Bay, fire management, weed control, revegetation, visitor management works and signs, and marine debris clean-up. Their capacity to continue these activities will be enhanced by one of their members becoming a full-time ranger with the Jabalbina Yalanji Rangers, and increased project funding for NRM activities.

The population of Wujal Wujal is relatively homogeneous, with everyone speaking the same language (with minor dialectal variations). However, there are also long-standing divisions between the Bloomfield River groups and Annan River groups, resulting in conflict between them. According to Anderson (1992), the Traditional Owners of the mission site, the Wujalwujalwarra, have better access to resources, jobs and houses, and the “residential” community members (non-Bloomfield people brought to the area under the Queensland Aborigines Act, and Annan River people) feel they are discriminated against and excluded from economic gains. This inter-clan tension is exacerbated by the small size of the settlement and close community living.

It must be noted that Wujal Wujal (formerly known as Bloomfield) is an Aboriginal Shire Council located on Deeds of Grant in Trust. This means that the council only has control of the small township area of Wujal Wujal and not the surrounding areas of Shipton's Flat and China Camp. These areas come under the auspices of the Cook Shire Regional Council and Cairns Regional Council respectively. Thus the council has a restricted rate base and little control over land use decisions for the wider Bloomfield River catchment. The council and other Aboriginal organisations have suggested that the Aboriginal Land Use Agreement lands, as defined under the Eastern Kuku Yalanji Native Title Determination (2007), would be a more appropriate land scale for local governance.

7.1.2 Geography

Wujal Wujal is 7km upstream from the sea on the Bloomfield River, 172km north of Cairns and 80km south of Cooktown. Although it is commonly believed that the community takes its name from the sacred waterfalls of Wujal Wujal, Traditional Owners point out that the term ‘wujal’ refers to a place where young people come to obtain resources from older people. The repetition of the term, ‘Wujal Wujal’, reinforces that a large number of young people were able to access plentiful resources, which references the importance of seasonal semi-permanent camps for Yalanji people. Wujal Wujal is located on the eastern side of the Great Dividing Range that bisects the Cape York Peninsula. It sits on a narrow coastal plain between sandy beaches and steep forested mountains stretching to the north and south and occupies approximately 100 hectares.

The primary river systems in the study area are the Upper Annan River system and the Bloomfield River system. The Annan River is comprised of seven major but short creek systems that flow steeply down Mt. Amos and Mt. Hartley with a total catchment area

of approximately 300km² (Anderson, 1984). The Bloomfield system is located in a valley bounded by ranges from which five major creek systems flow. These “short, swift rivers” flow down the mountains, through steep valleys and into impressive waterfalls. The first 7km of the Bloomfield River is tidal. The area has a high level of dense tropical vegetation, comprised of eleven types of closed forest and ten vine forest types as well as high species diversity. The Upper Annan area features medium and low woodland, and the Bloomfield basin and the Annan basin have both closed forest and open sclerophyll forest and woodland (Anderson, 1984).

The industries that developed in the wake of European settlement had a detrimental effect on the local environment. For example, although large-scale tin mining never developed in the Annan River area (due in part to the area’s remoteness), a number of small tin mining operations developed around local creeks. For the Kuku Nyungkal, this meant less disruption to their Traditional lifestyles than would otherwise have occurred. However, it also meant that creeks and streams were altered and dirtied, story places were destroyed and some campsites disappeared. With large amounts of earth being moved or washed away by sluicing, hillsides collapsed, rainforests disappeared as timber was chopped down for mines, and new species were introduced that affected Traditional food supplies and local biodiversity. These disturbances to the land, disruption in the social order, and destruction of sacred places were seen by the Kuku Nyungkal as causing loss of food sources, increased illnesses, storms and other extreme weather events: “Sickness and environmental disturbances such as storms or bushfires ... are often said by Kuku-Yalanji to stem from improper behaviour at or near a site (Anderson, 1989; p. 221).”

7.1.3 Climate and hazards

The study area experiences sharply defined wet and dry seasons. The seasons are characterised by high rainfall in the wet season (December through March), with the mean daily rainfall in January reaching 340.6mm, and falling to just 35.8mm in July (BOM, 2012a). It has a sub-humid to humid tropical climate, with the hottest and most humid days occurring in the wet season (mean maximum temperatures in January reaching 32°C). Mean minimum temperatures of 17.2°C occur in July. Thunderstorms and cyclones occur frequently during the wet season.

The Kuku Yalanji people’s relationship with the weather was mediated by their relationship with their land, which was seen as a ‘humanized environment’. The landscape (or bubu – here translated as ‘country’) was seen and described in human terms; not only did it interact with people, but it could also react in certain situations by “providing goods and resources or by withholding them and bringing hardship or climatic catastrophe upon humans (Rigsby 1980; p. 91 quoted in: Anderson, 1989; p. 80).” Thus, changes in the environment such as floods, drought and cyclones were seen not as rational events but brought about by things occurring in the social world.

To avoid these catastrophes, it was essential to look after country properly, use it regularly and maintain social order (demonstrated by the term ‘miyilda kujil’, literally translated as “to guard, keep or hold something” (Anderson, 1989)). Group memberships were used to mediate relationships with the land and weather. The majamaja was the focal male of the land-using group in charge of looking after the country and the people. They belonged to the bingabinga (‘grey hair’) who were connected to the ngujakura (‘law’ or ‘dreaming’). They oversaw the law from their own semi-permanent camps within the estate located where their power was strongest. Thus they “ensured health and well-being in the human world and order in the natural world (Anderson, 1983; p. 477).”

In more recent times, floods and cyclones have posed major hazards to the area. Flooding in the wet season is an ongoing problem, with road access to the region frequently cut. Cyclonic activity is also a recurrent risk and the recent impact of Cyclone Yasi is foremost in residents' minds. Yasi washed away the causeway at Bloomfield, cutting road access from the south for several months. Cottrell et al. (2001) highlighted residents' concerns regarding community preparedness for hazardous events. The lack of preparedness was related to a number of factors, including poor telecommunications due to topography, lack of all-weather access, and the existence of an unknown number of temporary residents, squatters at seasonal camps and tourists to the area unprepared for local weather conditions. The report noted that a number of strategies could be undertaken to address some of the concerns, including:

- gathering more detailed information about population estimates in the area;
- undertaking a community education program about hazard response;
- assessing tourism activity in the area to enable suitable planning;
- further development of social structures to be mobilised in time of hazard;
- greater mapping of flood levels in relation to community resources; and
- improvement of creek crossings (Cottrell et al., 2001; pp. 18-19).

It should be noted that improvements have recently been made to the Bloomfield Causeway, although creek crossings remain a problem in times of flood. Also, a 'Keeping Our Mob Climate Safe' initiative was recently undertaken in Wujal Wujal. This initiative by the Queensland government sought to help remote Indigenous communities prepare for the impact of extreme weather events through enhanced disaster management planning and community involvement in these planning processes.

7.1.4 Emergency management arrangements

Disaster management in the Wujal Wujal Aboriginal Shire is the responsibility of the Local Disaster Management Group, which is also responsible for advising the Cairns District Disaster Management Group when District level support is required (Wujal Wujal Aboriginal Shire Council, 2012a). The Chair of the local group is the Mayor and the Local Disaster Coordinator is the Chief Executive Officer of Wujal Wujal Aboriginal Shire Council. While the community has a two-officer police station and they are represented in the Local Disaster Management Group, they have no particular authority as they would in Western Australia and the Northern Territory.

The Local Disaster Management Group members are trained in the relevant disaster management procedures and undertake exercises at least on an annual basis together with all other personnel who will be part of the Local Disaster Coordination Centre when it is activated in an emergency situation. This centre carries out disaster operation planning and resource and information management (Wujal Wujal Aboriginal Shire Council, 2012a).

Activation of the disaster management system is at the discretion of the Chair, or their delegate (though the activation plan is still under development). Levels of activation include: Alert, Lean Forward, Stand Up, Stand Down, and Debrief (State Disaster Management Group, 2012). Activation occurs at the 'Stand Up' level, at which point the Coordinator leads the assessment of the risks, decides on the actions required, and starts the process of communicating with the relevant people. The response escalates with the level of risk so that relief and recovery actions are coordinated and carried out according to the relevant plans. After the emergency has passed, the Local Disaster Management Group carries out a rapid impact assessment to determine the damage and the needs for recovery, though they may request help from the District office for more in-depth impact assessments. More extensive resources are available at both

Cairns (Cairns Regional Council, 2011) and Cooktown (Cook Shire Local Disaster Management Group, 2009), but both towns are frequently inaccessible due to flooding following long periods of heavy rainfall.

While evacuation is not expected to be necessary under any perceived threat, the option can be implemented through an application for assistance through the District office. The Health and Aged Care Centre is the designated evacuation centre for the community, but it is not a designated storm shelter and has no backup power supply (Wujal Wujal Aboriginal Shire Council, 2012a).

The Local Disaster Management Group is, at the time of writing, undertaking a Natural Hazard Risk Assessment to determine the vulnerability of the community to natural hazards, their likelihood and potential impacts, and possible treatment options (Wujal Wujal Aboriginal Shire Council, 2012a). This will be based on the *Australian/New Zealand Standard AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines (AS/NZS ISO 31000, 2009)*.

Awareness of the Shire's disaster management arrangements is promoted through the provision of brochures in local offices and businesses, and through media, community meetings and postal drops. During activation, broadcasts will be made on the local radio station – RIBS – as necessary.

8. DEMOGRAPHIC HISTORY AND POPULATION VOLATILITY

8.1 *Approach and methods*

The purpose of this section is to analyse population volatility in the case study communities. Population volatility is a concept used in ecological demographic research to describe the susceptibility of populations to dramatic change in numbers (Lan and Chandran, 2011). It is most often used to flag the vulnerability of populations to extinction, but volatility can also indicate capacity to recover from threatening events, including climate change. Essentially, volatile populations change more rapidly and substantially than non-volatile populations (McLeman, 2010). There are no standard methods for assessing volatility, although common indicators include openness of the population (how much exchange there is between it and other populations), history of change (whether the population has changed dramatically in the past), and whether the population is suitably balanced between males and females and, reproductive age and non-reproductive age members (Lieberman and Melott, 2013).

Population volatility has rarely been used in human demographic research to this point. One example is investigating the relationship between demographic volatility and real estate demand (Cheng and Han, 2013). Nevertheless, the concept is echoed in research into the vulnerability of small populations such as rural and remote settlements. That research focuses on similar issues around openness (levels of migration into and out of the settlement), historical patterns of change, and population “balance” (Gloersen et al., 2009). Again, many studies are looking for vulnerability (population decline, population ageing, outmigration of young people, failure to attract new working age migrants etc.), but volatility presents different potentials in different contexts (Mayer and Knox, 2010). A volatile population may be just as susceptible to rapid growth as to rapid decline. To our knowledge, this project is the first to analyse population volatility in a structured way to help assess the potential demographic impacts of climate change on small communities.

The variables used in the analysis are limited to demographic variables, such as age and sex distributions, mobility and migration, and population density. While there has not yet been any systematic empirical testing of the relationship between these indicators of population volatility and climate change/weather event adaptation, the hypothesis emerging from the literature is that communities with excessive population volatility are likely to experience more dramatic disruption as a result of climate or other environmental changes (Bailey, 2011). Communities with excessive population volatility are also more likely to use migration as a response to climate change, as they have more experience with movement of people into and out of the community, and are likely to have social and familial networks connecting with a larger number of places beyond the community boundaries (Asian Development Bank, 2012).

There are conceptual challenges in examining population volatility. It is not clear from the literature how much volatility is ‘excessive’. It is also not clear how the concepts of population volatility should be operationalised in empirical studies such as this one. There is a small number of variables where there is some agreement as to operationalisation and ‘excessiveness’ thresholds. For example, it is widely believed that more than 102 males for every 100 females in a population is excessive and makes the population vulnerable to negative social issues and demographic fragility (Griskevicius et al., 2012). There have also been studies suggesting that communities with more than 40% of the population aged between 15 and 34 years are vulnerable to negative social issues and demographic fragility (Atta-Asamoah and Kwesi Aning, 2011). Many of the other variables used in this analysis have been selected because

they *prima facie* reflect the concept under investigation and they are readily available from secondary data sources.

This analysis uses ten variables that relate to the demographic dimensions associated with climate change adaptability, with particular attention to those postulated by McLeman (2010). The dimensions include the historical experiences of population growth and decline, the 'churn' of population brought about by temporary and long term migration to and from the community, and mobility within the community and between communities, 'unbalanced' age and sex profiles (Gloersen et al., 2009), and housing stress (Roiko et al., 2012). Data are drawn primarily from the 2006 and 2011 Censuses, with reference to additional Census data from 1976, 1981, 1986, 1991, 1996, and 2001.

The indicators used for the analysis (operationalisation detail is provided in the subsections for each indicator) were drawn from the literature review (see section 1):

1. Communities with more variable gross patterns of resident population growth and decline over time are likely to be more volatile.
2. Communities with larger differences between the observed (Census count) resident population and the likely (or estimated) resident population are likely to be more volatile.
3. Communities with larger numbers of residents who were not in the community on Census night and non-residents who were in the community on Census night are likely to be more volatile.
4. Communities with higher rates of migration in to and out of the resident population over a five-year period are likely to be more volatile.
5. Communities with higher rates of people changing their place of residence over a five-year period are likely to be more volatile.
6. Communities which have higher proportions of residents working outside the immediate area (potentially involving regular stays away from the community for work) are likely to be more volatile.
7. Communities with higher proportions of young adults (aged 15-34 years) in the population are likely to be more volatile (Atta-Asamoah and Kwesi Aning, 2011).
8. Communities with higher proportions of males in the population are likely to be more volatile, particularly those with higher proportions of males in the young adult population (Taylor, 2011).
9. Communities with higher proportions of adults who are single or un-partnered are likely to be more volatile.
10. Communities with higher levels of crowding of housing are likely to be more volatile.

The spatial characteristics of the networks created by mobility and migration (characteristics 3-6) are also likely to be important in understanding population volatility. Communities with smaller (i.e. fewer other communities involved in their spatial networks) or more concentrated (i.e. less distance between communities involved in the networks) are likely to have more predictable patterns of mobility/migration and could be considered less volatile (Carson, 2011). Constraints imposed by Census geography mean that spatial analysis cannot be done universally at the community level (many times, even relatively distant communities are grouped together under Census geography), but some indications of concentration and size of networks can be provided.

This research focuses on the Indigenous populations of the case study communities, but the characteristics of non-Indigenous populations are also important. The demographic analysis examines non-Indigenous census night mobility and residential

migration (characteristics 3 and 4) separately, and estimates the impact of the non-Indigenous population on the expression of some of the other characteristics.

The analysis has been conducted for Maningrida, Ngukurr, and Wujal Wujal. More historical data were available for the Northern Territory communities through previous Census data purchases made by the Demographic Research Program at Charles Darwin University. Analysis of the volatility of Wujal Wujal was restricted to the 2001, 2006 and 2011 censuses. A separate report has examined the characteristics of visitor flows to Broome. Broome is separate because we are looking at it as a destination for (potentially) climate change induced migration. The other communities are the (potential) origin communities.

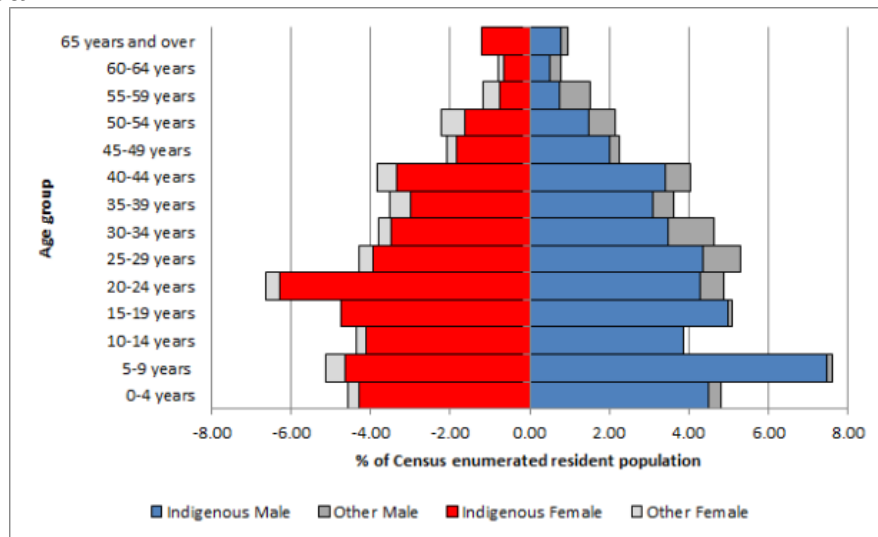
'Population volatility' is assessed in absolute terms for many of the indicators, but there has also been a process of comparison with a set of remote Indigenous communities in the Northern Territory to assess relative volatility (labelled here as 'analogue' communities). Forty-two communities (excluding Maningrida and Ngukurr) were used to identify 'average' characteristics.

8.2 Results

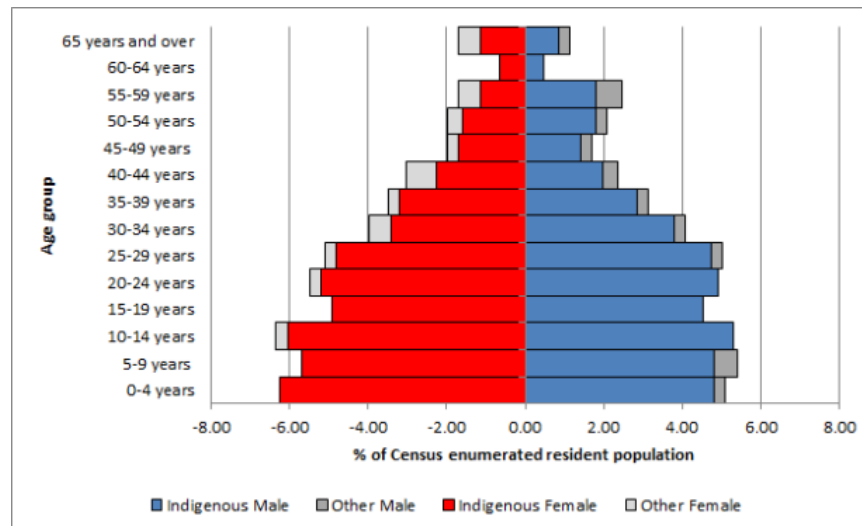
8.2.1 Gross population characteristics

According to the 2011 Census, Maningrida had 2,293 residents, and 90% of these identified as Aboriginal or Torres Strait Islander. Ngukurr had 1,057 residents and 92% identified as Indigenous. Wujal Wujal had 269 residents and 84% identified as Indigenous. Age and sex distributions (see Figure 8.1) revealed a young age structure for Indigenous populations, with many non-Indigenous people being in older age categories. Wujal Wujal had the most unusual age structure, with substantial 'craters' (representing deficits (Martel et al., 2011)) among young adults, and particularly young adult females.

Maningrida



Ngukurr



Wujal Wujal

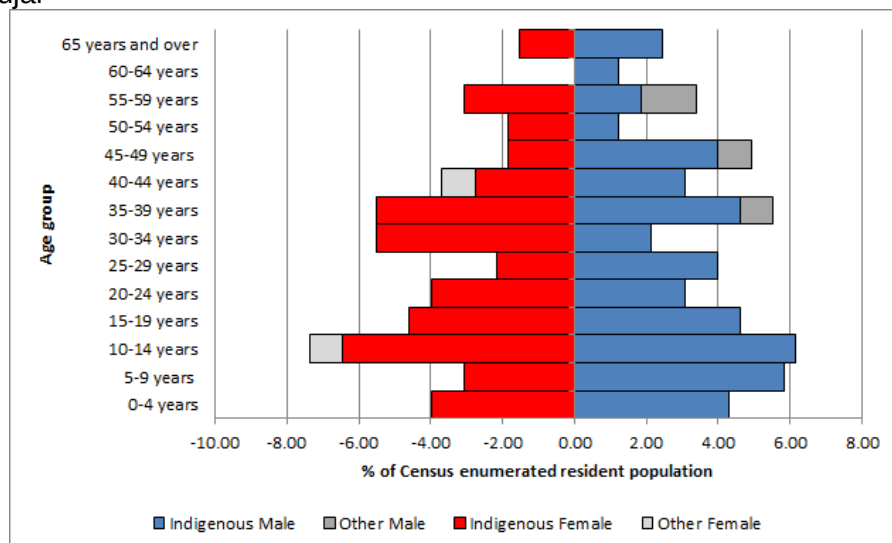
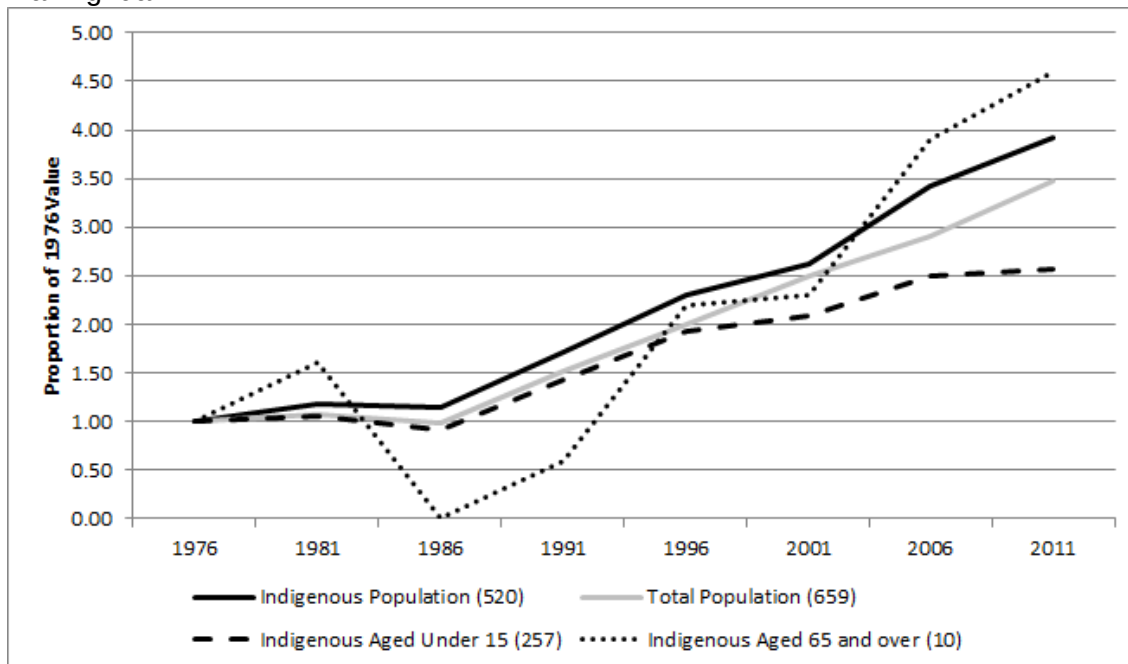


Figure 8.1: Age, sex and Indigenous structure of the populations, 2011.

Figure 8.2 shows how the populations of Maningrida and Ngukurr have changed over time. In each case, 1976 values for the Indigenous population, total population, Indigenous population aged under 15 years and Indigenous population aged 65 years and over have been set as '1' and subsequent Census counts are expressed as a proportion of the 1976 population. The actual 1976 counts are in brackets in the legend.

Maningrida



Ngukurr

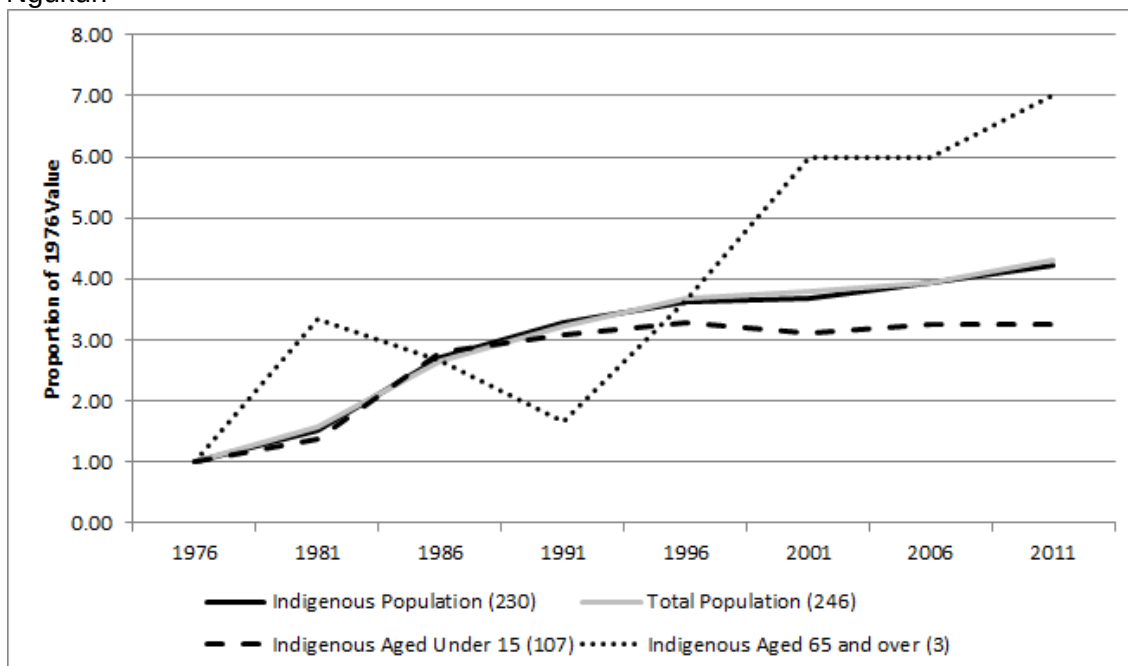


Figure 8.2: Demographic change 1976-2011.

Maningrida and Ngukurr both experienced fairly smooth population growth trajectories between 1976 and 2011. The Indigenous and total populations grew at similar rates, and population ageing (evidenced by slower growth in population aged under 15 years and faster growth in population aged 65 years and over) has been a consistent force, particularly since 1996. The 'smoothness' of the population growth for Maningrida and Ngukurr is reflected in the high linear correlation (around 0.9 for each community) between population size and time. Maningrida had a small population loss between 1981 (706 people counted in the Census) and 1986 (647 people or 8% less than 1981), which indicates some level of volatility.

Some limited assessment of population change in Wujal Wujal can be made comparing 2001, 2006 and 2011 Census data. 2001 data are only available based on place of enumeration (as distinct to place of usual residence) and do not distinguish between Indigenous and non-Indigenous populations. Nonetheless, Figure 8.3 shows the changing number of males and females in each age group enumerated in Wujal Wujal at each of the Censuses.

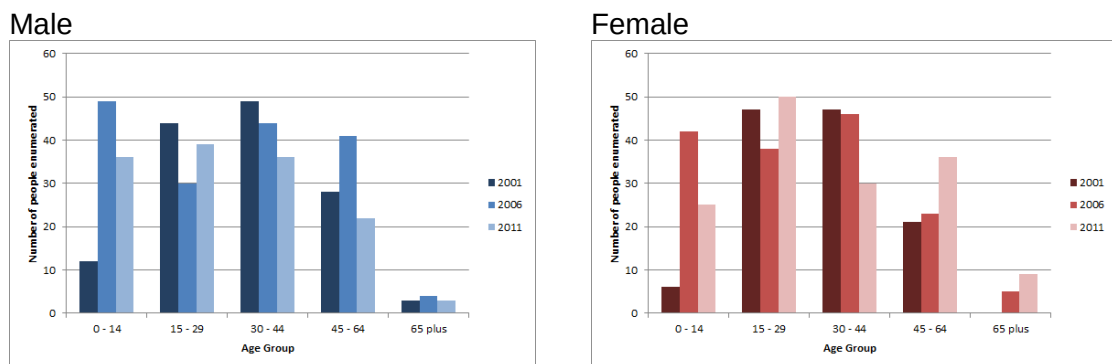


Figure 8.3: Population changes (enumerated population) in Wujal Wujal in 2001, 2006 and 2011.

The most dramatic change was the growth in the child population (aged 0-14 years) following the 2001 Census. There was also some evidence of ageing in the female population (increase in number aged 45-64 years and 65 years and over) that was not as evident in the male population.

8.2.2 Enumeration error

It is difficult to estimate Census enumeration error at the community level. The Northern Territory Department of Health and Community Services (Chondur and Guthridge, 2006) estimated resident populations for Northern Territory Indigenous communities based on data from the 2001 Census. On average, they estimated a 10% undercount in the Census. Maningrida and Ngukurr were each estimated to have had a 10% undercount. A review of Indigenous enumeration in the Northern Territory by the Australian Bureau of Statistics estimated up to a 20% undercount in remote communities collectively, but did not release estimates for individual communities (Australian Bureau of Statistics, 2006). The Bureau has not released similar estimates from the 2011 Census, but has estimated a national undercount of Indigenous people of about 18% (Australian Bureau of Statistics, 2012).

It may be possible to estimate under-enumeration of infants (people aged 0-2 years old) in Indigenous communities based on some assumptions about the expected

proportion of infants in any given population. International research has suggested that the proportion of people aged 0-2 years old in any given population is likely to be similar to the proportion of 4-6 year olds (Norman et al., 2008). Using this as a guide, we estimated enumeration error for infants as being the difference between the Census count of 0-2 year olds and either 90% (if there was under-enumeration) or 110% (if there was over-enumeration) of the Census count of 4-6 year olds. The analysis was conducted for 2006 and 2011. We also did a cohort analysis, ageing forward the 0-2 year old Census count for 2006 to compare with the count of 5-7 year olds in 2011. The cohort analysis appeared to confirm the findings of the age specific analysis in regards to direction and size of enumeration error. Across the set of 42 analogue communities, we estimated an under-enumeration of around 400 infants in 2006, which was equivalent to 30% of the enumerated infant population. The extent of under-enumeration was much lower in 2011 with perhaps 100 fewer infants than could be expected (noting that we were not able to confirm through ageing forward), equivalent to 5% of the enumerated infant population.

Maningrida had an estimated 39% under-enumeration of infants in 2006 (confirmed by the ageing forward analysis), and a 39% under-enumeration in 2011, indicating high population volatility. Ngukurr had an estimated 58% under-enumeration of infants in 2006 (the ageing forward analysis suggested 28%), but the enumerated infant population in 2011 was within the expected range, indicating high volatility in 2006 and low volatility in 2011. Wujal Wujal had an estimated 28% under-enumeration of infants in 2006, but this was not confirmed by the ageing forward analysis, which showed approximately the same number of 5-7 year olds in 2011 and 0-2 year olds in 2006. Wujal Wujal had an estimated 50% under-enumeration of infants in 2011, but this may again be a function of its small population size and expected variability in reproductive behaviour.

8.2.3 *Absentees and visitors*

Across the 42 analogue communities, there was a volume of visitors on Census night equivalent to about 4% of the resident population, while about 7% of the resident population were absent on Census night. The proportions were the same in 2006 and 2011. Maningrida, Ngukurr and Wujal Wujal had average volumes of absentees in both 2006 and 2011. Ngukurr had a relatively high volume of visitors (7%) in 2006, but not in 2011 (5%), while Maningrida had a relatively low volume of visitors (1%) in 2006, but not in 2011 (5%). Wujal Wujal had an average volume of visitors in 2006, but a high volume (11%) in 2011. Based on the analogue analysis, a 20% total volume of visitors/absentees might indicate high population volatility. Maningrida (8% in 2006 and 12% in 2011), Ngukurr (8% and 13%) and Wujal Wujal (12% and 15%) would not be considered volatile on this measure.

8.2.4 *Residential migration of Indigenous populations*

Changes to Census geography in 2011 meant that only a limited analysis of migration patterns could be conducted. While the total number of base geographic units (called 'Statistical Area 2' in 2011 and 'Statistical Local Area' in 2006) across Australia increased, the number of units in the Northern Territory and north and western Queensland decreased. For example, remote Northern Territory (excluding Darwin) contained 29 fewer Statistical Area 2s than Statistical Local Areas, and almost all of the 'lost' geographic units had delineated discrete Indigenous communities. We were able to analyse the number of people who had migrated to the specific communities from outside the immediate region (the size of the 'immediate region' varied according to the Census geography around each community), but not the number of people who had migrated out of the community. The Census records respondent's place of residence five years ago and place of residence on Census night. We are able to identify people who had different residential addresses at these two points in time, recognising that

this might reflect a move to a different house within the same community or a move from one community to another.

Between 2001 and 2006, about 2,200 Indigenous residents of the 42 analogue communities had changed residential address. This represented over 11% of the total Indigenous population of the communities. Between 2006 and 2011, about 10% of the Indigenous population of the analogue communities (about 2,000 people) had changed address. The proportion of residential migrants in Maningrida declined from 8% 2001-2006 to 5% 2006-2011, in Ngukurr from 9% to 6%, and in Wujal Wujal from 17% to 10%. There is some indication of volatility in Wujal Wujal, particularly for the 2001 to 2006 period.

Typically for both periods, about 70-80% of residential migrants had moved to the community from outside the immediate region. Maningrida had 75% for 2001-2006 and 80% 2006-2011. Ngukurr had 90% for 2001-2006 and 70% for 2006-2011. Wujal Wujal had 80% for 2001-2006 and 75% for 2006-2011. The increasing local area migration for Ngukurr may indicate a broader regional volatility (see Section 8.2.6 'Spatial Characteristics...' below).

An additional estimate of residential migration in to and out of the community can be made by ageing forward the population from one Census period to the next. The focus is on people aged less than 65 years to minimise the effect of deaths. Ageing forward the combined population of the 42 analogue communities provided an estimated net out-migration of around 3%, however there was substantial diversity, with 25 communities experiencing net out-migration and 17 experiencing net in-migration. Maningrida was estimated to have a net out-migration of about 2%, and Ngukurr was estimated to have had no net migration effect. Neither community would be considered volatile on this measure. Wujal Wujal, however, experienced a net out-migration of 28%, which reflected the overall decline in usual resident population (from 309 Indigenous people to 253 Indigenous people) and suggests a period of volatility.

8.2.5 Indigenous residents working outside the community

Again within the limitations of Census geography, it was estimated that 11% of Indigenous employed people resident in the 42 analogue communities worked outside of the immediate region according to the 2011 Census. This represented a substantial increase over 2006 (where 2% of employed residents worked outside the immediate region). Both Maningrida and Ngukurr went from having no employed residents working outside the immediate region in 2006 to 10% of employed residents working outside the immediate region in 2011. This suggests increased population volatility in this regard, although it is most likely explained by the process of local government reform in the Northern Territory in 2008, which centralised local government offices in the major centres (Katherine, in the case of these two towns) and meant that jobs previously based in communities became based in those centres. Conversely, Wujal Wujal had about 11% of employed residents working outside the immediate region in 2006, and about 6% doing so in 2011, suggesting decreased population volatility in this regard.

8.2.6 Spatial characteristics of mobility and migration networks (2011 only)

The most detailed level at which spatial analysis of mobility and migration could be conducted for the 2011 Census at the time this report was prepared is 'Statistical Area

2' (SA2⁷). Wujal Wujal was in the Cape York SA2, which includes communities as far away as Mapoon and Lockhart River. Maningrida was in the West Arnhem SA2, which also includes Gunbalanya and Minjilang. Ngukurr was in the Gulf SA2, which also includes Numbulwar, Miniyeri, and Borroloola.

Over 60% of Indigenous people away from the West Arnhem SA2 on Census night 2011 were in Darwin, with a further 15% in the neighbouring SA2 of Alligator. About 13% of people away were in locations outside of the Northern Territory, with half of these in either Townsville or Cairns. In contrast, just 9% of visitors to West Arnhem were from Darwin, with 60% from the neighbouring SA2 of East Arnhem. There were no visitors from outside of the Northern Territory.

Over one half of Indigenous people away from the Gulf SA2 on Census night 2011 were in Darwin, with a further 12% in Katherine. About 10% were outside of the Northern Territory, with most of these in Victoria. Nearly 30% of visitors were from Katherine, with a further 20% each from Darwin and Groote Eylandt. There were no visitors from outside of the Northern Territory.

Over 50% of Indigenous people away from the Cape York SA2 on Census night 2011 were in Cairns, and virtually all of the remainder were in other far north Queensland places such as Ingham (9%), Weipa (7%), and Yarrabah (4%). Indigenous visitors to Cape York SA2 were from a larger number of regions, but there was still a focus on Cairns (36% of visitors) and regions north of Townsville (collectively another 36%).

Residential migration networks were similar to mobility networks for West Arnhem. About half of the Indigenous people who had left the West Arnhem SA2 had moved to Darwin, and most of the remainder had moved to neighbouring SA2s. However, there was a relatively high level of in-migration from the Tiwi Islands (about 17% of in-migrants), as well as Darwin (53%).

The Gulf SA2 had a less concentrated migration network than its mobility network. Out-migration was similar to Darwin (22%), Katherine (22%), and Groote Eylandt (18%), and about 12% of out-migrants moved to Queensland. In-migration was shared among the Barkly region (20%), Katherine (17%), and Groote Eylandt (12%), with 29% of in-migrants coming from locations in Queensland.

Over 40% of Indigenous people who migrated out of the Cape York SA2 moved to Cairns, and 10% moved to Weipa. Only about 10% moved out of the Far North Queensland region. In-migrants came from Cairns (31%), Mareeba (8%) and Weipa (7%) along with other Far North Queensland locations. About 13% of in-migrants came from outside Far North Queensland, including 4% from overseas.

Figure 8.4 presents stylised network maps of mobility and migration (combined) for each of the SA2s. Black lines show locations or regions to which people had moved, and grey lines show locations or regions from which people had moved. Cape York had a larger network than the other SA2s (i.e. more locations involved), and the network

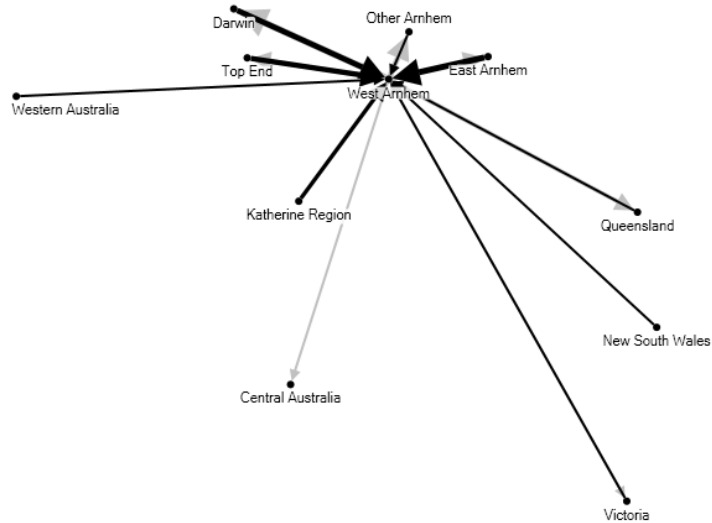
⁷ "SA2s generally have a population range of 3,000 to 25,000 persons, and have an average population of about 10,000 persons. SA2s in remote and regional areas generally have smaller populations than those in urban areas. There are some SA2s outside these bounds, due to other considerations such as:

- the relative sparseness of the population in remote regions (an SA2 with a population of 3,000 may cover too large and diverse a geographical area to be a meaningful unit)
- the benefit of preserving recognisable areas for which there is a considerable amount of historical data
- isolated geographical areas, such as islands or other isolated populations
- the need to avoid arbitrary subdivisions of otherwise coherent regions, such as very large suburbs or regional towns

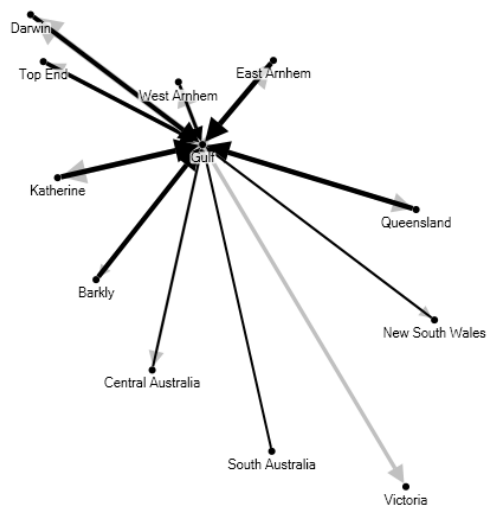
(<http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/88F6A0EDEB8879C0CA257801000C64D9?opendocument>).

was not so spatially concentrated. More diverse, less concentrated networks probably indicate higher volatility.

West Arnhem SA2



Gulf SA2



Cape York SA2

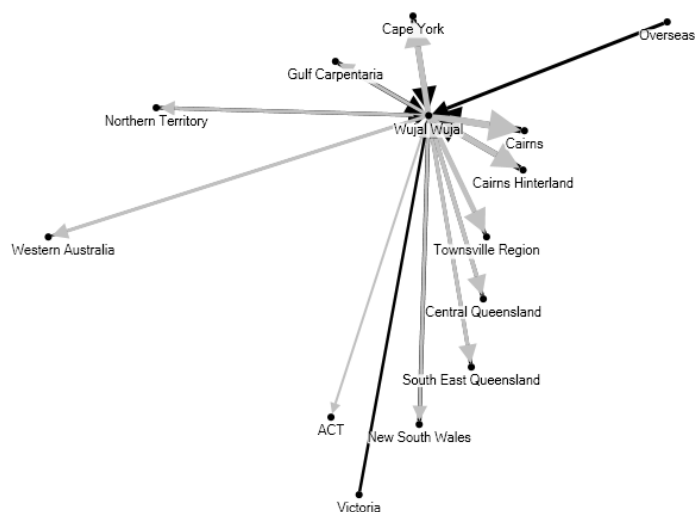


Figure 8.4: Spatial networks of mobility and migration inferred from 2011 Census data.

8.2.7 Young adult populations

Across the 42 analogue communities, 37% of the population were young adults aged between 15 and 34 years at both the 2006 and 2011 Censuses. Maningrida had a slightly larger young adult population (39% and 40%) at both Censuses, and Ngukurr experienced a small increase in the size of the young adult population from 37% to 39% between 2006 and 2011. Wujal Wujal experienced a larger increase from 30% in 2006 to 35% in 2011. Atta-Asamoah and Kwesi Aning (2011) asserted that communities with 40% or more of the population in this age group can be considered volatile.

8.2.8 Sex ratios

'Balanced' populations (Gloersen et al., 2009) typically have a sex ratio of between 97 and 100 males for every 100 females. Higher sex ratios are associated with social problems such as increased crime rates, drug and alcohol abuse, and violence (Griskevicius et al., 2012). The associations are particularly strong where there are high sex ratios within the population of young adults. The 42 analogue communities had a combined sex ratio of 96 males for every 100 females in 2006, and 97 males for every 100 females in 2011. The sex ratio for the Indigenous population was lower at 94 in 2006 and 95 in 2011. The sex ratio for young adults (aged 15 to 34 years) increased from 94 in 2006 to 97 in 2011. Maningrida has had high total (102 in 2006 and 106 in 2011) and Indigenous (102 and 102) sex ratios, but experienced a dramatic increase in the young adult sex ratio from 95 in 2006 to 102 in 2011. Ngukurr experienced dramatic decreases in the total sex ratios (104 to 91) and Indigenous sex ratios (106 to 93) between 2006 and 2011, while the young adult sex ratio stayed at 96 males for every 100 females. Wujal Wujal experienced dramatic declines in the total sex ratios (113 to 99) and Indigenous sex ratios (103 to 92) between 2006 and 2011, but a very dramatic increase in the youth sex ratio (there were no non-Indigenous youth in 2011) from 88 males for every 100 females to 145 males for every 100 females. These trends, as well as the actual rates, indicate high population volatility, with very strong evidence of 'female flight' (Taylor, 2011) from Maningrida and (especially) Wujal Wujal.

8.2.9 Un-partnered adults

The analysis examined the social marital status of adults aged 25-49 years. At the 2006 Census, 42% of Indigenous residents of the 42 analogue communities were 'single' (meaning not in a marriage or marriage like relationship). The rate declined slightly at the 2011 Census to 39%. Including non-Indigenous residents in the analysis (recognising a growing proportion of mixed marriages) resulted in 41% single at the 2006 Census, and 38% at the 2011 Census. Maningrida had a higher proportion of single Indigenous adults (46%) in 2006, and 43% of all adults were single. Maningrida also had a higher proportion of single Indigenous adults in 2011 (42%) but a similar overall proportion of single adults (39%). Ngukurr experienced a substantial decline from 43% of Indigenous (and total) adults in 2006 to 36% of Indigenous (and 34% of total) adults in 2011. Wujal Wujal experienced a decrease in single adults from about half the population in 2006 to 39% in 2011. These results do not necessarily reflect high volatility in any of the communities.

8.2.10 Crowding

Across the 42 analogue communities, there was an average of 5.8 residents for every occupied private dwelling enumerated at the 2006 Census and at the 2011 Census. Maningrida had extremely high levels of crowding in 2006 (9.1 residents per dwelling), and while this had declined in 2011, it still remained high at 8.2 residents per dwelling. Ngukurr had 6.2 residents per dwelling in 2006, but had increased dramatically to 8.0 residents per dwelling in 2011. In contrast, Wujal Wujal had just 2.9 residents per dwelling in 2006 and 3.3 residents per dwelling in 2011. This variable indicates a

continuing level of volatility for Maningrida, and a sharply increased volatility for Ngukurr between 2006 and 2011.

8.2.11 Non-Indigenous census night mobility and residential migration

Rates of non-Indigenous mobility and residential migration across the 42 analogue communities were similar in 2006 and 2011. There was a volume of non-Indigenous visitors to these communities equivalent to about 30% of the resident non-Indigenous population, and approximately 70% of non-Indigenous residents had not been living in their current community five years prior to the Census. Maningrida experienced an increase in both indicators at the 2011 Census compared with the 2006 Census. In 2006, there were just 4 non-Indigenous visitors compared to a resident non-Indigenous population of 162 persons, and 66% of those residents had not been in the community five years previously. In 2011, however, there were 100 non-Indigenous visitors in the community on Census night, equating to 39% of the 256 non-Indigenous resident population, and 80% of non-Indigenous residents had moved in to the community in the previous five years. Ngukurr experienced no change in the proportion of non-Indigenous visitors (20% of the resident population of 54 in 2006 and 85 in 2011), and despite the growth in the overall population of non-Indigenous residents, there was a decline in the proportion of new arrivals from 74% of the 2006 population to 65% of the 2011 population.

The number of non-Indigenous people in the Wujal Wujal population was very small (17 in 2006 and 16 in 2011), as was the number of non-Indigenous visitors (4 in 2006 and 1 in 2011). Over 70% of the 2006 non-Indigenous population had moved in to Wujal Wujal in the previous five years, and all of the 2011 non-Indigenous population had done so.

8.3 Broome population movement

Figure 8.5 shows the place of usual residence of Indigenous adults (aged 15 years and over) who were enumerated in Broome on Census night 2011, and who may be considered 'at risk' of homelessness as a result of socioeconomic characteristics. There were 209 of these visitors to Broome, and the characteristics used to assess risk of homelessness (with the number of visitors having these characteristics noted in brackets) were –

- Unemployed (77).
- Low income (below \$300 per week) (90).
- Did not complete year 10 or better education (33).
- Suffers from a disability (3).
- Provides care to someone with a disability (23) – this might include accompanying people to hospital.
- Poor English language proficiency (3).

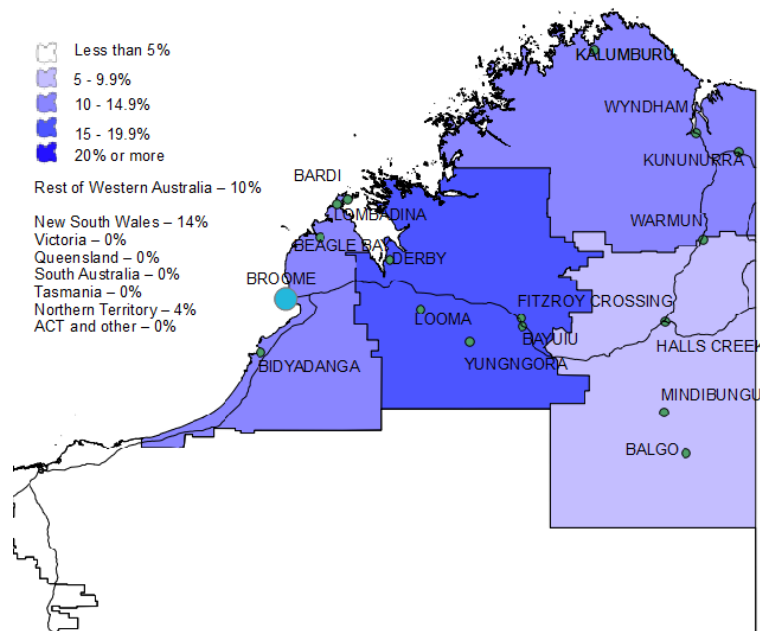


Figure 8.5. Origins of Indigenous visitors to Broome, Census night 2011.

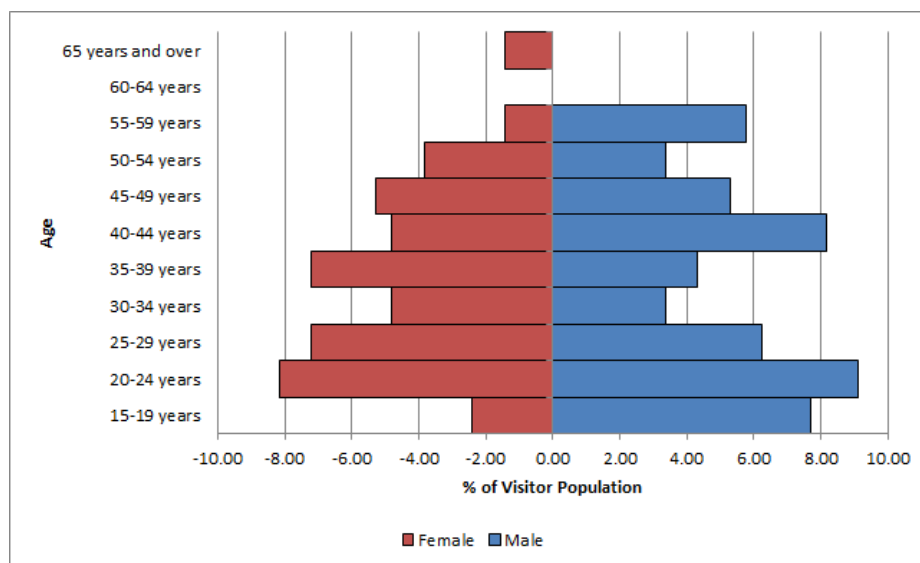


Figure 8.6: Age/sex pyramid of Indigenous visitors to Broome, Census night 2011.

Figure 8.6 describes these visitors by age and sex.

Figure 8.7 describes the place of usual residence of the most populous 'at risk' group (those on low incomes). Figure 8.8 describes the age and sex profile of this group. It is important to note that only 10 of the low income group were attending school, and all of these were in the 15-19 year age group. It is not known whether they were attending school in Broome.

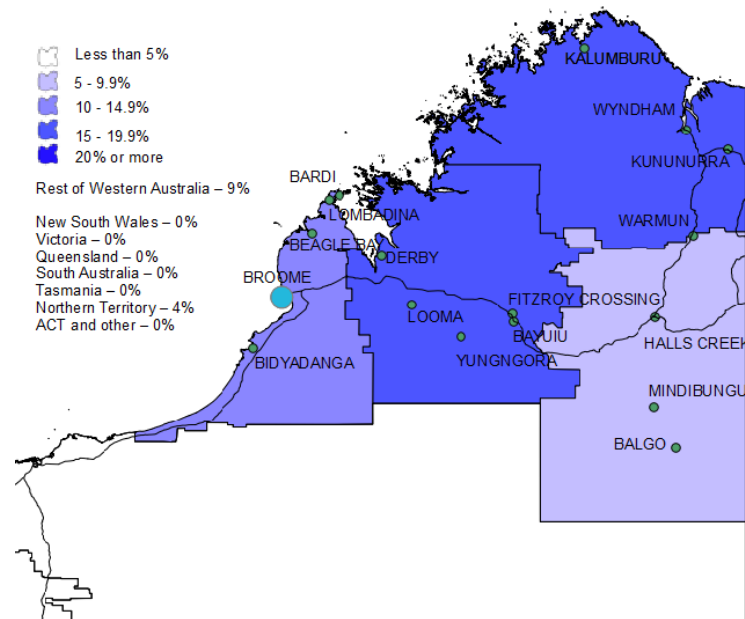


Figure 8.7: Usual residence of low income Indigenous visitors to Broome, Census night 2011.

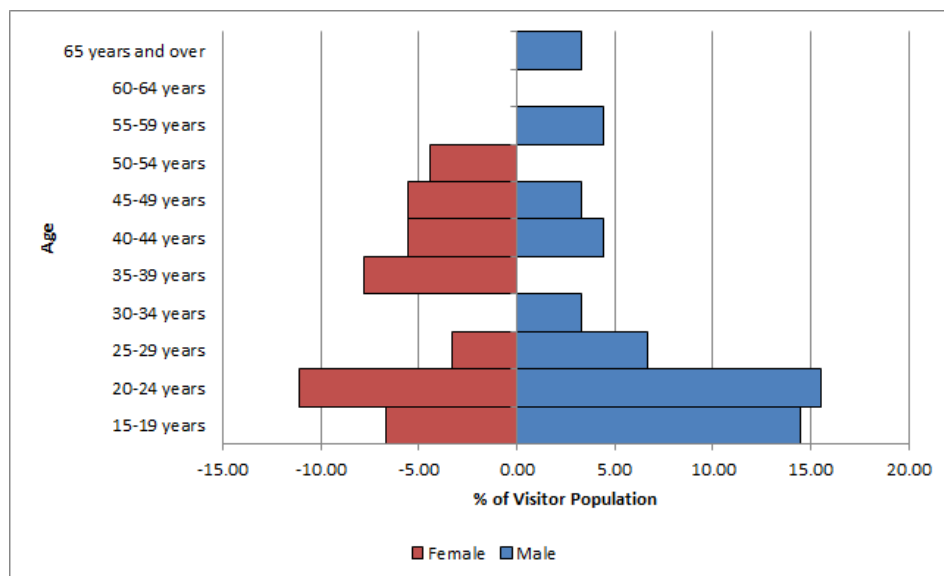


Figure 8.8: Age and sex distribution of low income Indigenous visitors to Broome, Census night 2011.

However, in order to understand the details of population movement into Broome, the level of detail provided by the Australian Bureau of Statistics is inadequate. This was recognised and addressed by the Yawuru Native Title Holders Aboriginal Corporation in a report on their 'Knowing our community' survey (Taylor et al., 2012). They noted that the error in the 2006 ABS Census (ABS, 2007) due to people failing to register their Indigenous status was estimated to be 78% of the 'usual residence census count'. Similarly, the Indigenous population decrease in 2006 relative to that in 2001 was hard to reconcile with an apparent expansion in numbers.

The 'Knowing our community' survey involved 928 Indigenous private households in the Broome area, and 249 individuals from non-private dwellings and camping sites around the town. They found that there were 3,379 Indigenous people living in private

dwelling in Broome in 2011, and a further 249 Indigenous people living in non-private dwellings or camping out. There were 240 Indigenous residents who were absent at the time of the survey, and 317 who were visiting private residences. Of the Indigenous people in non-private dwellings or camping out, 149 were visitors.

The survey found an apparent increase in number of Indigenous households of 44% compared with the 2006 ABS Census, and an increase of 61% in Indigenous population. This was taken as an indication that the ABS statistics substantially undercounted the Indigenous population. Further, the peaks in household residents were summed to estimate the peak population over an entire year. The figure of 8,763, though, was likely to be an overestimate of the peak, since not all household peaks were likely to occur at the same time. This figure is useful as an upper limit for service provision.

The age distribution showed a marked peak in the very youngest age group, of 0-4 years, suggesting a recent increase in fertility. The age distribution also showed a rapid fall-off in population with advancing age, especially among men, demonstrating a continuing high mortality rate.

The survey determined the whereabouts of Broome residents who were absent the night of the Census. It found that the biggest pull came from Perth, then from Derby and the Pilbara. Smaller numbers were found to have gone to Geraldton, Sydney and Darwin. The reasons for moving to these places, in priority order, were listed as: education, training and employment, social visits and medical reasons.

The origins of visitors to Broome had entirely different spatial patterns, which depended on whether they were accommodated in private dwellings, or in non-private dwellings or camping out. The visitors to private dwellings originated from the immediate West Kimberley region, as well as from centres such as Derby, Fitzroy Crossing, Kununurra, Kalumburu, Looma and Halls Creek. Substantial numbers also originated from as far away as Perth, Darwin and Alice Springs. These origins were taken to reflect the Yawuru diaspora, and the visitors were likely staying with relatives.

The visitors to non-private dwellings or those who were camping out originated almost exclusively from the Kimberley region, with particular concentrations from the Dampier Peninsula, Derby, Fitzroy Crossing, Balgo and Bidyadanga. This pattern was taken to reflect the needs of the Kimberley regional population to access Broome in its capacity as a major service centre.

In order to understand the factors involved in population movements in relation to Broome, it is important to understand who comes to Broome to access services, why they come, and what services they access. Prout and Yap (2010) found that people accessing social services in Broome mainly came from Fitzroy Crossing (205), Balgo and Bidyadanga (115 each), with a peak during the dry season.

The data we collected in the course of our project was derived from registrations at Nicholas Elmo's Kitchen for charity breakfasts (from 2009 to 2012), and from charity CentaCare breakfasts (2011 to 2012). These data showed that the largest proportions of those visitors originated from Balgo, Bidyadanga and Fitzroy Crossing. What is surprising about these concentrations is the relative distances of these centres from Broome. We analysed the data using the gravity model of population movement (Olsson, 1965; Stewart, 1948) based on Newton's theory of gravity, which assumed that the attraction of Broome would be proportional to the product of the source and destination populations, and inversely proportional to the square of the distance between them. We decided that it was not appropriate to use more complex models

that were designed for more complete statistics. As can be seen in Figure 8.9, the data are consistent with the gravity model for all the 57 communities considered, except for the outliers of Balgo and Fitzroy Crossing. These points remained inconsistent with the model even when we removed those attendees who demonstrably remained in Broome for longer than 6 months.

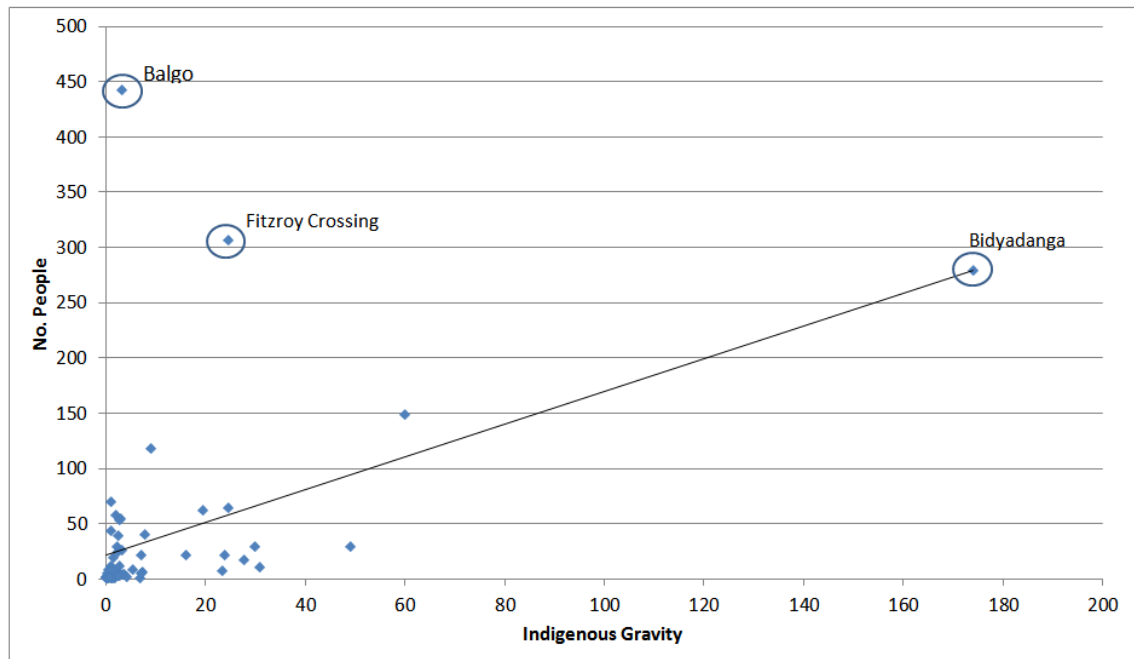


Figure 8.9. Plot of the number of Indigenous people attending CentaCare breakfasts compared with the gravity (where the gravity equals the Indigenous population at source, times the Indigenous population at destination, divided by the square of the distance between them).

Further, the numbers of people attending the two kitchens peaked in the wet season, rather than the dry (as with Prout and Yap (2010) study). This is illustrated in Figure 8.10.

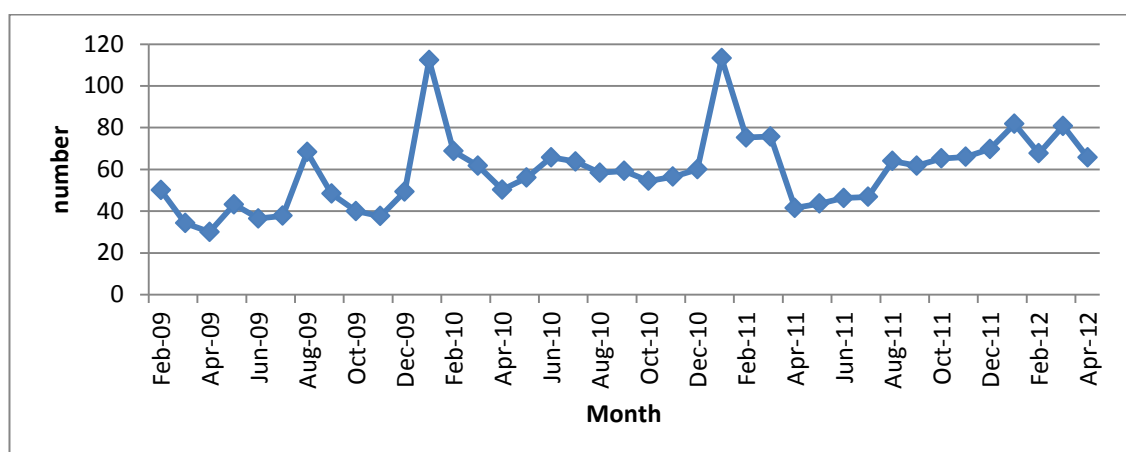


Figure 8.10. Plot of the number of Indigenous people attending Nicholas Elmo's Kitchen versus date.

A full explanation of why people visit Broome, therefore, needs to explain the inconsistent numbers from Fitzroy Crossing and Balgo, as well as the seasonal variations between visitors to the kitchens.

8.4 Summary

Table 8.1 summarises the volatility variables for each of the three communities: Maningrida, Ngukurr and Wujal Wujal. Variables that have been (subjectively) assessed as indicating relatively high volatility have been marked with one or two ‘*’s. Volatility may be assessed from the static value at the 2011 Census, or from the extent of change (from less to more volatile) between 2006 and 2011.

Table 8.1: Volatility variables for each of the three communities where one star indicates volatile, two stars indicates highly volatile and no stars indicates ‘normal’.

Indicator	Analogues	Maningrida	Ngukurr	Wujal Wujal
Change in gross population characteristics 1976 (2001 for Wujal Wujal) to 2011	n.a.			*
Under-enumeration of infants	*	**		*
Census night absentees and visitors				
Indigenous residential migration (within five years prior to Census night)				*
Indigenous residents working outside the community	*	*	*	
Nature of spatial mobility/migration networks			*	*
Young adult populations		*		*
Total sex ratios		*		
Young adult sex ratios	*	*		**
Un-partnered adults		*		
Housing crowding	**	**	**	
Non Indigenous mobility and migration	*	**		*

Population volatility in Maningrida centres mainly on the age structure, with a high youth population and consequent difficulties in enumerating the population accurately. There are also high (and increasing) sex ratios, which are linked to high numbers of un-partnered adults. Ngukurr, on the other hand, appears to have relatively low population volatility, with the exception of an increased volume of relatively local (within the same SA2) mobility, which may reflect increased population exchange between Ngukurr and nearby towns such as Numbulwar and Borroloola, although the direct relationships between these towns has not been modelled explicitly here. Wujal Wujal has high volatility as expected given its small size relative to the other two communities, and its proximity to Cairns and potential for frequent population exchange with that centre. It also sits within a region that has a very diverse mobility/migration spatial network.

Of critical importance is the observation that levels of apparent population volatility are themselves subject to substantial change over relatively short periods of time. This has been observed here, particularly with changes in sex ratios and indicators of mobility and migration. The extent to which a particular community may be subject to dramatic population change as a result of a weather (or some other) event is not only likely to be related to its demographic path *per se*, but to its exact position on that path at the time of the event. The relative exposure of familiar places to the same event will also have an impact. Floods, cyclones, heat waves, and other severe weather events may similarly impact the relatively nearby and similarly remote communities to which our case study communities are linked, but may increase the likelihood of migration to

familiar centres with more substantial hard and soft infrastructure, such as Darwin (for Maningrida and Ngukurr), Katherine (for Ngukurr) and Cairns (for Wujal Wujal). Migration in to the case study communities may also be a response to severe weather events impacting on other linked communities. The extent to which this may occur would be determined not only by the strength and direction of existing and past relationships between communities (see Figure 8.4), but the relative infrastructure 'wealth' of the case study communities.

Overall, and based on an assumption that 2011 demographic characteristics carry forward, one might anticipate relatively substantial demographic responses from Maningrida and Wujal Wujal with an emphasis on migration to Darwin and Cairns respectively. It is difficult to assess how much of this migration would be short-term or long-term, but recent evidence suggests increasing long-term out-migration from Wujal Wujal. Ngukurr is harder to assess because it has fewer clear markers of volatility and less concentrated migration networks. Ngukurr may even experience in-migration from nearby remote communities.

The literature suggests a wide variety of reasons for why visitors come to Broome, including visiting family, social factors such as courtship and domestic violence, visiting sick family members, accessing health facilities or prison facilities or accompanying family members to these facilities (though now the prison in Broome has closed and moved to Derby) (Prout and Yap, 2010). Birdsell (1988) described 'lines' of mobility which extended along the Western Australian coast and facilitated the movement of people returning from the places where they were forcibly detained as children, to their more northern homelands (Prout, 2008).

Other socio-cultural attractions include carnivals, music, ceremonial business and footy. So-called 'structural' attractions include the availability of retail services, job opportunities and access to alcohol. Prout and Yap (2010) found in their survey that many interviewees suggested that the introduction of alcohol restrictions in Fitzroy Crossing in September 2007, for instance, resulted in an increased flux of visitors to Broome in search of full-strength beer. While this may have happened, the effects must have been temporary, since the overall population of Fitzroy Crossing started to increase from 2006 onwards, after five years of decreases (ABS, 2011).

In summary, the reasons for the influx of visitors to Broome are likely to be dominated by visits to family, especially for visitors accommodated in private houses. Visitors living in non-private accommodation or camping out, come to Broome for a variety of reasons likely to be associated with services. The stronger than normal attraction of Broome for residents from Fitzroy Crossing and Balgo indicates that the factors that influence people to move are complex and not easily explained using simple arguments. In the future, the influence of major changes to both origin communities and to Broome will determine the flux of populations in the area. For instance, the construction of the gas processing plant at James Price Point by Woodside Petroleum and others is likely to dramatically change the dynamics of movement in both predictable and totally unforeseen ways. The influence of climate change, on the other hand, as far as we can determine from our studies, provides only a relatively minor contribution to the decision of whether or not to move to Broome. As argued by Hugo (2012), this will only change when the effects of climate change become manifest to such a degree that other factors reduce to secondary importance.

9. LAND USE PLANNING'S ROLE IN CLIMATE CHANGE ADAPTATION

9.1 *Approach and methods*

Recent research by Gurran et al. (2011) found that many local governments in coastal Australia have begun to engage in climate change adaptation activities and that their responses suggest that a continuum of climate change adaptation responses is emerging at the local level. The actions undertaken within this continuum ranged from:

- undertaking detailed risk or vulnerability analyses before proceeding to comprehensive adaptation plans covering a range of initiatives to build local community resilience;
- adopting strategies to address specific risks to local infrastructure assets and reviewing approaches to their provision and maintenance; to
- changing land use planning and development controls to reflect climate change adaptation considerations (Gurran et al., 2011).

The level of response is often reflected by the availability of adequate resources. These findings are consistent with research into the processes undertaken by Australian public and private sector organisations in identifying climate risk analysis as a precondition to adaptive action (Gardner et al., 2010).

This chapter addresses land use planning's role in climate change adaptation through land use planning systems in the case study communities in northern tropical Australia in three different jurisdictions: Maningrida (NT), Ngukurr (NT), Wujal Wujal (Qld) and Broome (WA). In particular, we examine the key elements in the land use planning systems in each of the jurisdictions, including planning legislation and planning policies, and whether they facilitate climate change adaptation and improve disaster resilience in the case study communities.

This chapter compares the land use planning systems in the three jurisdictions to ascertain how the application of hazards knowledge is incorporated into statutory land use plans (also referred to as planning schemes) for each of the case study communities. The chapter includes:

- a discussion of the responsibilities for land use planning and disaster resilience in Australia's federal system of government;
- a discussion of disaster risk analysis as the first stage in climate change adaptation;
- an examination of how climate change adaptation measures are considered in the context of land use planning and in particular to what extent these matters are factored into the relevant planning legislation, state planning policies, regional strategy plans, local statutory planning schemes, enforceable planning and development controls and building codes; and
- an examination of whether climate responsive design principles (CRD) are considered an important element in planning and development assessment.

What we found from our research is that the land use planning systems in Australia are primarily geared toward promoting and facilitating development and have not evolved sufficiently to take account of climate change. One of the more pressing issues identified by respondents in the case study communities is the consideration of climate in the design and siting of housing and the lack of consultation that they had in the design of social housing. This in turn had a significant impact upon the community's ability to adapt to predicted climate changes.

9.1.1 Land use planning and disaster resilience in Australia's federal system

Like most other federated nations, the legislative and policy arrangements in Australia governing land use planning and disaster resilience are quite complex due to the structure of our federation established and enshrined in the Australian Constitution. Figure 9.1 shows the responsibilities for disaster resilience and emergency management, land use planning, Indigenous policy and programs and local government reforms in the Australian federal system of government.

The following discussion explains the complexities of our federal system of government to enable a more in-depth understanding of the issues involved in creating disaster-resilient communities through land use planning in Australia. Our particular focus is on remote communities with high proportions of Indigenous people in their demographic profiles.

Under the Australian Constitution, Australia's federal system of government has resulted in a tripartite hierarchy of political power consisting of federal (national), state and territory, and local government. The six colonial States came together in 1901 to form the Australian federation, the Commonwealth of Australia. As a consequence of Section 125 of the Constitution, and almost a decade after federation in 1910, the state of New South Wales (NSW) surrendered a portion of NSW to become the Australian Capital Territory for the Seat of Government of the Commonwealth. In 1989, the Commonwealth granted the Australian Capital Territory responsible government, with a Legislative Assembly headed by a Chief Minister. In January 1911, a decade after federation, the Northern Territory (NT) was separated from South Australia and transferred to the Commonwealth and an Administrator was appointed by the Governor-General to administer the NT on behalf of the Commonwealth. In 1978, the Commonwealth granted the Territory responsible government, with a Legislative Assembly headed by a Chief Minister.

To overcome some of the structural impediments to national policy development, in 1992 the Commonwealth, the six States and the two self-governing Territories agreed to the establishment of the Council of Australian Governments (COAG). COAG's primary role is to facilitate policy reforms that are of national significance and that require the coordination of all levels of government. In 2011, COAG underwent a structural reform and reduced the overall number and types of Ministerial Councils and fora operating under its umbrella (COAG, 2011b). COAG decided to establish a system of three types of ministerial councils, comprising ongoing standing councils to address issues of national significance; select councils that are reform-focused and time-limited; and legislative and governance fora for overseeing responsibilities set out in particular legislation, intergovernmental agreements and treaties outside the scope of standing councils.

The nature and responsibilities of some of the Standing Councils and other fora relating to national policy development for emergency management, disaster resilience and land use planning are discussed below.

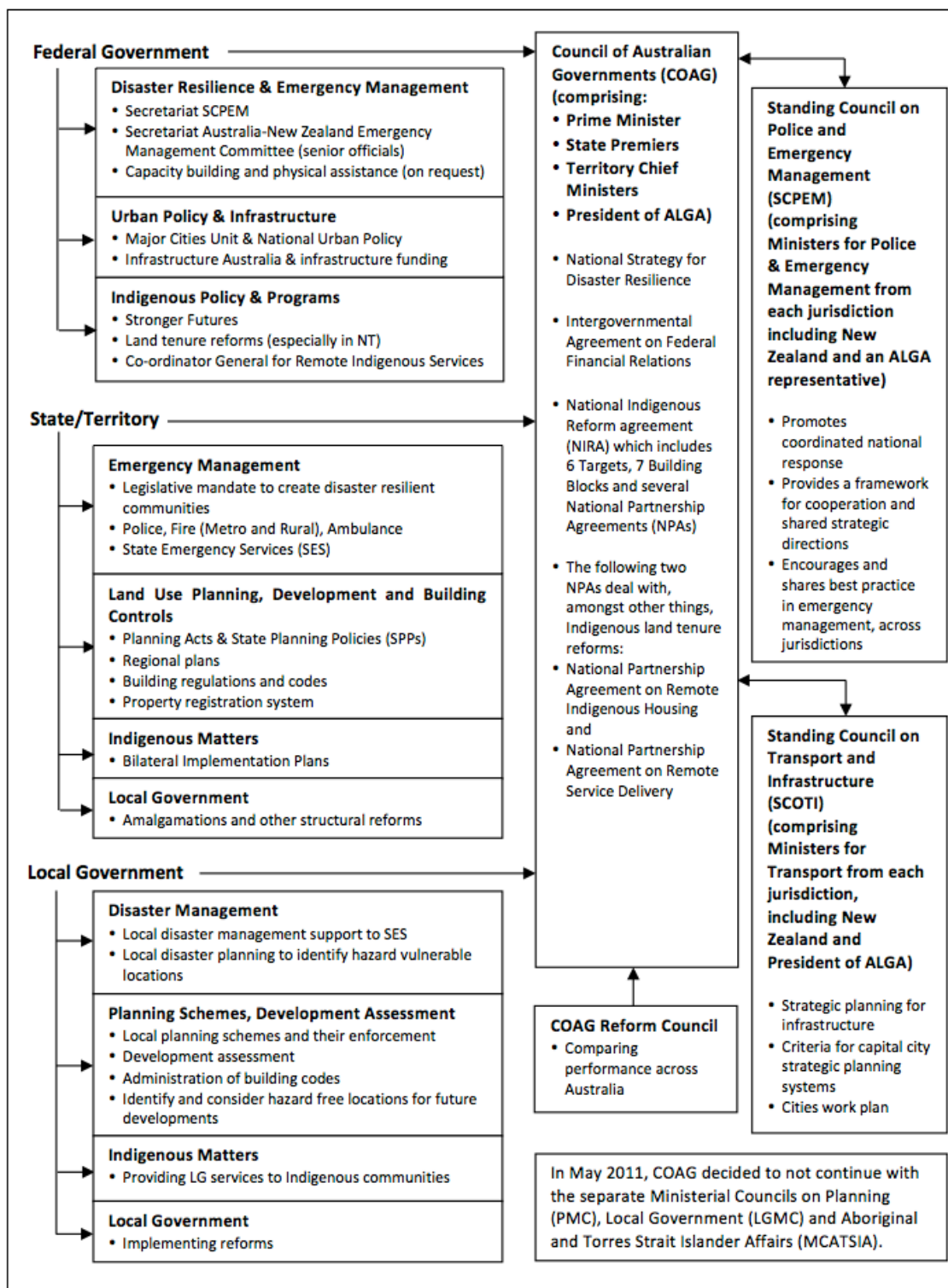


Figure 9.1: Relationship between three levels of government and responsibilities for disaster resilience and emergency management, land use planning, Indigenous policy and programs, and local government reforms.

COAG has also established the COAG Reform Council as part of the arrangements for federal financial relations to assist COAG with driving its reform agenda (COAG, 2008a). Independent of individual governments, the COAG Reform Council reports directly to COAG on reforms of national significance that require cooperative action by Australian governments. The COAG Reform Council's mission is to assist COAG in strengthening the performance and public accountability of governments, and it does this by monitoring the performance of the various National Partnerships and Agreements that COAG enters into (COAG, 2008a).

COAG's membership comprises the Prime Minister, the six State Premiers, the two Territory Chief Ministers and the President of the Australian Local Government Association. Local Government has no independent constitutional status in Australia; it derives most of its powers solely from state legislation, via Local Government Acts in each state and the NT. Other legislation confers additional powers on local government, such as for planning and the regulation of development. As Williams and Maginn (2012) observe, within this legislative framework, local governments can exercise a large degree of autonomy over some services, while also being an agency for State or Federal Governments on other matters.

Section 51 of the Australian Constitution contains the powers conferred on the Federal Government by the States. Significantly, the Federal Government does not have any specific powers for emergency management, disaster resilience or land use planning and regulation of development because the States and Territories retained responsibility for these matters.

Primary responsibility for the protection of life, property and the environment rests with the States and Territories and this includes the provision of police, fire, ambulance services and emergency service organisations, and State Emergency Services (SES), comprising of staff and volunteers who provide a disaster response capability within each jurisdiction. Managing emergencies is also the responsibility of State and Territory Governments, with local governments playing a significant support role. State and Territory Governments have arrangements with each other to share resources when necessary and, in particularly major disasters or adverse events, a State or Territory Government may seek federal assistance (COAG, 2011c).

At the national level, the Ministerial Council on Police and Emergency Management (SCPEM) is a Standing Council of COAG. Its membership comprises ministers responsible for Police and Emergency Management from the federal, state and territory governments and from New Zealand, and a representative from the Australian Local Government Association. In relation to emergency management, the Ministerial Council promotes a coordinated national response to emergency management issues, provides a framework for cooperation and shared strategic directions for Australia and New Zealand, and encourages and shares best practice across the jurisdictions. The Ministerial Council is also responsible for providing national leadership on emergency management (all hazards) and disaster resilience, including national policies and priorities, and the consideration of recommendations of national interest arising from commissions of inquiry into recent natural disasters. The Federal Government through the Attorney-General's Department (AGD) provides the secretariat for the SCPEM and supports the States and Territories by providing a comprehensive approach to emergency management, assisting them with developing their capacity for dealing with emergencies and disasters, and for providing physical assistance to requesting States or Territories when they cannot reasonably cope during an emergency. The Attorney-General's Department also provides the secretariat for the Australia-New Zealand Emergency Management Committee comprising senior officials from the relevant agencies in each of the jurisdictions.

In 2009, COAG (2009) agreed to adopt a whole-of-nation resilience-based approach to disaster management, recognising that a national, coordinated and cooperative effort is needed to enhance Australia's capacity to withstand and recover from emergencies and disasters. The SCPEM therefore prepared a National Strategy for Disaster Resilience (NSDR) which was adopted by COAG in 2011 (COAG, 2011b). The NSDR provides high-level guidance on disaster management to all levels of government, business and community leaders, and the not-for-profit sector. While it focuses on priority areas to build disaster-resilient communities across Australia, it also recognises that disaster resilience is a shared responsibility for individuals, households, businesses and communities, and governments.

The NSDR is also seen as a first step in delivering long-term sustained behavioural change and enduring partnerships (COAG, 2011c). To this end, the NSDR includes a number of suggested priority outcomes in relation to reducing risks in the built environment through land use planning, development control and building regulations (COAG, 2011c), including:

1. All levels of decision-making in land use planning and building control systems take into account information on risks to the social, built, economic and natural environments.
2. Information on the likelihood of damage from hazards is actively shared, and tools are available to support understanding of potential consequences and costs.
3. Building standards and their implementation are regularly reviewed to ensure they are appropriate for the risk environment.
4. Development decisions take account of both private and public risks.
5. Natural hazard management principles are included in tertiary and vocational training and education curricula for relevant professional and building industry sectors.
6. Settlements, businesses and infrastructure are, as far as is practicable, not exposed to unreasonable risks from hazards or have implemented suitable arrangements, which may include hardening infrastructure or taking up adequate insurance, to protect life and property from known hazards.
7. Following a disaster, the appropriateness of rebuilding in the same location, or rebuilding to a more resilient standard to reduce future risks, is adequately considered by authorities and individuals.

The NSDR recognises factors that influence disaster resilience, including remoteness, population density and mobility, socioeconomic status, age, and percentage of the population for whom English is a second language. Remarkably however, it does not recognise the need for tailored advice and support for Indigenous communities that are exposed to risks from climate change impacts. This is a significant omission.

For many years there were separate Ministerial Councils for Planning, for Local Government and for Aboriginal and Torres Strait Islander Affairs that provided coordination on urban and regional affairs and land use planning, local government matters, and matters affecting Indigenous people. However, in May 2011 pursuant to a national review of COAG councils and committees, COAG decided to discontinue these Councils.

Nevertheless, in 2009 COAG agreed to a review of capital city planning and adopted a set of nine national criteria for capital city strategic planning systems (COAG, 2009), and in 2012 agreed that COAG's Standing Council on Transport and Infrastructure (SCOTI) would undertake further work on cities (COAG, 2012). SCOTI's primary responsibility is to ensure Australian cities are globally competitive, productive,

sustainable, liveable and socially inclusive and are well placed to meet future challenges and growth (SCOTI, 2009).

The national criteria for capital city strategic planning was reviewed by the COAG Reform Council in 2012 to determine the extent to which they improved integration and consistency in planning and delivery across relevant parts of government, especially transport, economic development and land use (SCOTI, 2012). The review concluded that none of the capital city strategic planning systems were found to be wholly consistent with the national criteria (SCOTI, 2012). Furthermore, there was no consideration of hazard mitigation within the review, nor were there any recommendations to address natural hazards within the land use planning systems.

In May 2011, the federal Minister for Infrastructure and Transport released the Government's National Urban Policy (Australian Government, 2011b), setting in place the Australian Government's objectives and directions for our major cities.

What is noteworthy about these developments in relation to land use planning, is that there are no linkages or references to the seven priority suggestions in the NSDR mentioned above, and none of these initiatives extend to improving the land use planning systems to consider disaster resilience in towns and settlements across remote and very remote Australia, let alone across tropical Australia, where the impacts of cyclones, sea level rise and storm surges are likely to be greater.

What this analysis demonstrates is that the land use planning systems are not evolving in response to improvements in knowledge and information about the likely impacts arising from natural hazards and climate changes. There has been some shift in emphasis from merely facilitating development to considering the impacts of land use and development on ecological processes since the United Nations Conference on Environment and Development (UNCED) took place in Rio de Janeiro, Brazil, in 1992. However, land use planning systems are yet to fully embrace their role in mitigating the risks to loss of life, property damage and destruction of vital infrastructure assets arising from natural hazards and climate change impacts in particular.

The NSDR makes some important suggestions with respect to reducing risks in the built environment, but there is still room for improvement in integrating these considerations into land use planning processes. The lack of integration between the set tasks of the SCPEM and SCOTI, discussed above, shows the lack of integration at the national level. The case studies documented below highlight the importance of integrating data sets that emergency management agencies collect and apply in their hazard management activities into land use planning systems to improve the level of disaster resilience in new and established communities.

The current Commonwealth and State/Territory policy framework for dealing with Indigenous matters is documented in more detail in Appendix 1. The following observations are pertinent to the discussion with respect to land use planning and disaster resilience in remote Indigenous communities.

Issues affecting Indigenous people and communities are considered directly by COAG and are presently being dealt with through the National Indigenous Reform Agreement (NIRA) that was initially endorsed by COAG in 2008 (COAG, 2008b) and updated in 2011 (COAG, 2011d). The NIRA is a partnership between all levels of government to work with Indigenous communities in order to 'close the gap' in Indigenous disadvantage in target areas, including health, education, housing, economic development, personal safety, and governance and leadership. The States and Territories are tied into this agenda through a series of National Partnership

Agreements and Bilateral Implementation Plans, which include several objectives relating to Indigenous land tenure reform to facilitate home ownership and economic development on Aboriginal held land. The federal government initiated these reforms because it regards existing group or communal land tenure arrangements as failing to provide secure tenure over public investments in housing and infrastructure and as an obstacle to the expansion of government-backed home ownership programs and economic development (Wensing, 2013). While personal safety is included in COAG's list of target areas, disaster resilience in remote Indigenous communities is neither mentioned nor considered. Likewise, the likely impact on land tenure and/or Native Title rights and interests is also neither mentioned nor considered.

Understanding these complex intergovernmental arrangements for emergency management, risk reduction, land use planning, Indigenous policy and local government responsibilities is crucial to responding to the impacts of climate change and building community resilience. These complexities indicate that securing comprehensive and consistent national level policy and legislative responses to disaster resilience, emergency management and land use planning relies upon a high level of sustained cooperation between the various jurisdictions. These arrangements can sometimes be fraught with tension, inter-governmental rivalry and disagreement. Other times, they are simply overlooked, as discussed above.

9.1.2 Disaster risk analysis

Effective land use planning is critical to reducing a community's vulnerability to natural hazards and assists in the creation of resilient communities. The risks and consequences from natural hazards vary depending on the location of the community, the physical characteristics of the terrain, and the type and scale of development. Land use planning combined with development controls and strong building codes can mitigate against the likelihood of loss of life, as well as damage to and/or destruction of property and infrastructure assets (COAG, 2011c).

The location of existing settlements or their planned expansion to accommodate population growth through new development (including the provision of essential infrastructure and services) can create or exacerbate exposure to natural hazards. Land use planning systems with in-built climate change adaptation measures are therefore vital to the creation of safe, resilient and sustainable communities, as they can reduce the level of risk even where risk profiles have increased over time or where risks are not fully understood. The predicted impacts of climate change through increased frequency and/or intensity of extreme weather events must be considered in land use planning and development assessment processes. It is essential that the relevant authorities are able to enforce compliance with planning and development requirements so as to minimise the level of community risk and exposure, which in turn increases community resilience.

The case studies examine the extent to which land use planning contributes to hazard or disaster resilience by reviewing and comparing the various elements of state/territory planning systems, including planning legislation, state planning policies, regional strategy plans, local planning schemes, the requirements for property disclosures associated with natural hazards, and data used by emergency management services. The case studies also examine whether land use planning adequately identifies locations that are considered vulnerable to the effects of natural hazards and therefore should not be zoned for development.

To ascertain how well land use planning takes account of natural hazards and produces disaster-resilient communities, we applied a comparative method of study in public policy and administration. The comparative methods (after Geva-May, 2002)

examine the relationship between the problem (hazard vulnerability and disaster resilience) and the solutions (hazard mitigation) through land use planning. To validate the comparative analysis, the circumstances in each case and how they deal with hazard reduction and disaster resilience are discussed.

9.1.3 *Climate responsive design*

The challenges discussed above provide the opportunity for innovation, especially in land use planning. For example, there is a strong case for incorporating the principles of Climate Responsive Design (CRD) to successfully reduce energy consumption within the built environment in order to enhance resilience to climate change.

There have been significant global efforts to evaluate the way settlements and the urban form are designed to reduce greenhouse gas (GHG) emissions to become more resilient (see for instance Davoudi et al., 2009). The concept of resilience can be defined as the ability to accommodate and adjust to the unwanted impacts of increased climate change and has been identified as an ideal policy goal by the Intergovernmental Panel on Climate Change (IPCC) (IPCC, 2007). The IPCC defines resilience as the ability to absorb the impacts of climate change, while maintaining the same structure and functions of the environment and includes the ability to learn from the disturbance. A resilient system is forgiving of external shocks. As resilience increases, the magnitude of a shock from which it cannot recover becomes smaller and smaller. "Resilience shifts attention from purely growth and efficiency to needed recovery and flexibility (IPCC, 2007; p. 65)."

The IPCC's Fourth Assessment Report (2007) suggests a mix of adaptation and mitigation measures in responding to the challenges of climate change. Adaptation is needed for the unavoidable impacts that will arise due to the emissions that have already occurred, and mitigation measures must be put in place to actively reduce the amount and severity of impacts in the future.

Furthermore, if climate change impacts are not successfully mitigated to reduce the long-term effects, "the ability for the built and natural environments to adapt would be significantly compromised and adaptation is not possible, or will only be available at very high social, environmental and economic costs (Hamin and Gurran, 2008; p. 1)." Mitigation in planning and development works to reduce current and future GHG emissions, including those that are generated through the built environment and the transport sectors. Adaptation, however seeks to change the built and social environment so as to minimise the negative outcomes that are now unavoidable.

The implementation of CRD has been identified as an effective approach to reducing energy consumption within the tropical urban environment through a mix of adaptation and mitigation policy responses (Davoudi et al., 2009). Figure 9.2 considers the incorporation of CRD as a local government response to State and Federal Government adaptation strategies (i.e. action). The extent to which local statutory planning schemes incorporate the key elements of CRD is examined and discussed later in this chapter.

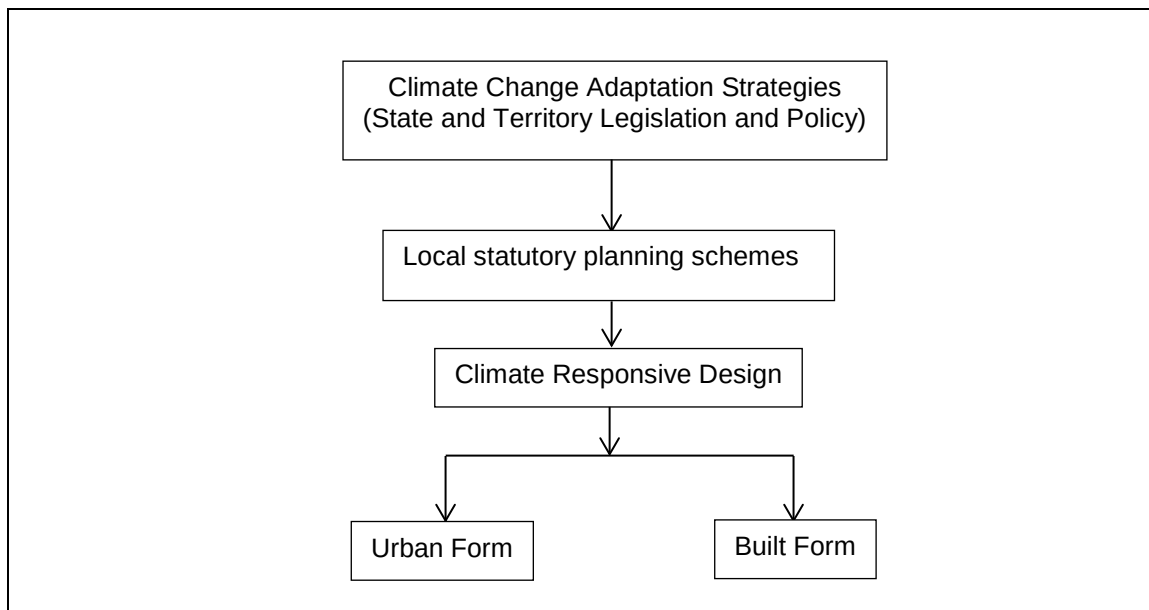


Figure 9.2: Climate responsive design as an adaptation action.

9.2 Land use planning and disaster risk management

For this study, we undertook a comparative analysis (after Geva-May, 2002) of the land use planning and disaster risk management systems in the three jurisdictions covering the tropical north of Australia, where our case study communities are located (WA, NT and Qld). While each jurisdiction has the power to create its own separate systems specific to their history and circumstances, we assessed five common elements within each of these systems for measures that require or encourage natural hazard resilience. These were:

1. **Planning legislation** – Do the objects or purposes of the legislation require the planning process to create natural hazard-resilient communities? Does strategic planning for the expansion of current communities or the location of future communities consider the vulnerability of communities to natural hazards and require the inclusion of abatement or mitigation measures in subordinate instruments?
2. **State planning policies** (instruments that protect matters of importance or significance to the state or territory) – Are there state planning policies specific to hazard mitigation in place within the jurisdiction and, if so, are they reflected in other state or territory planning instruments and are local government planning schemes required to take them into consideration?
3. **Planning schemes and development assessment** – To what extent are statutory planning schemes and development application assessments required to consider natural hazard risks and either prohibit or limit development in identified hazard locations? Do development assessment processes assess the natural hazard risks at the individual site or project level?
4. **Property disclosure** – Does the property register system (land title) include a requirement to disclose information about the location of the land in relation to hazards (including flood maps and storm surge maps)?
5. **Emergency management systems** – What data does the emergency management system collect and collate to identify and mitigate the risk of natural disasters (in this case cyclones, floods, and storm surges), and to what extent is this data accessible and applied by relevant state/territory and local

government agencies responsible for land use planning and development assessment?

The first four components comprise the planning frameworks, which are broadly similar in each jurisdiction. The fifth element was particularly important because we wanted to ascertain the extent to which data collected by emergency management agencies was being used in land use planning processes to develop disaster-resilient communities, especially in the context of remote Indigenous communities in northern Australia.

Planning legislation is an Act of Parliament that regulates planning and development and enacts State Planning Policies (SPP) as statutory instruments to protect matters of state interest (Williams, 2007).

The following discussion documents our examination of the land use planning and disaster risk management systems in each of the three jurisdictions.

9.2.1 Maningrida and Ngukurr, Northern Territory

Land use planning and development in the NT is controlled through the *Planning Act 2009* (NT) – the NT Act. The objects of the NT Act do not specifically mention hazard mitigation. The focus is on the creation of a system to control use and development. The objects of the act are to plan and provide a framework of controls for the orderly use and development of land through:

- sustainable use of resources;
- strategic planning of infrastructure;
- appropriate use of land;
- control of development (natural environment, sustainable use of land and water resources);
- minimising impacts of development upon amenity;
- public consultation; and
- fair and open decision-making and appeals processes.

The NT Planning Scheme (2007) is subordinate to the NT Act, is the only statutory planning scheme in the NT planning system, and applies to the whole of the Territory. It includes planning principles, area plans and land use zones, and subdivision and development control conditions.

The NT Planning Scheme (2007) specifically protects existing lawful uses (and associated rights) of the land, prior and subsequent to a planning scheme coming into effect. It does, however, mention risk mitigation specifically as this relates to meteorological hazards and requires the consideration of “flood and storm surge levels associated with floods and cyclones to minimise risk to life and property (Northern Territory Government, 2007; p. 2-1).”

The NT Planning Scheme (2007) applies storm surge maps to delineate primary and secondary storm surge zones that may be affected. To mitigate risk to person and property, the planning scheme requires all development within the primary storm surge zone to gain the approval of the Development Consent Authority (DCA), which is able to grant certain concessions to development within the secondary zones. Where development does not trigger the provisions within the NT Planning Scheme, the building codes and regulations include provisions to ensure structural resilience. However, there are no statutory plans or storm surge maps applicable to either Ngukurr or Maningrida. The NT Government, as the owner and developer of the houses, determines their design and siting in these communities.

There are no state planning policies contained within the Northern Territory planning framework, nor are there any specific policies regarding the location of development within identified hazard locations. All development, including its location, is controlled via the NT Planning Scheme, and there are no higher order statutory mechanisms that can override the Scheme that may require the consideration of measures that would improve the level of hazard resilience in a particular local community. In the absence of local control, members of both communities are dependent upon the NT Government to decide what will be built, where and to what design specifications. Moreover, there are no statutory provisions in the NT that require natural hazard information to be noted on the relevant land titles.

The Northern Territory *All Hazards Emergency Management Arrangements* (2011) specifically identifies the role that land use planning plays in creating prepared and resilient communities. The NT Counter Disaster Council has audited the hazards and risks that might affect the Territory and has allocated responsibilities for responding based on the extent of the disaster experienced. While land use planning is identified within the Emergency Management Arrangements in the Prevention part of the model (Figure 9.3) as playing a role in creating prepared communities, these arrangements focus solely upon the organisation of government agencies in the event of a disaster.



Figure 9.3: Approaches to emergency management in the Northern Territory (adapted from NT All Hazards Emergency Management Arrangements, Northern Territory Government, 2011).

Data published by the NT Emergency Services to identify the relevant storm surge zones is available and is used within the NT Planning Scheme. Yet, despite the availability of this data and associated mapping, development continues to intensify in storm surge zones. The NT Planning Scheme does not prohibit development within storm surge areas for two reasons: firstly, there is no higher order policy or legislation that enables this prohibition; and secondly, the planning system is based on risk mitigation and contains provisions to reduce risk through measures such as declaring a minimum floor-level of habitable rooms in primary and secondary storm surge zones (typically 300mm above the identified site flood-level).

There are no such maps to identify these areas within Maningrida, but current mapping highlights the high watermark. Moreover, Maningrida and Ngukurr do not have statutory land use plans and therefore the Territory government, as the owner and

developer of social housing in these communities, may determine the location and design of structures independent of risk assessments.

In addition, there are a series of Local Counter Disaster Management Plans that each local area has prepared and is required to follow in the event of a disaster. These plans are created to prevent disasters and assess threats most likely to affect the community. They include a general description of the community, including its population, major infrastructure and topography. These plans, including the assessment process and the outcomes of the risk assessment, are not considered in the preparation of the NT Planning Scheme pursuant to the *Planning Act 2009* (NT), nor are they referred to by the Development Consent Authority when undertaking development assessments to ensure that planning contributes to creating hazard-resilient communities. In sum, the land use planning system functions without using the data created and used by the Emergency Services in the Northern Territory.

Based on information garnered from interviews (see section 10.2.8.2), it is evident that the views of local communities are frequently not taken into consideration in planning and development assessment decision-making processes affecting the case study communities in the NT.

9.2.2 Wujal Wujal, Queensland

All development in Queensland is controlled through the *Sustainable Planning Act 2009* (Qld) (hereafter referred to as the SPA). The purpose of the SPA is to achieve ecological sustainability by:

- (a) managing the process by which development takes place, including ensuring the process is accountable, effective and efficient and delivers sustainable outcomes;
- (b) managing the effects of development on the environment, including managing the use of premises; and
- (c) continuing the coordination and integration of planning at the local, regional and State levels (S.3).

The purposes of the SPA are advanced through:

- (a) ensuring decision-making processes are accountable, take account of short and long-term environmental effects of development at various scales (including the effects of development on climate change), apply the precautionary principle, and provide equity between present and future generations;
- (b) sustainable use of natural resources;
- (c) reduction of environmental effects of development (climate change, urban congestion and human health);
- (d) diversification of housing and the economy;
- (e) infrastructural efficiency;
- (f) enhancement of the amenities of the built environment; and
- (g) opportunities for community involvement (S.5).

SPA requires planning schemes to address the impacts of climate change, but not natural hazards (unless these hazards can be proven to be the result of climate change). There is no requirement in the SPA to create hazard-resilient communities. Rather, the focus is on procedural and environmental sustainability matters.

The SPA requires all planning schemes within the state to comply with 'State Planning Policies' (SPPs). The SPP most directly related to natural hazards is SPP1/03: 'Mitigating the Adverse Impacts of Flood, Bushfire and Landslide' (Queensland Government, 2003). However, this policy only requires the cumulative flood impacts of storm-tide inundation to be considered when determining the extent and severity of

flood hazard. Storm surge is specifically triggered through an assessment process that incorporates the consideration of coastal hazards. The Queensland government is currently reviewing the coastal hazard policy and associated maps for the area north of Lucinda. This process has been underway for some time. At the time of writing this report therefore, the impact of these maps on future development assessment processes is unclear.

The only hazard maps contained within the (draft) Wujal Wujal planning scheme relate to landslide risk, bushfire hazard and flood risk (from the Bloomfield River). There are no hazard maps identifying the extent of the risk from storm surge tides as the Queensland Government is still producing these. There are overlay maps that identify natural hazard overlays, and where development occurs within identified hazard areas the associated codes are, in turn, triggered through the planning scheme provisions. The relevant Performance Outcome (PO3) in the draft scheme relating to natural hazards in the Township Zone of the Scheme states:

“Development is located and designed to firstly avoid and, if avoidance is not possible, mitigate risk within areas subject to flood, storm tide inundation, bushfire and landslide (Wujal Wujal Aboriginal Shire Council, 2012b; p. 58).”

In relation to flooding, the Acceptable Outcome (AO3.1) for this Performance Outcome states:

“Adequate area is provided so that buildings are not constructed below the identified flood line shown in Natural Hazard (Flood) Overlay Map or coastal management area shown in Natural Hazard (Coastal) Overlay Map; (Wujal Wujal Aboriginal Shire Council, 2012b; p. 58).”

These provisions cannot be read in isolation of the land tenure conditions in this community. All land within the township of Wujal Wujal is owned and controlled by either the Aboriginal Shire Council or the state government. Due to the nature of the natural hazard risks, there are less than eight lots remaining to be developed within the existing township area. Therefore, all future growth in housing will have to be located elsewhere:

“Due to a lack of suitable land for residential purposes in the future, the local people will be required to reside outside of the centralised township and into their homelands, which include middle camp, Ayton, Degarra and the ‘southern lots’. Most of these areas are located outside the Wujal Wujal local government area (Wujal Wujal Aboriginal Shire Council, 2012b; p. 4).”

The lack of suitable and available land for development is limited due to a number of factors, including terrain and only a restricted area being considered for development (i.e. for housing). There is more suitable land within the boundaries of the Wujal Wujal Aboriginal Shire Council but this has not been identified for development. This, in turn, means that the families of Traditional Owners who wish to live in the area will need to reside outside of Wujal Wujal because the current planning scheme does not permit further development within the ‘serviced area’ (infrastructure provision).

In Queensland, there are also no legislative provisions that require hazards to be noted on land titles and, therefore, no property disclosures about risks arising from hazards apply.

The Wujal Wujal Aboriginal Shire facilitates a Local Disaster Management Group (LDMG) that is chaired by its Mayor. The LDMG follows a Local Disaster Management

Plan that, like its NT counterpart, has undertaken extensive risk assessments of its jurisdiction in accordance with the requirements of the National Emergency Risk Assessment Guidelines (Australian Emergency Management Institute (AEMI), 2010). These national guidelines require LDMGs to identify the risk of all natural hazards in addition to developing a comprehensive strategy regarding the population characteristics, which must include a vulnerable person's register to support emergency management procedures. In this particular instance, the local government is responsible for both land use planning and supporting the LDMG and its initiatives. However, the data created and applied by the LDMG are not used in the development of the local planning scheme. The risk analysis (pursuant to the National Emergency Risk Assessment Guidelines) is currently being undertaken but, as previously noted, will not be incorporated within the planning scheme provisions.

9.2.3 Broome, Western Australia

Development in Western Australia is controlled via the *Planning and Development Act 2005* (WA) (hereafter referred to as the PDA). The PDA establishes the Western Australian Planning Commission as an independent statutory authority to oversee planning and development in WA. While the SPA in Queensland quite specifically sets out how the purposes of the Act are to be achieved, the PDA in WA is silent on these matters. However, the PDA does contain provisions for the creation of Development Assessment Panels to control development within regions. While local governments are responsible for the preparation of local planning schemes, decisions regarding subdivisions and other higher order matters are not made locally.

All planning schemes must have due regard to the range of state planning policies produced by the Western Australia Planning Commission (WAPC). The State Planning Policies (SPPs) specifically relevant to climate change are SPP 2.6 *State Coastal Planning Policy* (WA Government, 2012) and SPP 3.4 *Natural Hazards and Disaster* (WA Government, 2006). There is also a State Planning Policy on *Aboriginal Settlements* (SPP 3.2) (WA Government, 2011) that provides a framework for planning large permanent Aboriginal communities and other discrete Aboriginal communities with the objective of improving the standard of living and quality of life for community members. This SPP and its supporting guidelines are silent on measures for improving disaster resilience in settlements subject to this SPP.

SPP 2.6 *State Coastal Planning Policy* provides guidance for decision-making within the coastal zone, including for the establishment of foreshore reserves, managing development and land use change, and to protect, conserve and enhance coastal values (WA Government, 2012). Of all three jurisdictions, this SPP is the only one that includes explicit provisions for the consideration of the effects of climate change (amongst other matters) when making decisions about development. The policy specifically requires a process that establishes the context, vulnerability assessment, risk identification, analysis, evaluation, adaptation, funding arrangements, maintenance, and for the monitoring and review of development along the coastal foreshore for Western Australia. More specifically, where the analysis identifies a lot that is likely to be affected, then the following annotation must be noted on the Certificate of Title for the land: 'VULNERABLE COASTAL AREA – This lot is located in an area likely to be subject to coastal erosion and/or inundation over the next 100 years' (WA Government, 2012).

SPP 2.6 is not currently being applied in Aboriginal communities in Western Australia because many of them are located on land held by the Aboriginal Lands Trust (ALT). The ALT holds land in trust for the use and benefit of Aboriginal people and most of these land holdings are not subject to individual titles. The land tenure issues in Aboriginal communities in Western Australia are currently under review as part of the

WA Government's commitments under the National Partnership Agreements on Indigenous Housing and Remote Service Delivery (see discussion in Appendix A).

As a consequence of past policies, very few remote Aboriginal communities in WA are within the purview of local statutory planning schemes, although under SPP 3.2, new Aboriginal Settlement Plans are progressively being prepared for discrete Aboriginal Settlements and the relevant local planning scheme can incorporate the Settlement Plan as part of the Scheme.

A new local planning scheme for the Shire of Broome is currently being prepared and, when finalised, this will be the first local planning scheme that will apply to the whole of Broome Shire and all of the Aboriginal Settlements within the Shire. The finalisation of this planning scheme is imminent as this report is being prepared.

SPP 3.4 *Natural Hazards and Disasters* requires local governments to plan for disasters as a fundamental element of all statutory and non-statutory documents (including town planning schemes). The current Shire of Broome town planning scheme does not consider this planning policy. However, it is expected that the reviewed policy will consider this policy. It should also be noted that the specific terms that are applied within this policy are very loose, i.e. the local government is required to make due regard to this state planning policy and that it is expected (not mandated) that mitigation is considered. For instance, with respect to flooding, SPP 3.4 states (WA Government, 2006:1534):

“Proposed development on a floodplain is considered acceptable with regard to major flooding as long as it does not produce an adverse impact on surrounding development and it has an adequate level of flood protection. Land uses in flood prone areas should not allow development that will obstruct floodways (WA Government, 2006).”

The emphasis in the policy is on ‘not obstructing the floodway’, rather than ensuring any development is not at risk of being inundated should the flood be worse than previously experienced or expected.

The West Australian government is currently in the process of creating culturally appropriate disaster management plans for Aboriginal communities, however these are still in the pilot project evaluation stage, and to date there is little data on what these will do and how they will be created and implemented.

9.2.4 Discussion

The results show that none of the land use planning systems in the three case study jurisdictions uses their planning legislation effectively to create disaster-resilient communities. For example, the objects and purposes of the planning Acts do not include a specific requirement to take the effects of climate change into account (Table 9.1). However, in the provisions explaining what advancing the purpose of the SPA in Queensland means, it is stated that “avoiding, if practicable, or otherwise lessening, adverse environmental effects of development, including, for example—climate change (s.5 *Sustainable Planning Act 2009* (Qld)).”

Table 9.1: Summary of comparative analysis.

Criteria	Northern Territory	Queensland	Western Australia
Planning Legislation	<i>Planning Act 2009</i> (NT)	<i>Sustainable Planning Act 2009</i> (Qld)	<i>Planning and Development Act 2005</i> (WA)
Purpose:	To provide for appropriate and orderly planning and control of the use and development of land, and for related purposes.	Achieve ecological sustainability through managing the planning process, managing the effects of development and through government coordination.	Provide for efficient and effective land use planning system in the state and to promote the sustainable use and development of land in the state.
Objectives:	Objects of this Act are to plan for, and provide a framework of controls for, the orderly use and development of land. The objects are to be achieved through sustainable use of resources; strategic planning of infrastructure; appropriate use of land; control of development to protect the natural environment by sustainable use of land and water resources; minimising adverse impacts of development on existing amenity; appropriate public consultation; and fair and open decision-making and appeals processes.	Advancing the purpose of the Act includes ensuring decision-making processes are transparent and accountable; the sustainable use of renewable natural resources and prudent use of non-renewable natural resources; lessening adverse environmental effects of development including climate change and urban congestion and adverse effects on human health; considering housing choice and economic diversity; supplying infrastructure in a coordinated, efficient and orderly way; applying standards of amenity in the built environment; and opportunities for community involvement.	No objectives stated in the Act. The purposes of the Act are to consolidate the provisions of several previous pieces of planning legislation and repealed by this Act; provide for an efficient and effective land use planning system in WA; and promote the sustainable use and development of land in WA through the preparation of state planning policies, regional plans and local planning schemes. There is no definition of the meaning of 'sustainable use and development' or how this is achieved through the Act.
State Planning Policy	No provisions within the <i>Planning Act 2009</i> (NT) for territory level planning policies.	Flood mapping was included in the planning scheme pursuant to State Planning Policy 1/03. This policy is triggered through the <i>Sustainable Planning Act 2009</i> (Qld).	2.6 – State Coastal Planning Policy. 3.4 – Hazards and Disasters.
Planning Scheme	Considers storm surge. However, despite this requirement, intensification continues in declared primary and secondary storm surge zones – none of which apply to Maningrida or Ngukurr, as there are no local statutory planning schemes in place for these communities.	No storm surge maps, but development is required to consider flooding effects through overlay maps.	Not considered, as the current Broome Planning Scheme was written before State Planning Policies were introduced. A new planning scheme for the whole of Broome Shire was being prepared at the time of preparation of this report.
Property Disclosure	Nil.	Nil.	Mandatory in relation to coastal hazard risks.
Emergency Management Systems	Systems in place to identify locations and respond to disasters. No linkage between the data created by Emergency Management is used in land use planning.	Systems in place to identify locations and respond to disasters. No linkage between the data created by Emergency Management is used in land use planning.	Systems in place to identify locations and respond to disasters. No linkage between the data created by Emergency Management is used in land use planning.

Queensland and Western Australia have state planning policies dealing with natural hazards and disaster risks (Queensland Government, 2003; WA Government, 2006). In both jurisdictions, the preparation of regional and local planning strategies, structure plans, local planning schemes, and planning decisions to have regard to relevant SPPs. The Queensland Government's SPP1/03: *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*, states that Queensland will be vulnerable to the impacts of climate change and that predicted changes include "sea level and coastal erosion" and "flood risk", but not "sea level rise" (Queensland Government, 2003; p. 5). The

Western Australian state planning policy on natural hazards and disasters makes no mention of the likely impacts of climate change (Western Australian Government, 2006). The NT planning system does not have any state planning policies and, therefore, does not have a state planning policy dealing with natural hazards and disaster risks.

The focus of land use planning legislation and policy in all three jurisdictions is primarily on planning and regulating development and administering development assessment processes efficiently and effectively. With some exceptions for Queensland, land use planning and emergency management processes are not adequately geared toward addressing the priorities identified in the NSDR discussed in Part 9.1.1 above, and especially not in terms of improving the disaster resilience for likely climate change impacts in remote Indigenous communities. This is a serious deficiency in our land use planning systems given what we know about the likely long-term effects of climate change impacts.

There is a serious disconnect between emergency management, hazard knowledge, land use planning and disaster resilience. This disconnect is present throughout each of the state and territory emergency management and land use planning regimes, with some exceptions for Queensland, where attempts have been made to include the consideration of likely climate change impacts in the SPA.

Emergency management views land use planning as essential to disaster prevention pursuant to the NSDR (COAG, 2011c) and the NT Government's *All Hazards Emergency Management Arrangements* policy (Northern Territory Government, 2011). However, as far as we could ascertain, local land use planning does not view the data produced by emergency managers as relevant to the development of local planning schemes, with the exception of the relatively recent planning scheme for Wujal Wujal in Queensland (Wujal Wujal Aboriginal Shire Council, 2010). It appears that taking account of the "risks to the social, built, economic and natural environments in land use planning and building control systems (COAG, 2011c; p. 11)" and ensuring that "settlements, businesses and infrastructure are, as far as is practicable, not exposed to unreasonable risks from hazards (COAG, 2011c; p. 11)" as per the NSDR, does not necessarily occur in WA and the NT.

We also examined the land title registration and disclosure systems in the three jurisdictions. We found that only WA requires disclosure of hazard data about properties to be mandatory. While this requirement appears to be extremely effective for the major cities and urban settlements in WA, it is not the same for remote Indigenous communities. This is because in almost all cases the underlying land tenure in remote and/or discrete Aboriginal communities in WA is held in trust by the state for the use and benefit of Aboriginal inhabitants and parts of the reserves may be leased to an Aboriginal organisation on limited terms and conditions. This form of tenure is also subject to Native Title rights and interests.

The case studies show that despite their experiences with several cyclones and storm surges of various magnitudes, the communities persevere and grow; yet their planning frameworks pay scant attention to hazards and disregard the advantages of planning for hazard-resilience. For example, there is little focus on landscaping provisions to ensure that vegetation is of a type and form that will be less likely to become missiles in high winds. In turn, this places far greater reliance for response and recovery responsibilities upon the state emergency services and the local community.

The notion that hazard awareness and empirical evidence influence future development is tenuous at best, because the land use planning system can only assist

in reducing hazard risks where the system is designed to achieve such outcomes. In a case heard in the Queensland Planning and Environment Court (*Mackay Conservation Group Inc v Mackay City Council and East Point Mackay Pty Ltd* [2005]), a conservation group appealed a development decision on the basis that the development was within a storm surge zone and was, therefore, inconsistent with contemporary legislative provisions. The court approved the decision to proceed with the development and in its summary maintained that planning is about balancing risk with economic development. Moreover, the local council defended its decision to approve the development because designing the whole site for potential events is impractical. It therefore appears that there is a perception that mitigating hazards in hazard-prone urban environments is counterproductive to achieving economic development.

The case studies clearly indicate that the land use planning systems in tropical northern Australia are not sufficiently geared toward taking climate change risks and impacts into account. This is a serious omission in our land use planning systems given what we now know about the likely long-term effects of continued climate change impacts. Effective forward planning can reduce the physical vulnerability of settlements by identifying suitable low-hazard locations and make valuable contributions to building hazard and disaster resilience in local communities.

Part 9.2 of this report explored the linkages between land use planning and disaster resilience. Current policy settings and administrative arrangements do not adequately consider the relationship between knowledge and action. This is further exacerbated in the planning and development of Indigenous communities, as these communities have not evolved through the typical development trajectories associated with economic growth. Historically, much of the housing and development in these remote communities was often carried out by religious institutions or state and territory governments and without any reference to contemporary planning requirements. As such, very little development has occurred that was cognisant of the linkages between natural hazard risks, land use planning, development controls and disaster resilience at the local scale.

9.3 *Climate responsive design*

The following discussion describes how climate can be considered within the built environment of settlements in remote Australia. Climate Responsive Design (CRD) is achieved when the surrounding environment influences design. Reducing energy consumption, using natural resources, and planning for comfortable, healthier and sustainable living are the main aims of CRD. Hyde (2000; p. 7) states that “[c]limatic responsive design is therefore an integral part of the environmental framework that is being developed to reduce environmental impacts and provide for human wellbeing.” CRD is founded on the principle of allowing the built environment to be designed in a way that manipulates the climate for environmental and human well-being (Hyde, 2000). Thomas (2003; p. 46) advocates that:

“... building design considerations in cities show how closely the buildings are linked to their surroundings. The temperatures, wind speeds, humidity levels, air quality and noise levels are all related to, and will depend on, density of development, energy sources, landscape choice of transport systems and similar factors. Urban design and building design are inextricable.”

The overall principles of CRD in the tropics are to reduce thermal discomfort and limit the amount of energy consumption used for air conditioning and cooling, while maximising the use of renewable energy and passive design in the built environment

(Givoni, 1998; p.383). These principles are consistent with the policy goals for both mitigation and adaptation strategies in the built environment. These principles can be achieved through:

“... choices of colours (surfaces with a high albedo will reflect more solar radiation), building material, glazing distribution and shading, vegetation (using trees and green areas, vines and wall plants), energy use for heating and cooling (including natural ventilation, night cooling and mixed mode) and water features, density of built up area, height of buildings, and orientation of streets with respect to wind directions (Gill et al., 2004; pp. 21-22).”

Therefore, CRD has particular relevance in designing settlements at both urban and built form levels to achieve a mix of mitigation and adaptation outcomes.

9.3.1 Methods

Comparative policy analysis methods were applied to determine the extent to which climate change and CRD are considered essential ingredients in land use planning and development assessment in the same way as the land use planning and disaster resilience systems were compared. The tables below summarise the results of this analysis.

As the science surrounding climate change is widely acknowledged, the effects this can have upon the built environment has triggered a need for:

“... new approaches to settlement design to enable human and non-human species to adapt to these increased risks. A wide variety of policy responses are emerging at local and regional levels – from sustainable urban form, to alternative energy production and new approaches to biodiversity conservation (Hamin and Gurran, 2008, p. 1).”

The planning legislation and relevant state planning policies in each of the three jurisdictions (NT, WA, Qld) was analysed first as this is the higher order variable and is a critical part of the planning system. If climate change and CRD are not addressed through these elements of the land use planning system, then subsequent elements of the system regulating planning and development will not be required to consider them.

In order to identify how successful each state is in addressing the concepts of climate change and CRD, the criteria for evaluating this variable is shown in Table 9.2. The criteria employed a similar approach to the maturity model used by PlanDev Business Solutions, whereby three different maturity levels were established (represented by coloured dots), those being advanced, intermediate and basic (PlanDev Business Solutions, 2012). Definitions for each level are justified and the elements are assessed accordingly.

For example, a basic level resulted in a score of 1 coloured dot and is awarded when the component is addressed but not comprehensively, while an advanced level resulted in a score of 3 coloured dots and is awarded when the component is thoroughly advanced and “goes beyond the minimum standards, and includes successful implementation, continuous improvement and feedback loops – it achieves the built environment vision (PlanDev Business Solutions, 2012; p. 8).” Where the case study site did not address the criteria at all there are three blank dots to represent an absence of attention to substance. This method was chosen as it demonstrates a commitment to implementing climate change adaptation through statutory planning controls. Table 9.2 describes the methods and criteria for analysing the extent to which the jurisdiction included climate change and climate responsive design within the

purpose of the relevant planning legislation and whether or not there were any associated state planning policies (SPP) to guide development.

Table 9.2: Methodology for analysing planning legislation and policy.

PLANNING LEGISLATION AND POLICY			
			
LEGISLATION	Whether the purpose of the act specifically mentions climate change and the need for CRD.	Whether the purpose of the act or any other part of the act mentions climate change and the need for CRD.	Whether the purpose of the act or any other part of the act mentions sustainable development.
STATE PLANNING POLICY	Whether any SPPs specifically mention climate change or the need for CRD.	Whether any SPPs mention climate change and the need for CRD.	Whether any SPPs mention sustainable development.

Table 9.3: Results of Analysis of Planning Legislation and Policy. See Table 9.2 for a description of the analysis criteria and scales used below.

STATE		PLANNING LEGISLATION	STATE PLANNING POLICY	OVERALL
WA	Conclusion	The <i>Planning and Development Act (2005)</i> (WA) mentions promoting the sustainable use and development of land in the state within the purpose of the act. However, there is no specific mention of CRD or climate change.	In Western Australia there are five State Planning Policies (SPPs) regulating climate change, residential development, sustainable development, and CRD. SPP No.1 states that its key principle is to achieve sustainable development. SPP No. 2 also discusses about sustainable development, climate change and design responding to the environment. SPP No. 3, also addresses sustainable development and CRD. SPP No. 3.1 and Liveable Neighbourhoods address environmental sensitivity and CRD. Therefore, CRD and climate change are addressed in WA'S SPPs.	The <i>Planning and Development Act (2005)</i> (WA) does not specifically address CRD or climate change. However, there is mention of the need for sustainable development. The SPPs that Local governments must have 'due regard to' when creating strategic plans, local planning schemes and regional plans address CRD and climate change Climate Change and Climate Responsive Design.
	Results			
QLD	Conclusion	The purpose of the <i>Sustainable Planning Act (2009)</i> (Qld) is to achieve ecological sustainability and sustainable development. Section 5 of the Act requires the consideration of climate change impacts. Furthermore, Section 11 of the Act, titled "Explanation of terms used in ecological sustainability" states that potential adverse impacts on climate change are considered,, including sustainable settlement patterns and sustainable urban design.	In Queensland there are three SPPs that address residential development, climate change and planning in general. The SPP 1/07 makes no mention of climate change or CRD. However, the guideline, which is extrinsic material under the <i>Statutory Instruments Act 1992</i> (Qld), discusses the need to consider good urban design and sustainable design to minimise energy and waste and Appendix 2 has a list of good urban design principles. SPP 2/12 and 1/03 also make no mention of sustainable design or CRD. SPP 1/03 discusses climate change but only regarding natural disasters. Climate change is mentioned in the SPPs and CRD is addressed, but only as a guideline under an SPP.	The <i>Sustainable Planning Act (2009)</i> (Qld) has the ultimate goal of achieving ecological sustainability and in the "Explanation of terms used in ecological sustainability", the Act states that potential adverse impacts on climate change are considered, including sustainable settlement patterns and sustainable urban design. The SPPs also address sustainable development and climate change. There are provisions in the guidelines of the SPP 1/07 to achieve good urban design, however, this is not specifically in the SPP itself. Furthermore, climate change is addressed in the SPPs and in the Legislation, but the need for CRD is not included.
	Results			
NT	Conclusion	The <i>Planning Act (2009)</i> (NT) mentions strategic planning of land use and development and the sustainable use of resources in the objects of the Act. However, there is no specific mention of climate change or the need for CRD.	N/A – Northern Territory has no Territory level Planning Policies.	The <i>Planning Act (2009)</i> (NT) does mention the need for strategic land use planning and sustainable use of resources. However, the legislation does not include requirements to consider the impacts of climate change, nor the need for CRD.
	Results		N/A	

Table 9.4: Summary of the Results for Planning Legislation and Policy. See Table 9.2 for a description of the analysis criteria and scales used below.

STATE		PLANNING LEGISLATION	STATE PLANNING POLICY	OVERALL
WA	Instrument	<i>Planning and Development Act (2005) (WA)</i>	1) State Planning Policy No. 1 – State Planning Framework Policy (Variation No. 2) (2000). 2) State Planning Policy No. 2 – Environment and Natural Resources Policy (2003). 3) State Planning Policy No.3 – Urban Growth and Settlement (2006). 4) State Planning Policy 3.1 – Residential Design Codes (2010). 5) Liveable neighbourhoods (2009).	Overall, in Western Australia the planning legislation only mentions sustainable development but some SPPs consider climate change and the need for CRD.
	Results			
QLD	Instrument	<i>Sustainable Planning Act (2009) (Qld)</i>	1) State Planning Policy 1/07: Housing and Residential Development (2007). 2) Temporary State Planning Policy 2/12: Planning for Prosperity (2012). 3) State Planning Policy 1/03: Mitigating the Adverse Impacts of Floods, Bushfire and Landslide (2003).	Overall, in Queensland the planning legislation and SPPs mention climate change and sustainable development but do not mention the need for CRD.
	Results			
NT	Instrument	<i>Planning Act (2009) (NT)</i>	N/A – Northern Territory has no Territory level Planning Policies.	Overall, in the Northern Territory the planning legislation and Territory planning policies fail to mention climate change or the need for CRD.
	Results			

9.3.2 Elements of Climate Responsive Design in the Urban Form

In reviewing the literature, it becomes apparent that there are four main elements to implementing CRD in the built environment. These include: density, public open space/green space, shading, and overall lot layout.

Density requirements should increase closer to the city and decrease in rural and residential areas. If density is too high in residential areas this will limit the amount of airflow and natural ventilation within the urban form. Givoni (1992; p. 400) supports this, stating that in hot-humid climates “[u]rban density is among the major factors which determine urban ventilation conditions”, as well as the urban temperature. With some urban configurations and urban areas with a high density of buildings can experience poor ventilation and a strong “heat island” effect (Givoni, 1992; p. 399). The element of density is also addressed by Emmanuel (2005; p. 118), who suggested that density of the urban form is a key consideration in designing for urban wind movement in the tropics and that higher densities in the urban form often result in poor natural ventilation. Public open/green space within urban areas is also essential in cooling the urban form. These areas enhance ventilation as they open up the urban form, provide shade, prevent wind blockages in built up areas and reduce the impacts of excessive rain and flooding in vulnerable urban areas (Givoni, 1992; p. 399).

The Australian Model Code for Residential Development (AMCORD)⁸ has a specific section on public open space for recreation, conservation, amenity and utility (Commonwealth Department of Housing and Regional Development, 1995). This document discusses the need for open areas to help green the urban environment and provide a spatial setting for houses.

Shading is also a critical element in tropical climates, as protection from the sun is a necessity. This can be implemented through the use of trees along streetscapes and providing a strong presence of vegetation throughout the urban areas. Friedman (2007) implies that trees and other vegetation in urban areas play an important part in cooling the urban form and reducing the impacts of the ‘urban heat island’ (UHI) effect. AMCORD outlines in the ‘streetscape and landscape’ section that “assisting energy conservation in buildings through the attention to micro-climate and shading control (e.g. street tree species selection influenced by suitability for creating year-round shading in hot-humid and hot-arid climates, or summer shading and winter sun penetration in temperate and cooler climates)” and “promoting air quality improvement through tree planting and retention” are key aspects that should be implemented in the neighbourhood design level (Commonwealth Department of Housing and Regional Development, 1995, p. 138).

Lastly, the overall lot layout and design of subdivisions must be developed strategically to maximise the advantages of CRD. Givoni (1992; p. 398) states that “the orientation of the streets in a town affects both the urban ventilation and the solar exposure of the buildings.” Although CRD can be achieved in many ways, the most crucial stage is at the beginning, starting with the overall layout of the urban form. With regard to tropical climates and reducing energy consumption, site orientation for avoidance of the sun and to consider air movement must be strategically addressed (Emmanuel, 2005). The layout of streets and lots should consider wind direction to maximise natural ventilation. Not all areas need to be planned the same way due to factors that alter wind direction. For example, areas that are close to water bodies are different to other development sites as the “differences in the thermal properties of land and water generate sea/land

⁸ Residential neighbourhood and subdivision design controls vary enormously within and between jurisdictions and are generally determined by local government and subject to State planning controls. AMCORD has been used here because it is the only ‘national’ standard developed by the Commonwealth in 1995 as a guide only.

breezes at day/night respectively. These wind flow patterns could be effectively used by sensitive urban planning measures that promote deep wind penetration into cities (Emmanuel, 2005; p. 118).” Givoni (1992) proposes that houses being the same height and width all located perpendicular to the prevailing wind will block wind flow and provide bad ventilation. Furthermore, although a city street layout parallel to the major wind directions will be beneficial at the urban scale, it might cause wind flow problems at the building scale. Givoni (cited in, Emmanuel, 2005; p. 118) recommends that the “tropical street layout be at an oblique angle (between 30 and 60 degrees) to the prevailing winds.” AMCORD also suggest that a performance criteria for the design of neighbourhoods is that “the street and lot orientation and lot dimensions facilitate the siting and design of dwellings which conserves non-renewable energy sources and assists in design appropriate for the climatic conditions (Commonwealth Department of Housing and Regional Development, 1995; p. 67).”

Table 9.5 describes the methods and criteria for analysing the extent to which jurisdictions include consideration of density, open space, provision for shading and lot layout to address climate change or climate responsive design principles.

Table 9.5: Methodology for analysing the urban form.

URBAN FORM			
			
DENSITY	Whether density of development is mentioned to specifically address climate change and the need for CRD.	Whether density of development is mentioned to specifically address climate change or the need for CRD.	Whether density of development is mentioned but not for the purpose of climate change or the need for CRD.
PUBLIC OPEN SPACE/GREEN SPACE	Whether the designation of public open spaces and green spaces in the urban form specifically addresses climate change and the need for CRD.	Whether the designation of public open spaces and green spaces in the urban form specifically addresses climate change and the need for CRD.	Whether the designation of public open spaces and green spaces in the urban form mention climate change or the need for CRD.
SHADING POLICY	Whether the development of a shading policy or framework specifically addresses climate change and is considered to be consistent with CRD.	Whether the development of a shading policy or framework specifically addresses climate change or is considered to be part of a CRD response.	Whether the development of a shading policy or framework is mentioned but not to specifically address climate change and not regarded as part of a CRD response.
OVERALL LOT LAYOUT	Whether the design of the overall lot layout of neighbourhoods and subdivisions is seen as specifically addressing climate change and regarded as part of a CRD approach to planning neighbourhoods and subdivisions.	Whether the design of the overall lot layout of neighbourhoods and subdivisions is seen as specifically addressing climate change or as part of a CRD approach to planning neighbourhoods and subdivisions.	Whether the design of the overall lot layout of neighbourhoods and subdivisions is not regarded as addressing climate change impacts and not seen as part of a CRD approach to planning neighbourhoods and subdivisions..

Table 9.6: Results of the Analysis of Climate Responsive Design in the Urban Form (See Table 9.5 for a description of the analysis criteria and scales used below)

		DENSITY	PUBLIC OPEN SPACE/GREEN SPACE	SHADING POLICY	OVERALL LOT LAYOUT	OVERALL
WA	Conclusion	The density of development is discussed in SPP 3.1, SPP 3 and Liveable Neighbourhoods. Density is encouraged to be higher in general to provide sustainable development and reduce urban sprawl. However, the implications of this with respect to climate change and CRD are not considered.	SPP 3, SPP 3.1 and the State Planning Strategy all mention the need for open space but not with respect to climate change or CRD. However, Liveable Neighbourhood sets a limit that subdivisions must dedicate at least 10% of the area to open space and discusses the importance of open space with respect to reducing heat loads. Therefore, open space is addressed with respect to CRD but not climate change.	Liveable Neighbourhoods states that street trees providing a canopy when fully grown should be planted in most streets for pedestrian shade and shelter. This acknowledges the need to respond to the environment and protect the urban form from the sun. However, climate change is not addressed.	SPP 3, SPP 2 and Liveable Neighbourhoods all address the need for appropriate location of lot layout with respect to Climate Responsive Design through the consideration of climatic conditions such as prevailing breeze and solar orientation. SPP 2 also addresses this issue in response to climate change mitigation and design of lot layouts to reduce energy consumption.	On average the State of Western Australia addresses CRD in the urban form through SPPs and the Operational Policy titled 'Liveable Neighbourhoods', However, this is not always in direct association to climate change mitigation or adaptation.
	Results					
Broome	Conclusion	Density is mentioned in the planning scheme, stating that higher densities are encouraged closer to the city. The scheme also mentions that densities must be compliant with SPP 3.1. However, the implications of density in the urban form with respect to climate change and CRD are not considered.	The planning scheme outlines specific provisions for open space in various types of land uses. The Environmental Cultural Corridor and Parks and Recreation reserve land use states the need for open space to provide cooling for the urban form and assist with rain from the wet season. Therefore, the scheme does address open space with regard to CRD but not climate change mitigation.	Shading is not discussed at all in the planning scheme, only with respect to car parking.	The planning scheme only mentions overall lot layout once in the development zone, stating that it must be consistent with residential design guidelines. The Broome Planning Steering Committee and the Local Housing Strategy mention the need for lot layout to respond to the climate, however, these documents are not statutory. Furthermore, there is no mention of climate change or CRD with respect to lot layout and subdivision design.	Broome's Planning Scheme deals with urban form, but does not address issues associated with shading. Broome's Planning Scheme addresses density, overall lot layout and public open space. In relation to CRD, but there is no mention of climate change.
	Results					

		DENSITY	PUBLIC OPEN SPACE/GREEN SPACE	SHADING POLICY	OVERALL LOT LAYOUT	OVERALL
QLD	Conclusion	The SPP 1/07 specifies types of development that are appropriate for different types of densities. For example, the intensity of development should increase close to the city and in areas that are well serviced. However, the policy does not consider density for the purposes of climate change or implementing CRD.	Public open space/green space is not addressed in any statutory document.	There is no State Planning statutory document that addresses shade.	The SPP 1/7 does not elaborate on subdivision or overall lot layout.	Queensland's only instrument that addresses the urban form is the SPP a/07. Density is discussed but not with regard to Climate Change or Climate Responsive Design.
	Results					
Wujal Wujal	Conclusion	The FNQ Regional Plan mentions densities and limits on density in particular areas but not with regard to Climate Change mitigation or Climate Responsive Design. There is no specific mention of density in the draft Wujal Wujal Planning Scheme.	Climate Responsive Design is not addressed with regard to open space or Climate Change within the Wujal Wujal Planning Scheme.	The FNQ Regional plan has design principles to have covered walkways to protect from shade and sun and measures to have trees present in the urban form to provide for shade and cooling. The Wujal Wujal Planning Scheme contains no provisions to address shade in any zone codes.	The FNQ Regional Plan addresses the need for the development and design of lot layouts and subdivisions should address Climate Responsive Design to capture breezes and reduce energy consumption. However with respect to Wujal Wujal, development options are limited within the current footprint of the township zone and no specific provisions have been made for Climate Responsive Design or Climate Change.	The FNQ Regional Plan addresses the concepts of built form quite well but not with respect to Climate Change. The Wujal Wujal Planning Scheme makes no reference to the consideration of the built form for the purposes of climate change adaptation or Climate Responsive Design.
	Results					

		DENSITY	PUBLIC OPEN SPACE/GREEN SPACE	SHADING POLICY	OVERALL LOT LAYOUT	OVERALL
NT	Conclusion	The NT Planning Scheme does have provisions for densities in local area plans. However, the provisions governing density do not consider climate change impacts or the need for CRD. The NT Planning Scheme has very limited application in remote Aboriginal Communities.	The NT Planning Scheme has a zone for public open space and under the section on residential subdivision, it states that there should be a minimum of 10% public open space in residential subdivisions. However, the purpose of the open space is to provide for recreation areas and is not specific to climate change or CRD. There are no similar provisions that apply in remote Aboriginal Communities.	The NT Planning Scheme does not specifically include a requirement for shading in the urban form. However, the scheme does have local areas that mention the need for shading in streetscape and throughout the urban form (NT Government 2010, pp. 5-5 & 4-34) but not with respect to climate change or CRD. There are no similar provisions that apply in remote Aboriginal Communities.	The NT Planning Scheme makes provision for residential subdivision to have lots that are oriented in a way that considers the environment, including breeze and sunlight. The Scheme also has local areas that discuss the need for lot layouts to consider sunlight and airflow. Therefore, CRD is addressed in relation to overall lot layout, but climate change is not. There are no similar provisions that apply in remote Aboriginal Communities.	Northern Territory has a Territory-wide Planning Scheme. Overall, the NT Planning Scheme addresses the issues associated with urban form but not in relation to climate change or CRD. There are no local statutory planning schemes that apply in remote Aboriginal communities.
	Results					
Ngukurr and Maningrida	Conclusion	Nil provision made and no statutory plan in existence.	Nil provision made and no statutory plan in existence.	Nil provision made and no statutory plan in existence.	Nil provision made and no statutory plan in existence.	Nil provision made and no statutory plan in existence.
	Results					

9.3.3 Elements of Climate Responsive Design in the Built Form

The literature also suggests that there are four main elements that must be considered on a built form level to successfully implement Climate Responsive Design principles. These include: building height, orientation of buildings, overall design features and landscaping.

Building height was discussed by Givoni (1992), who stated that high long buildings of the same height are to be avoided in the urban form as they block the wind and provide poor ventilation. AMCORD maintains that building height must be consistent with the overall form and as buildings increase in size, so should the setback distance. This is to allow enough room between buildings for airflow and ventilation (Commonwealth Department of Housing and Regional Development, 1995). Emmanuel also supports this, stating that buildings will prevent wind flow, and Givoni (1994, cited in, Emmanuel, 2005; p. 118) advises that an “urban profile of variable building height, where buildings of different heights are placed next to each other, and when the long facades of the buildings are oblique to the wind enhances urban ventilation.” Therefore, while it is not supported that neighbourhood areas should have high rise developments adjacent to single story dwellings, it can be seen that building heights can vary by a storey or two, in order to encourage wind flow.

The next element is siting and orientation of buildings. While it has been established that overall lot layout is important, it is also essential to consider the building envelopes and the way houses are actually sited. In order to achieve an energy reduction in the built form in a tropical environment, it is critical that buildings are oriented to avoid the sun and encourage air movement (Emmanuel, 2005). Friedman (2007) advocates that buildings should be designed to maximise sunlight in order to reduce the need for artificial lighting. Moreover, “[t]he location and orientation of buildings can maximize and capture solar energy year-round, especially during winter months. The daily and yearly changing positions of the sun should be evaluated in the initial planning stages by using sundials and path diagrams (Friedman, 2007; p. 56).” Therefore, appropriate orientation of houses varies between different climate conditions. In AMCORD, under ‘hot humid climate’, a performance criterion is to ensure that “buildings are sited to maximize the use of cooling breezes and provide natural ventilation (Commonwealth Department of Housing and Regional Development, 1995; p. 193).”

The third element in the built form is the overall design features of buildings. This involves incorporating features into the design of houses that assist in achieving the goals of Climate Responsive Design, specifically related to features that will enable natural cooling and lighting in the built form. This includes insulation in walls and roofs, the use of louvres and overhangs. In AMCORD, under ‘design for climate’, acceptable solutions state that “buildings are designed with openings on opposite or adjacent walls for cross-ventilation AND all habitable rooms are naturally ventilated, with minimum openable areas of 15% of the floor area of that room AND roof spaces are ventilated with louvre opening (e.g. gable end) or by roof-mounted ventilators (subject to Cyclone Code) (Commonwealth Department of Housing and Regional Development, 1995; p. 193).”

Other design features include the use of appropriate building materials including lightweight materials and glazed windows. AMCORD advises that while heavyweight materials such as concrete and stone walls are effective in some climatic zones, the use of them in tropical areas should be avoided (Commonwealth Department of Housing and Regional Development, 1995). This is because they absorb the heat during the day and release it at night, making the house quite hot, with little ability to cool down naturally (Commonwealth Department of Housing and Regional

Development, 1995). This is similar for dark colours and dark roofs, as lightweight and light coloured materials are preferred in the tropics.

Landscaping is the final element that should be incorporated at a built form level. Trees and vegetation are important not only in the urban form but in the built form. AMCORD (Commonwealth Department of Housing and Regional Development, 1995; p. 192) suggests that “[l]andscaping around the house plays an important role in modifying the micro-climate of a site and the energy efficiency of a building ... In all climate zones it is preferable to locate evergreen trees to the west and east of a dwelling. The sun is at a low angle in the morning and afternoons, and shade trees can prevent considerable glare and heat on these sides.” Emmanuel (2005) supports this by stating that in tropical areas, energy efficiency can be achieved by implementing landscaping provisions to reduce heat gain. Therefore, these eight design elements include a mixture of mitigation and adaptation strategies that are appropriate for tropical areas and should be implemented into the tropical Australian urban planning framework.

Table 9.7 describes the methods and criteria for analysing the extent to which the jurisdiction included building height, orientation, overall design features, and landscaping to specifically address climate change and climate responsive design.

Table 9.7: Methodology used for analysing the built form.

BUILT FORM			
			
BUILDING HEIGHT	Whether building height measures are included that specifically address climate change impacts and incorporate elements of CRD.	Whether building height measures address climate change impacts and incorporate elements of CRD.	Whether building height controls are in place but are not there to address climate change impacts or to be part of a CRD response.
BUILDING ORIENTATION	Whether measures governing the orientation of buildings specifically addresses climate change and are included as an element of CRD.	Whether measures governing the orientation of buildings are intended to address climate change and are part of a CRD response.	Whether measures governing the orientation of buildings are in place but are not necessarily intended to address climate change nor be part of a CRD response
OVERALL DESIGN FEATURES	Whether the overall design features of buildings in urban areas are intended to specifically address climate change and are part of an active CRD policy.	Whether the overall design features of buildings in urban areas are intended to address climate change but may not be part of an active CRD policy.	Whether the overall design features of buildings in urban areas are not necessarily intended to neither address climate change nor be part of a CRD policy.
LANDSCAPING	Whether landscaping measures are intended to specifically address climate change and are part of a CRD policy.	Whether landscaping measures are intended to address climate change but are not part of a CRD policy.	Whether landscaping measures are in place but are not intended to address climate change and are not part of a CRD policy.

Table 9.8: Results of Analysis in Climate Responsive Design in the Built Form (See Table 9.7 for a description of the analysis criteria and scales used below)

		BUILDING HEIGHT	BUILDING ORIENTATION	OVERALL DESIGN FEATURES	LANDSCAPING	OVERALL
WA	Conclusion	SPP 3.1 has provisions for building height to consider sunlight and open space. Therefore, CRD is addressed in a roundabout way, but not specifically with respect to climate change.	The Liveable Neighbourhoods policy specifically states that the orientation of lots should be designed to facilitate CRD and energy efficiency. However, the policy does not address climate change. Furthermore, the State Sustainability Strategy also discusses the need for passive solar design when considering building orientation. However, this is not a statutory document.	None of the SPPs address the overall design features of dwellings. However, WA has established a strategy in 2003 titled 'Hope for the future: Western Australia State Sustainability Strategy.' The strategy discusses the need for energy efficiency in the built form to reduce energy consumption. The State Planning Strategy 1997 also discusses the need for energy efficiency in households and the use of appropriate building materials. However, these strategies are not statutory documents.	SPP 2 addresses the importance of considering landscaping design in the built form to ensure that development is consistent with the character and landscape of the area. However, this is not specifically in relation to CRD or climate change.	WA has various SPPs and an operational policy titled 'Liveable Neighbourhoods.' Overall, these policies address most of the criteria except for overall design features but CRD is only specifically considered in relation to building orientation. Climate change is not addressed.
	Results					
Broome		The Local Planning Scheme for Broome has specific measures for building height stating that the wall height of buildings should not exceed 6.5m and a total building height of 10.5m in residential areas. However, this building height restriction is for the character and amenity of the neighbourhood, not for CRD or climate change purposes.	Broome's Local Planning Scheme does not include any provisions relating to building orientation. Therefore, there are no enforceable provisions relating to building orientation. The Broome Local Housing Strategy 2009 and the Broome 2004 Country Land Development Program Report both have provisions relating to built form and orientation to improve air circulation and take advantage of prevailing winds or tropical breezes. However, these are not statutory	Broome's Local Planning Scheme includes provisions to take account of the local tropical climate. But there are no requirements to take account of likely climate change impacts.	Broome's Local Planning Scheme addresses landscaping requirements, however, it does not discuss landscaping for the purposes of climate change or CRD.	Overall, Broome's Local Planning Scheme addresses the concepts associated with CRD for the built form, except for building orientation. However, it does not specifically address climate change impacts or CRD.
						

		BUILDING HEIGHT	BUILDING ORIENTATION	OVERALL DESIGN FEATURES	LANDSCAPING	OVERALL
QLD	Conclusion	N/A. Queensland has no SPP that includes building height controls. These controls are generally left to local Councils to decide.	Queensland has an initiative for Smart Sustainable Home and Design objectives. This is a guideline for homes in Queensland. The document mentions that orientation of building should consider the climatic conditions for passively designed homes. However, this document has no statutory backing and cannot be enforced.	The SPP 1/07 does not address overall design features but the guidelines attached to the policy do. However, this is not a part of the policy itself, and is therefore unenforceable. Queensland's Smart and Sustainable Design Objectives includes provisions for overall design features but this is not a statutory document.	Queensland's Smart and Sustainable Design Objectives includes provisions for landscaping to act as a heat block. However, this is not a statutory document.	In the State of Queensland there are no statutory planning instruments that address requirements for overall design features of a house to respond to climate change impacts or to accommodate elements of CRD.
	Results					
Wujal Wujal	Conclusion	Buildings are not permitted to be higher than 8.5m. However, this is not because the scheme considers CRD, the height limitations are directly related to the amenity of adjoining properties.	The FNQ Regional Plan has specific provisions for CRD in association with building orientation, however the extent to which this can be applied in Wujal Wujal is not clear. . The Wujal Wujal Planning Scheme contains provisions for setbacks from lot boundaries to meet local character and amenity objectives.	The FNQ Regional Plan contains provisions relating to appropriate building design features that respond to the climate. However, these are not addressed in relation to climate change, nor are these embodied within the Wujal Wujal Planning Scheme. The Wujal Wujal Planning Scheme requires lightweight building materials to meet local objectives relating to styles that create interest and reduce the scale and bulk of buildings.	The FNQ Regional Plan mentions landscaping but not with respect to climate change and there are no landscaping provisions in the Wujal Wujal Planning Scheme.	The FNQ Regional Plan addresses the need for overall building design to respond to the climate. However, the criteria are not addressed in relation to climate change and nothing further is embodied within the draft Wujal Wujal Planning Scheme.
	Results					

		BUILDING HEIGHT	BUILDING ORIENTATION	OVERALL DESIGN FEATURES	LANDSCAPING	OVERALL
NT	Conclusion	The NT Planning Scheme has a general height control criteria for buildings that should not exceed 8.5m. However, it is not stated that these provisions for height are for the purpose of climate change or CRD. However, this does not apply to Aboriginal Communities.	The Northern Territory Planning Scheme has specific provisions for CRD in association with building orientation; however, this is not specifically related to climate change. This does not apply to Aboriginal Communities.	The NT Planning Scheme has provisions in local areas plans of certain areas to limit the amount of sunlight into buildings with appropriate screen, awning and eaves (Northern Territory Government 2010; pp. 4-21). However, this is not addressed in relation to climate change and does not apply to Aboriginal Communities	The NT Planning Scheme has a landscaping provision. The purpose is to ensure that landscaping enhances the streetscape, while being water efficient. The Scheme states that landscaping should be appropriate to the local climate and designed to assist in energy conservation of buildings by providing shade and absorbing sunlight. However, this is not addressed in relation to climate change mitigation and does not apply to Aboriginal Communities.	The NT Planning Scheme is quite good in addressing the need for overall building design to respond to the climate. However, the criteria are not addressed in relation to climate change. None of these provisions apply to Aboriginal Communities.
	Results					
Ngukurr and Maningrida	Conclusion	Nil provision made and no statutory plans in existence.	Nil provision made and no statutory plans in existence.	Nil provision made and no statutory plans in existence.	Nil provision made and no statutory plans in existence.	Nil provision made and no statutory plans in existence.
	Results					

9.3.4 Discussion

This chapter applied a comparative policy analysis to examine the extent to which climate change adaptation and CRD are incorporated in land use planning and development assessment decision-making. Our analysis revealed that neither climate change adaptation measures nor CRD strategies are included in key parts of the land use planning and development assessment system.

The discrepancy in the application of these measures between urban centres and remote Aboriginal communities is evident and this, in turn, creates significant disparities in terms of equity and amenity. Aboriginal people articulate their aspirations for housing design to consider climate change, but are denied opportunities for contributing their ideas to the design and construction of housing. In the Ngukurr example, there is an absence of statutory land use planning controls and, as such, no mechanisms can be applied to ensure consideration of climate responsive design principles in either the urban or built forms. Of the case study communities, Wujal Wujal is the only discrete Aboriginal community that is currently undergoing a statutory land use planning process and, as far as we were able to establish, there are no provisions within the planning scheme that require the providers of social housing to apply CRD principles in the design and siting of new social housing. However, risk hazard has been broadly considered in the draft planning scheme for Wujal Wujal. This consideration is largely due to having limited suitable land for development in close proximity to the existing settlement because of the range of natural constraints that affect this community.

There are no statutory planning schemes that apply to remote Aboriginal communities in the Northern Territory. In effect, this means that social housing provided by the NT Government is generally exempt from any planning scheme and, therefore, exempt from being required to take CRD measures into account. In Western Australia, remote Aboriginal communities are only included in local statutory planning schemes to the extent that State Planning Policy 3.2 applies. However, SPP 3.2 is silent on the need to take climate change impacts and CRD measures into account in settlements that are subject to this SPP.

9.4 Conclusion

We agree with the NSDR that land use planning is an important mechanism for improving disaster resilience (COAG, 2011c). We are concerned, however, that remote Indigenous communities that are likely to experience increased frequency and/or intensity of extreme weather events, both slow (sea level rise, drought) and rapid onset (storm surges, cyclones, floods), as a consequence of climate change appear to be ignored. It is apparent that land use planning mechanisms will only work effectively when there is an explicit requirement for them to take these factors into account for a particular area, either when local land use plans are first being prepared or when they are due for periodic review.

It is also evident that there is a clear disjuncture between 1) understanding the likely impacts of climate change arising from sea level rise, storm surges and flooding, and the collection of emergency management data, and 2) the consideration of hazards and risks in land use planning systems. With the exception of Queensland, land use planning and emergency management processes are not adequately geared toward addressing the priorities identified in the NSDR and especially not in terms of improving disaster resilience for likely climate change impacts. This disjuncture is particularly evident in the context of remote Indigenous communities in Australia. Moreover, the research highlights that Aboriginal people have expressed their concerns about climate

change impacts and it is critical to include community members in development decision-making processes.

We also found that only WA makes disclosure of hazard data about properties mandatory. However, this system does not work in discrete Aboriginal communities in WA as a way of passing on knowledge about potential disaster risks because the land is not held by individual landholders but rather by the State for the use and benefit of Aboriginal people.

We conclude that several legislative, policy and administrative reforms are urgently required if remote and discrete Indigenous communities are to be afforded the same levels of protection from the impacts of sea level rise and storm surges as are afforded to other communities around Australia.

This study clearly indicates that land use planning is not concerned with the hazard-resilience of communities. Land use planning frameworks are somewhat isolated and disconnected from the emergency management and disaster recovery systems. There are no active policy linkages between the two systems, or at least not in so far as the impacts of cyclones, sea level rise and storm surges are concerned, such that the two systems gain from each other's knowledge and experiences. Given the nature of the legal system that protects land use rights, it is highly unlikely that this situation will change in the immediate future. Creating hazard-resilient communities, therefore, becomes the sole responsibility of emergency management and disaster recovery authorities, as these organisations deal exclusively with a community's response to a disaster event.

COAG's mantra through the NSDR is to create disaster-resilient communities, yet the very institutions and associated systems that govern these systems are not structured or adequately tasked to achieve this goal. The hazards literature fails to understand the traditional purpose of land use planning and how communities protect their lifestyles through land use rights. If the goal of federal and state governments in Australia is to create disaster-resilient communities through the land use planning systems, then a fundamental change to the way in which planning is conceptualised and practised is urgently required. However, this fundamental change is not specific to just the planning fraternity, rather all public institutions that affect disaster resilience, including planners and emergency managers. Better mechanisms for sharing the data and knowledge accumulated by emergency management systems and for integrating that information into land use planning systems need to be developed as a matter of urgency.

From the results of this analysis, the most immediate actions necessary to create disaster-resilient communities through land use planning systems in tropical Australia include:

- Create consistent methodologies and data frameworks to enable information sharing between and across government agencies at all levels, especially between emergency management agencies and land use planning agencies at both state/territory and local government levels.
- Improve access to risk information data during land use planning exercises to ensure the latest information available is applied and appropriate land use planning and development controls are incorporated into planning schemes.
- Ensure planning and development controls are aimed at lowering risks and strategies for improving disaster resilience are enforceable.
- Improve access to data and tools to assess hazards and risks to enable communities to better understand natural hazard risks.

10. INDIGENOUS VIEWS OF CHANGE AND RISK

10.1 *Approach and methods*

Green et al. (2010) highlight the importance of recording cultural knowledge because: 1) typically, it is shared through song and stories rather than written and 2) some of the knowledge has been lost due to the passing of elders. Recording such knowledge must be done using culturally appropriate techniques, where Indigenous people's interests, experiences and knowledge are "at the centre of research methodologies and the construction of knowledge" concerning them (Rigney, 1999; p. 119). Based on this, Porsanger (2004) asserts that researchers must think critically about methodological processes in order to "contribute to the body of knowledge of Indigenous peoples about themselves and for themselves, and for their own needs as peoples, rather than as objects of investigation (p. 105)."

With respect to the above, we adopted a participatory research approach in order to garner a multifaceted understanding of how Indigenous people have coped with and adapted to past and ongoing environmental changes. Cornwall and Jewkes (1995) describe participatory research as "less of models of research which merely involve participation in data collection than those which address issues of setting the agendas, ownership of results, power and control (p. 1669)."

Various activities and methods were employed to investigate Indigenous views of change and risk. These included observations (during trips for hunting bush tucker/medicine and working on country), interpretations (of art, music and storytelling), semi-structured and open interviews, workshops, and participatory research methods. More specifically, participatory methods included:

- Timelines of life – community members were asked to explain if and how things were different within the communities when they were growing up, and if and how they thought things might be different in the future.
- Seasonal calendar – researchers initiated discussions on what was normally expected within each season, how these expectations were shifting and changing due to environmental and social influences (climate change/land use change/ change in community demographics, etc.), how various climate change scenarios would impact on the range of flora and fauna characterised by each season and how these changes would, in turn, impact Indigenous people.
- Transect walk – researchers, together with community members (including women, men, elders, local leaders, rangers and government officials), walked around the community/coastline/riverbank/country and noted down all the dangers and/or environmental and social issues within the community that worried them.
- Causes, solutions, responsibilities and actions – local people discussed the things that caused or exacerbated issues within their community, possible solutions, and who should assume responsibility for the actions needed for change.
- Film – local people filmed the important things to them within their community.

Scoping trips, which are outlined below, were undertaken in order to establish contact with key stakeholders within each community and: 1) gain a preliminary understanding of the relationship Indigenous people have with their ever-changing environment and 2) how this makes them more or less vulnerable to climate change impacts.

Location	Team	Dates
Wujal Wujal	Deanne Bird, Sharon Harwood, Helen Murphy	5 – 6 Mar*
Broome	Deanne Bird, Sharon Harwood, Stephen Russell	21 – 28 May
Ngukurr	Deanne Bird, Jeanie Govan, Benjamin Gillespie	13 – 17 Jun
Maningrida	Deanne Bird, Jeanie Govan, Benjamin Gillespie	19 – 23 Jun

*Please note, Helen Murphy and Sharon Harwood are conducting ongoing research projects with the Eastern Kuku Yalanji people in and around Wujal Wujal. Therefore, a shorter scoping trip was undertaken to introduce the project to key stakeholders with whom Sharon and Helen were already partnered.

Fieldwork was then conducted as per the following schedule:

Location	Team	Dates
Broome	Deanne Bird, Jeanie Govan, Stephen Russell	17 – 31 Jul
Maningrida	Deanne Bird, Jeanie Govan, Benjamin Gillespie	13 – 26 Aug
Ngukurr	Deanne Bird, Jeanie Govan, Benjamin Gillespie	5 – 22 Sep
Wujal Wujal	Deanne Bird, Sharon Harwood, Helen Murphy, Jeanie Govan	8 – 20 Oct

All fieldwork activities followed the 14 principles of ethical research, as outlined by AIATSIS (2012), and the specified agreements with each individual researcher's Human Research Ethics Committees (HREC) at their designated institutions. The HREC at the lead institution, Charles Darwin University, granted ethical clearance for this project on 13 March 2012. The project has been assigned an HREC reference number H12026, which expired on 13 March 2013.

In addition to the abovementioned field trips, a third visit to Broome was organised in conjunction with Rangelands NRM, who invited researchers to discuss climate change adaptation with their key stakeholders within the Broome community. Our NCCARF researchers used this opportunity to run a short workshop with the captive audience and hold a second workshop with a local ranger group the following day. Details of these workshops are presented in Appendix B.

More than 150 people were involved in the research, either through direct interviews, observations, workshops or on country activities. An audio recording device was used where possible and if permission was granted. Table 10.1 provides a summary of respondent demographics. All information produced within this project will remain the property of the individual or community and every effort will be made to ensure that it is stored within an appropriate database that is accessible to community members for future use.

All recordings were transcribed by the professional company 'The Transcription People', and double-checked for accuracy by the researchers. The analysis process began with the researchers working together to read through the interviews and discuss themes emerging from the data. Some themes, such as emergency management, were known to be within the data, as these issues had been discussed in the majority of situations. Coding the data for these topics was relatively straightforward. Other themes, such as the use of music in healing, were issues that were not discussed by all respondents. However, as the data was analysed, a pattern began to emerge with all themes and issues grouped under broader categories that have been used to frame the results and discussion (Section 10.2). The qualitative data analysis software program QSR NVivo 10 was used to aid analysis and management of the data.

Table 10.1: Respondent demographics. Please note, group work is indicated where attribute data for age is labelled as 'mixed'. ID codes are used throughout the report alongside quotes in order to respect the anonymity of respondents. PBC=Prescribed body corporate, NGO=Non-government organisation, TO=Traditional owner.

ID	Age	Gender	Indigenous	Region	Position
B1	35-50	Male	No	Broome	Government
B2	35-50	Female	Yes	Broome	Government
B3	Mixed	Male	Mixed	Broome	Business Owner
B4	50+	Male	No	Broome	Teacher
B5	35-50	Male	No	Broome	Church
B6	15-34	Female	No	Broome	Council
B7	35-50	Male	No	Broome	Church
B8	35-50	Male	No	Broome	Community Activist
B9	35-50	Female	Yes	Broome	Council
B10	35-50	Male	No	Broome	PBC/NGO
B11	35-50	Female	No	Broome	Community Activist
B12	15-34	Male	No	Broome	PBC/NGO
B13	Mixed	Mixed	Mixed	Broome	Government
B14	50+	Female	Yes	Broome	Resident
B15	15-34	Female	No	Broome	PBC/NGO
B16	15-34	Male	No	Broome	Government
B17	15-34	Female	No	Broome	Government
B18	50+	Female	No	Broome	Church
B19	Mixed	Mixed	Mixed	Broome	Mixed
B20	Mixed	Mixed	Mixed	Broome	PBC/NGO
B21	Mixed	Male	Yes	Broome	Ranger
B22	50+	Female	No	Broome	Resident
B23	50+	Male	Yes	Broome	Elder/TO
B24	50+	Male	Yes	Broome	Elder/TO
B25	35-50	Male	Yes	Broome	Elder/TO
B26	50+	Female	No	Broome	Church
B27	35-50	Female	Yes	Broome	Elder/TO
B28	50+	Female	Yes	Broome	Resident
B29	50+	Female	Yes	Broome	Elder/TO
M1	Mixed	Female	Yes	Maningrida	Resident
M2	50+	Male	Yes	Maningrida	Government
M3	50+	Male	No	Maningrida	PBC/NGO
M4	35-50	Male	Yes	Maningrida	Resident
M5	50+	Female	Yes	Maningrida	Elder/TO
M6	50+	Male	Yes	Maningrida	Elder/TO
M7	15-34	Female	No	Maningrida	Government
M8	50+	Female	Yes	Maningrida	Ranger
M9	50+	Male	Yes	Maningrida	Elder/TO
M10	35-50	Male	Yes	Maningrida	Elder/TO
M11	35-50	Male	Yes	Maningrida	Elder/TO
M12	35-50	Male	Yes	Maningrida	Ranger
M13	50+	Male	Yes	Maningrida	Resident
M14	Mixed	Male	Yes	Maningrida	Ranger
M15	15-34	Female	No	Maningrida	Ranger
M16	35-50	Male	No	Maningrida	Ranger
N1	50+	Female	Yes	Ngukurr	Elder/TO

ID	Age	Gender	Indigenous	Region	Position
N2	35-50	Male	Yes	Ngukurr	Ranger
N3	15-34	Male	Yes	Ngukurr	Community Activist
N4	50+	Male	Yes	Ngukurr	Elder/TO
N5	50+	Female	Yes	Ngukurr	Elder/TO
N6	Mixed	Female	Yes	Ngukurr	Elder/TO
N7	15-34	Male	Yes	Ngukurr	Resident
N8	50+	Male	No	Ngukurr	Government
N9	50+	Male	Yes	Ngukurr	Church
N10	Mixed	Mixed	Mixed	Ngukurr	Government
N11	Mixed	Mixed	Mixed	Ngukurr	PBC/NGO
N12	Mixed	Female	Yes	Ngukurr	PBC/NGO
N13	15-34	Male	No	Ngukurr	Government
N14	50+	Male	No	Ngukurr	Government
N15	15-34	Female	Yes	Ngukurr	PBC/NGO
N16	Mixed	Female	Mixed	Ngukurr	Mixed
N17	15-34	Female	Yes	Ngukurr	PBC/NGO
N18	15-34	Female	No	Ngukurr	Government
N19	50+	Male	Yes	Ngukurr	Resident
N20	35-50	Female	No	Ngukurr	Council
N21	35-50	Male	No	Ngukurr	Council
N22	Mixed	Female	Mixed	Ngukurr	Government
N23	50+	Male	No	Ngukurr	PBC/NGO
N24	15-34	Male	No	Ngukurr	PBC/NGO
N25	50+	Female	Yes	Ngukurr	Elder/TO
W1	Mixed	Mixed	Mixed	Wujal Wujal	Mixed
W2	35-50	Female	Yes	Wujal Wujal	Resident
W3	35-50	Female	Yes	Wujal Wujal	Business Owner/TO
W4	35-50	Male	No	Wujal Wujal	Emergency Management
W5	Mixed	Mixed	Yes	Wujal Wujal	Mixed
W6	35-50	Female	Yes	Wujal Wujal	Business Owner/TO
W7	35-50	Male	No	Wujal Wujal	Government
W8	35-50	Male	Yes	Wujal Wujal	Business Owner
W9	35-50	Male	No	Wujal Wujal	PBC/NGO
W10	35-50	Female	No	Wujal Wujal	Emergency Management
W11	35-50	Male	Yes	Wujal Wujal	Business Owner/TO
W12	50+	Female	Yes	Wujal Wujal	Elder/TO
W13	35-50	Female	Yes	Wujal Wujal	Elder/TO
W14	50+	Female	Yes	Wujal Wujal	Official
W15	35-50	Male	Yes	Wujal Wujal	Ranger

10.2 Results and discussion

Respondents were not asked a specific set of questions and, therefore, the qualitative data produced cannot be used to quantify. Instead, participatory and ethnographic techniques have allowed an in-depth and rich understanding of the issues relating to vulnerability, change and capacity. It is important to note that this section is not a literature review or an exhaustive account of these topics, instead it covers what respondents felt was important to them and their communities. The following sections provide detailed information on the various issues and 'themes' that emerged from the qualitative data. All information is derived from the interviews, observations, workshops and on country activities, unless otherwise stated. Where possible, quotes have been used so that respondents' voices can be heard.

Climate change and adaptation take place within a much broader context of cultural, environmental, social and governance change. This chapter (inevitably artificially) structures each of those areas of change in order to communicate and understand both the changes themselves and the capacity for adaptation. Climate change adaptive capacity runs through most of these themes, but it is interlinked with all of the other forces of change. Some of these inevitably emerge as problems and constraints, but the overall challenge of adapting to immense changes while retaining the values of culture and country is clearly the basis of adaptation to climate change. Therefore, it is not realistic to isolate climate change adaptation from the totality of culture and environment. The respondents' voices communicate knowledge and interconnectedness. Consequently, this is a long chapter, in which Indigenous voices are the meaning and the authenticity of the research and its findings.

There are eight themes that are grouped as follows, with each containing subsections that explain and discuss an element of the theme:

- Indigenous culture
 - Art
 - Bush tucker and medicine
 - Ceremonies
 - Family – Skin Groups
 - Funerals
 - Language
 - Leadership
 - Living on country – looking after country
 - Music
 - Sacred sites
 - Seasonal indicators
 - Spirituality
 - Stories – song lines
 - Traditional burning
- Climate factors
 - Bushfire
 - Cyclone
 - Drought
 - Dry season
 - Extreme heat
 - Flood
 - Wet season
 - Sea level rise
- Changes in biodiversity
 - Native flora and fauna
 - Feral flora and fauna
 - Strategies
- Emergency management
 - Communication and warnings
 - Policy and planning
 - Preparedness
 - Prevention/mitigation
 - Response and recovery
 - Evacuation
 - Strategies
- Infrastructure
 - Electricity and water

- Access – airstrips, bridges and roads
 - Stormwater and sewerage
 - Strategies
- Mining
- Social issues
 - Alcohol and drugs
 - Communicating with youth
 - Education
 - Health
 - Mental illness and suicide
 - Remoteness/resources
 - Population change/mobility
 - Overcrowding
 - Livelihoods and employment opportunities
 - Strategies
 - Healing
- Policies
 - Tenure and Native Title
 - Planning and housing
 - Centralisation of services
 - Employment
 - Environmental management
 - Rangers
 - Strategies
- Perception of climate change

10.2.1 Indigenous culture

10.2.1.1 Art

“Art means a lot of things – sculptures; art means, you know, dancing and singing and art can be a lot of things. If you want art as in painting, well, then it has to have a story (W11).”

Aboriginal art involves paintings, artefacts, spear making and crafts, such as weaving pandanus for baskets, wall hangings and mats. Each of our case study locations have their own art centres dedicated to local Aboriginal artists. While Broome, Ngukurr and Wujal Wujal have adopted Western techniques alongside Traditional, Maningrida Arts and Crafts Cultural Centre maintains a philosophy to purchase artwork that is produced using only Traditional methods. This approach is viewed as a way to support Aboriginal people living on country while generating an income. When artists access their supplies from the bush they are able to transfer and share their knowledge with children and family members who help locate the materials.

Furthermore, this practice contributes to people's physical health through movement on country and the general well-being and sustainability of their small communities. The sale of art contributes to the quieter lifestyle that families on outstations prefer. Some contemporary art reflects images of bush tucker, bush medicine plants or beings from creation, depicting the clan group or families' knowledge of dreamtime stories handed down: *“It's a story been told from my grandparents, my parents, their parents and my mum parents, from different area Kuranda this site Djapukai area and Yalanji area. I like ... pretty colours. Make you happy (W2).”*

Aboriginal art and craft has, for some time, been showcased locally, nationally and internationally. However, the global financial crisis resulted in a decline in the demand

for and value of Aboriginal artwork. Although there was a financial loss suffered by the Maningrida Arts and Crafts Centre, the sacking of some Balanda⁹ staff led to a boost in the morale of local Aboriginal people, as they were given more responsibility for tasks not normally assigned to them. *“They are taking on that responsibility and doing it well (M3).”*

Aboriginal rock art is of enormous cultural and spiritual significance to Aboriginal people and non-Indigenous groups do not always respect this. The removal or relocation of rocks and paintings is considered insensitive to Aboriginal cultural and several regions raised concerns about these practices: *“Oldest rock art in the world, Woodside are going to look after it. They literally moved this mass ... they basically blew it up. And then any fragment that had some kind of drawing on it, they numbered it with big white paint, and they put it in a wired compound (B22).”*

Local rangers in Maningrida reported that they have utilised silicon to act as a barrier to prevent rain streaming down over rock art and that fences have been placed around spiritually and culturally significant places to prevent damage from buffalo and pigs. North of Cooktown, cave paintings have been re-touched by local Traditional Owners to help retain the stories. The other important work of rangers and tourism groups is to record sites of significance for cultural and historical purposes so that future generations will have access to this information.

“So, some of these paintings are, have been repainted, but ... I remind them that the authenticity is in the story. We need to keep some of these things intact, otherwise we will just forget about them. ... So I've got all these on a GPS reading. And they then have that database just for that area (W11).”

10.2.1.2 Bush tucker and bush medicine

Bush tucker and bush medicine are woven through the intricate fabric of Aboriginal life and feature in stories about cultural identity, purpose and movement around country/land. Bush tucker and bush medicine are freely spoken about by both genders, with men sharing their stories about hunting for bush tucker, including wild potatoes and yams, and fishing for turtles, dugong, stingray and shark. In doing so, they share knowledge of bush medicine used for its healing properties: *“Goanna will go to hibernate before the big wet ... then they full of oil. When you do eat goanna, oil will come out through the skin. It will detoxify it (W11).”*

Aboriginal women take a proactive role in learning and sharing their knowledge of bush medicines handed down from their mothers, grandmothers and aunties: *“They'd come down here and sit down with the kids on the school excursion, or even the weekend we'd come down here, and they were teaching communal stuff, all about ceremony and tell us about what good medicine, bush medicine (N7).”*

Aboriginal women, generally being the sole carers and nurturers of young children, also share the healing properties of bush medicine for sicknesses such as flu, diarrhoea, boils, chest infections and sores with other family members and the non-Indigenous community, e.g. friends and health clinics.

While visiting the study locations, it was observed that the gathering of bush tucker and bush medicine primarily occurred through community-based or educational agencies. We also visited Aboriginal organisations such as nurseries, women's centres, arts and crafts centres, aged care and youth services. These organisations generally possess two of the most valuable resources required to gather bush tucker and bush medicine

⁹ Name for non-Aboriginal person in Northern Arnhem Land.

on a daily basis – a 4WD and an allocated budget. Others, however, feel that they cannot access bush tucker: *“Don’t go much now because we got no vehicle (N5).”* 4WDs in the community are typically work vehicles and few families own their own. As many people lack access to a vehicle, there is concern that they have a more sedentary lifestyle and greater reliance on the community shop for food and the local clinic for alternative forms of medicine (see section 10.2.7.4 on health).

Aboriginal women’s love of fishing means they also take the children for an outing: *“While other ladies are fishing, we take them for a walk to get bush tucker, bush plum, bush berry (M1).”* The sharing of knowledge is continued when families cook their bush tucker: *“Cook the crab on the coals and share old people story (M1).”* However, some elders are concerned that the younger ones are not interested in learning this information, as they have other daily priorities and/or worries: *“Some younger generation are not interested in learning, therefore we can’t pass our knowledge on (M1).”*

One of the concerns raised was overhunting and the depletion of animal stocks due to people’s access to guns, vehicles and boats.

“There has also been overhunting of turtle eggs as people have greater access to beaches that they wouldn’t have been able to get to easily before. Difficult to get to those locations in a canoe but you have greater access in a boat. There are so many boats now that just go out hunting all the time and consequently the things like dugong ... you’ve got to go a long way for ... to harpoon dugong these days (M3).”

Similarly, respondents on the Dampier Peninsula noted that there were fewer turtles, dugong and fish in the area. Reasons for this were cited as the use of outboard motors on boats instead of Traditional hunting methods, overfishing by big trawlers off the coast, and tourism: *“Now local people go to Beagle Bay to get turtle and they never used to do that before (B3).”* See section 10.2.3 for more information on changes in biodiversity.

Concern was raised regarding lands that have been inundated with development, where Aboriginal groups face exclusion while trying to retain and continue cultural practices and respect: *“You can’t get things from that area, because now it’s occupied by someone ... unless you establish a relationship with those people to have visitation on that land (W3).”*

Bushfires were also flagged as a problem, along with the impact they can have on country and the bush ‘supermarkets’ if they are uncontrolled and/or deliberately lit.

“Late fires are too hot. Recreational burning or roadside burning. One match can do a lot of damage. A couple of years ago, fires did a lot of damage and cooked blackberries, plum, yams and even mussels. People are going out further to access bush tucker (N2).”

Feral animals and buffalo cause enormous damage to hunting grounds and prevent people accessing local fishing and swimming areas for safety reasons. Wild buffalo are known to charge at people and their large horns and body size can cause significant damage: *“Cause these days ... they don’t walk now because of the wild buffaloes (N7).”*

Ranger programs include the culling of feral animals to try and manage the damage to country and bush tucker. One Traditional Owner reported that the rangers had shot *“about 500 buffaloes ... and other side, he got about 280 (M6).”* Although many

respondents discussed their concerns regarding feral animals, others viewed the buffalo as a reliable source of food. *"There's buffaloes going in the mangroves and making deep holes. It might become a creek one day. But some people like having the buffalo around because they eat them (M13)."* Another respondent declared that he liked to *"eat buffalo and pig (M11)"* and another stated, *"They're good eating them pigs (N4)."*

See section 10.2.3.2 for more information on feral animals.

10.2.1.3 Ceremonies

Ceremonies are conducted to celebrate the rites of passage taken by Aboriginal people, whether they have progressed to an important stage in their life or to allow for grieving/celebration of life and the next spiritual journey to be taken: *"When you die, in your clan, they take you back to your home ... And put you, they leave the bones in the thing ready for cremation. They got to paint that bone up and have ceremony for that (N4)."*

Dances, songs and music are drawn from creation and dreamtime stories. Some ceremonies remain culturally strong, while others have either ceased or changed in all study locations we visited. Nevertheless, respondents greatly respected cultural practices of past and present: *"We found an old body just here ... We leave them there ... why should we move them? They belong to the country (B23)."*

A non-Indigenous teacher, who has lived in Broome for the past 35 years, has witnessed a great deal of change within Broome and the surrounding communities, including a breakdown in cultural knowledge: *"My impression is that they've lost contact with a lot of their culture (B4)."* The teacher explained that when he was first working in Broome, culture was still very much a part of growing up.

"When I had the kids here they were all taken for initiation. It was called grabbing. You know the elders would grab the kids who were about 14, they'd take them out bush and put [them] through the lore. And when they came back here to this college they were completely different. They were men. You could tell on their face (B4)."

The strong kinship and family relationships, established through Traditional and non-Traditional arrangements for marriage, result in the mobility of groups throughout many communities, cities, states and international boundaries. *"Travel to other communities. That ceremony ... connected from marriages and through our ceremony ... Through the moiety ... and kinship (N1)."*

While some groups expressed their sadness at the loss of songs, dances and ceremonies, it was recognised that the increased ability of people to travel has enabled respondents to explore ceremonies, art forms and the differing ways of life of other Aboriginal groups. One respondent from Wujal Wujal commented about her visit to relatives in Western Australia:

"I wanted to see what the Aboriginal people over there like, you know? How they live, you know. And find out their culture, their way of life. I seen their art painting all that, and I noticed their culture's stronger than our culture. They still keep that Traditional way of life. But I'm always interested in their culture, you know, their painting and the artefacts ... Now, today, in Queensland, it's been all mixed. Contemporary and Traditional art all sort of mixed, 'cause we sort of lost touch, yeah (W2)."

Reasons cited for a decline of ongoing ceremonies in some areas included the passing of elders who were responsible for conducting ceremonies, and knowledge not being passed down, which was due, in part, to disinterest from younger generations.

10.2.1.4 Family – Skin Groups

Family is vitally important to the strength and ongoing existence of Aboriginal people. While it is usual for families to be large, we observed that this may be a hindrance due to cultural obligations to support each other, which is particularly difficult when people are living below the poverty line. Nevertheless, this is not viewed as a burden: *“That’s pretty common in our mob, that we help a lending hand and its family, you know. They know where to come ... so it’s all good (W3).”*

Today, Aboriginal communities are comprised of various Traditional land owners, clans and multiple language groups. This creates a mixed community with a history related to mobility from past events, including re-settlement, either voluntary or involuntary. *“We all came together from Arnhem Land to make up this mission, Roper River Mission ... Ngukurr, mixed up tribes (N4).”*

The large, extended Aboriginal families are mixed with their own history, achievements and happy stories, which were shared with us with pride – the old people, where they lived, school holidays, fishing, camping and sharing stories around a campfire. But among these family stories lay pain, trauma and grief, which at times is openly displayed in front of the next generation. *“It’s a shame that people have suffered enough from all this pain. We need to step up and say what’s right ‘cause our people have suffered and suffered their whole life. I know what it’s like (N3).”*

Local initiatives alongside government programs provide support and strategies to help families deal with past issues and pain. However, in areas where culture is strong, the policies and procedures are alienated from the target group because the language used is not one local Aboriginal people identify and are familiar with.

Moreover, problems occur when governments build houses that are not suitable for large families. Many respondents expressed frustration over inappropriate housing designs whilst trying to articulate designs that better suited the reality of large Aboriginal families. *“At Numbulwar they’ve got five [rooms] – three at the bottom, two at the top. Houses, brick houses ... We want to live with family, blackfella. Once mummy and daddy got you that house, that for everybody, grandchildren and all (N6).”*

For more information about housing design and overcrowding issues, see sections 10.2.8.2.

10.2.1.5 Funerals

Funerals, naturally, are highly emotional experiences that involve many families and clan/kinship groups. Sadly, funerals occur too frequently. They can be extremely costly, as attendees may not only have to travel by road but also charter flights from nearby islands or inaccessible homelands, draining the resources of local organisations. Moreover, funerals can span months, involving ceremonies, songs and dance, and bring an influx of families to the host community from other regions.

Some funeral processions still retain Traditional elements: *“Kuku nyunkgal boy-gu. Paperbark. Used for when our people dies used to wrap them up and bury them (W6).”* However, due to the church’s presence in Aboriginal communities, elements of their belief systems feature in funerals, christenings, baptisms, weddings, anniversaries, birthdays and special events. *“Yeah, they’re buried there now. They used to have a*

church service over there, and they used to bury them right along, not far from the hill. Nobody been buried in a cemetery before in this country (N4)."

The four study locations still conduct smoking ceremonies to cleanse a spirit in death, including the places they entered or visited prior to their passing. Smoking ceremonies are also conducted for newborn children and at various stages through life. *"For the little girl over there when she's older. I'm smoking in the wet season, you know, when she's a little bit older and a bit warmer (M5)."*

From a cultural perspective, attendance at funerals is compulsory. The absence of community members has a significant impact on employment, income, families and employer organisations, although some organisations have adjusted their strategies: *"Our blokes will go and do a funeral. You know, they're not working for me, but they're working for the community so we still pay them ... we might have to call them on a Sunday or a Saturday. That's what we do, so we're very flexible (N23)."*

10.2.1.6 Language

Among the study locations there are many different language groups arising from the mixed nature of the communities. *"There's seven language groups that make Yugul Mangi, Ngukurr (N4)"* and about 14 in Maningrida. Some communities have adopted 'Kriol', which combines English and Traditional Aboriginal language to form a type of broken English. *Kriol* is spoken in all Aboriginal communities in some form but it is the primary language spoken in Ngukurr.

"Well ... my parents is Mara and when I got married I went from here and I lived, stayed with my sister, and by listening and looking what they used to do in the language ... We put the Alawa songs into like Kriol, then from English to Kriol, then to languages ... and we use it at the church (N6)."

While some areas have lost most, if not all, of their Traditional languages, others are documenting and recording their languages for the use of future generations. *"Your language and your culture, especially language ... that's what keeps the culture together. People are making a big attempt now to get Yawuru language introduced in schools here in the Kimberley (B4)."*

In Ngukurr, the *Strongbala Women's Group* is developing a 'Baby Book', which will be given to the families of newborns. Local Aboriginal artists will produce artwork depicting animals and places relevant to the country and use Kriol and Traditional languages to name the animals and places. Copies of the book will be kept in the community library. The Ngukurr community also has a Language Centre and a *Kriol* dictionary, which is available on the internet.

10.2.1.7 Leadership

Indigenous leadership encompasses significant cultural obligations. It was evident to us that an elected Aboriginal person is not only accountable to their incorporated body, but also to family and kinship members. *"I got so many so many families, I have to go around Ji-Marda or other communities, I have to see them, talk to them. Show them activities. They have to do in next step (M6)."*

Indigenous leaders emphasise the importance of young leaders stepping up. *"Yeah, have to take in kids to learn, to see it, what will happen and that they have to carry on (M6)."* Leaders are called on to fight continuous battles, whether for recognition or handing back of Traditional lands, and to be involved in the development of their country so that communities feel they are in partnership with governments, non-government organisations, private investment, etc.

"Traditional owners in the Kimberley are very strong on this is our country and we want to be managing and looking after it and we're wanting to do that with the support of others but we want to be seen as the lead drivers ... we want others to be working with us to build our capacity to manage and look after our country and make the decisions about what's appropriate use of country ... We want to be prioritising the projects and the investment into programs that, you know, are important and things that are working rather than just being passive recipients (B2)."

10.2.1.8 Living on country – looking after country

Aboriginal culture and lore clearly defines which groups of people are the Traditional Owners for particular parcels of land (country) and emphasises the importance of living on country, i.e. on your own ancestral land. *"I was nine or ten years old my father and my grandfather and my mother's, mother's brother telling me about, you know, where you going to live, in the right place (M6)."*

However, many Aboriginal people are scattered throughout regional towns, remote communities or homelands/outstations, either by choice or for a variety of other reasons (see section 10.2.7.7). Although some people are living away from their Traditional lands, there are always reasons to get back on country: to visit family and friends, fish, hunt and share stories. For those fortunate enough to be on country, there is a strong commitment to sharing stories about ancestral movement on country. *"This is our camping area, all along here, that's Gunavidji people. See all the shell fish, from old people, middens (M5)."*

There are abundant reasons why people enjoy living on country, among them are cultural responsibilities and the more peaceful, healthy lifestyle they have, compared to those living in larger communities.

"There seems to be a lot of break-ins [in the community], a lot of countrymen fighting amongst themselves, and they're putting all language group in one little area ... which is not acceptable you know in our way of life. But the people that are living on the outstation, they have more healthier life, rich life really (M9)."

10.2.1.9 Music

Aboriginal people use music as a way of communicating about country, performing ceremonies, storytelling, and illustrating dances. Aboriginal music captures the essence of culture – Traditional and contemporary. Today, song lines are performed and creation stories are portrayed to recreate the journey of the ancestral being. Dreamtime stories and dances, often about particular animals, are incorporated into songs and music.

Music has traditionally been an avenue for Aboriginal men and women to demonstrate their talents through ceremonial songs and dances. Today, it is mostly Aboriginal men who establish bands, enter festival competitions and use music to express their concerns and worries through songs touching on sensitive topics as drugs and alcohol, violence and responsibility. *"I been using music to sort of heal myself and use it in that way to communicate and get other mob to see, I'm not just a rapper, I'm a story teller. I sort of express my story through music and I feel free, you know, after what, everything I been hiding (N3)."*

Aboriginal people are proud of their musical talents and today it is not hard to find Aboriginal bands successfully making and producing music – sometimes with an old computer on a remote community. Many bands upload their music, song and dances to YouTube and share their journeys and messages. *"When I first came here and I'm*

talking to them boys about, you know, music ... I'm a songwriter – but ... I was telling them boys, "Song writing will help you tell your story." And then I ended up recording them, and they won the year before at Barunga [Music Festival] (N3)."

Traditional Aboriginal arts have enabled some people to travel widely, touring with dancing, art exhibitions, cultural exchanges and festivals. Like elsewhere, the younger generation explores music from a variety of artists, locally and internationally. *"Today our children have been influenced from another culture (B24)."* Walking around the communities we visited, music was everywhere; on mobile phones, stereos and any technical device available. There are many talented musicians, singers, performers and dancers in all the communities we visited. However, the elders are concerned about the influences from other cultures and the impacts that will have on some of the younger generations. *"We asked them who is the number one hip hop artist in the world and they gave us the top 50, without breathing (B24)."*

10.2.1.10 Sacred Sites

Aboriginal people know many areas or places around their country that are considered 'Sacred Sites'. *"All them community they got sacred sites, and they got stories (W2)."* The stories relating to these sites on land and sea have been handed down through tribal groups to chosen recipients. Some locations may be burial sites, where bones from deceased people are kept along with Aboriginal ornaments that carry spiritual significance for the living and for those that have passed on. Some areas are designated according to gender, that is, they could be men's or women's ceremonial grounds or meeting places designed for specific purposes. Sites could be for men's initiation or birthing places for women. Traditionally, elders have the responsibility of looking after these areas. *"There's a special jungle and there is a two paperbark in the jungle representing my tribe. A very sacred place. It's got longneck turtle and the scorpion. It's ... big jungle there and they're representing the scorpion; my tribe (M6)."*

People mentioned the 'sickness' that can come from disturbing country, whether it is out of cultural ignorance or cultural disrespect. Locals know where land should be left untouched and worry about the health of others who enter and disturb the living, sacred country. *"They're putting their new houses up, digging holes everywhere, and people used to get really sick from that digging holes because there's so many sacred, you know? (N6)"*

Aboriginal groups have for years provided cultural awareness programs to organisations and employees who choose to reside in specific towns and regions so they are able to gain a better understanding of the area and why it is important to consult with Traditional Owners prior to entering country. Whilst this strategy has been appreciated, there remain some who have a disregard for such information and are unmoved by the concerns and hurt they cause Traditional Owners when visiting sacred sites, on land and on the water. *"But you have to know where you can't go. You know, business ground, woman's business ground, you know. You can't go there. They're rules. Like spiritual ground (B23)."* To make people aware of the sacred sites off the coast of Maningrida, the Djelk Sea Rangers install buoys (Figure 10.1).



Figure 10.1: Buoy used for marking sacred sites off the coast of Maningrida.
Photo: Deanne Bird.

10.2.1.11 Seasonal indicators

The change in season is noted by variations in weather conditions, which directly relate to the behaviour or availability of local flora and fauna. As such, these are used as seasonal indicators. The flowering of trees and plants indicates the availability of types of foods such as fish, goanna, oysters, fruits and berries. Another way of looking at it is that the seasonal indicators advertise which items are on sale in the local bush supermarket.

Some interviewees expressed concerns regarding the lack of items in season with fruit and flowers occurring out of season. *"Some weathers changing just a bit – because everyone go by seasons here, seasonal hunting, seasonal things and the seasons not right, something wrong with the weather (B25)."*

"You need a lot of rains to bring the leaves, to bring the flower, to set the fruit to ripe. Sometimes you see there's only two or three rains, and then you see all the fruit dried up because the next one didn't come. That's been happening a bit too (B8)." Other people offered the following explanations for variations: hotter temperatures, cooler weather, bushfires, feral animals and weeds, over-fishing and increased natural disaster events happening locally, nationally and internationally.

10.2.1.12 Spirituality

Aboriginal people have a multilayered belief system that is intricately linked with the land. The Dreamtime and Dreaming are two different things. The Dreamtime involves mythical beings, along with animals, and cultural stories on how the landscape and people's existence were shaped all around. The 'Dreaming' is a place and being – here and now and existing today – an environment that's all around us. Like every other culture, Aboriginal people have a vast array of Traditional cultural spiritual beliefs, some of which incorporate aspects of other religions. *"I don't believe no other god but that one god up top. We was a Seventh Day Adventist (W2)."*

Some people believe in a 'black magic' or type of witchcraft. *"Feel the bad vibes in Kuranda, like, devil was there. And I think to myself, 'Is it because of this ... all the hippies doing all the witchcraft in the rainforest?' They call it dumma-murri. That's another word for witchcraft or purri (W2)."*

Some respondents said that when it comes to death, blame is associated with black magic or a devil-devil presence. It does not matter if someone is in the last stages of life from old age or a terminal illness, someone else can be blamed for contributing to the death.

"There's young people now learning to do witchcraft, and that's wrong ... Yeah, black magic. Instead of doing it in the right way, you know, fixing their people up, they want to kill them, you know, harm other people, kill that person that they hated (W2)."

Through their connection to country, Aboriginal people read things within the landscape and interpret various events, such as the occurrence of cyclones or the appearance of spiritual beings within waterfalls. *"I seen Cyclone Yasi on TV ... bit scared, like the devil's over the whole Queensland (W2)."* Furthermore, this connection provides Aboriginal people with the power to try to prevent certain things from occurring. *"They sing a song to keep the bad weather away. Just sing the thunder songs. They've got to respect, in order for you to respect, you have to sing it to make you safe. And for us, it's nothing new (M9)."*

When Cyclone Tracy impacted Darwin in 1974, residents of Maningrida prepared themselves at the town hall, where *"old people they was singing away, maybe make cyclone dizzy or stop her to do that and stop her wings, flapping and all that ... Now when cyclone season time, some people in outstation they sing to Cyclone but not in Maningrida. 40, 50 years old or 60, they sing to them cyclone (M8)."*

10.2.1.13 Stories – song lines

Song lines, or dreaming tracks, are expressed in dance, music, storytelling and paintings. Describing stories of creation, the song lines mark locations of significance in time and place, linking cultural groups through language and songs over thousands of kilometres.

"Forty women from Balgo, and most of these ladies never seen the ocean ... When we drove from Balgo, they sung the whole song cycle to Broome. And they never been here. That's how it is ... And that's what the song cycle is, you get the map in the song, yeah. Places. And whole Australia like that (B8)."

Since the song lines are considered to be *"the tribal people. Living ... it's our culture ... (B23),"* it is understandable that there was great concern among the Yawuru and Goolarabooloo people with respect to the impact that the proposed gas plant will have on the song lines. *"The gas hub that's going to be built 60 kilometres north of us, that will have a hindrance on, particularly with our song lines. The old people, they created the song lines only to provide life, that's all, to the people, the trees and the animals (B24)."*

The challenge is that the concept of song lines is one that some members of the wider non-Indigenous community are struggling to understand, respect and recognise the importance of. Aboriginal spirituality is not a vision but a feeling expressed through songs, dance, music and art. Spirituality is about their whole existence and the song lines help to identify and link various groups over vast areas. A Broome respondent noted, *"I think next week – about 30 people coming from the desert, following the song cycle ... because the song cycle from here is connected to their country (B8)."*

10.2.1.14 Traditional burning

Aboriginal groups have a Traditional strategy of seasonal burns for hunting bush tucker, managing conservation estates for bush medicine, and maintaining culturally

significant sites. *"Of course back then, you know ... we use to burn off, seasonal change. And that practice is still alive and well today (M9)."*

Rangers consult with Traditional Owners to ensure that they are burning the right areas. *"We use the rangers who use the helicopters to go and do the burning off ... They have to come and talk to the TOs ... which area they can burn or not burn (M9)."*

"All the rangers have their own land, I talk to them and they talk to family, 'cause you can't tell people what to do on their own land. A lot of rangers also don't have a lot of vehicles to go to Homelands (N2)."

"We want to control burning to go back to cultural knowledge of burning, which we are doing but people are lighting fires in the Dry Season (N2)."

Organisations utilise helicopters to conduct aerial burns on outstations or parcels of land as it can be quicker than a ranger group travelling by road or because the land may be inaccessible by road due to a heavy wet season. Unfortunately, the use of helicopters has a significant impact on the resources of these organisations that are heavily reliant on ongoing government funding. *"It can be too wet to get to these areas so the rangers rely heavy on the chopper. Budget is low, therefore it limits where rangers can work – hoping to get increased funding (N2)."*

Some ranger groups are in the early stages of developing fire-burning strategies, learning different techniques from other groups. Some work is undertaken in partnership with government and corporate bodies: *"Hopefully by the end of the year we'll have some corporate sponsorship to develop that process and build that relationship (B2)."* This is done to not only manage country in an effort to get the best environmentally appropriate outcomes but also to develop specific methodologies under the Carbon Farming Initiative. For more information on rangers see section 10.2.8.5.1 and 10.2.8.6 for fire management strategies.

Two of the challenges ranger groups work with when managing fires and country are visitors who light fires for recreational purposes, as often the fire is not extinguished properly, and *"countrymen, they have to light fire every time they go for a walk, it's a job that belongs to the Yugul Mangi Rangers (N6)."* A Yugul Mangi ranger noted, *"recreational burning or roadside burning. One match can do a lot of damage (N2)."*

The bigger a wet season, the bigger and hotter a fire can be during the dry season. As funding is limited, rangers use natural firebreaks, such as creek beds, rocky cliffs and outcrops for strategic burning. Ranger groups link with other organisations involved in Emergency Management and are then contracted by such organisations, including Shires, to establish and maintain firebreaks as a way of generating income by charging a fee for service. There are a variety of views on burning and some people's attitudes are that it either shouldn't be done at all, or not to be done every year. *"Like when I was working, I used to tell them not to burn too much, or don't burn every year. You don't have to burn every year. Because when you burn every year, you're demolishing our berries, our bush tucker, our bush medicine ... our bush life (N1)."*

Another concern is the absence of people on their Traditional lands, as the country is then neglected and at an increased threat from fires. *"A lot of fire ... That's the biggest thing, because of empty people ... so it doesn't get burnt regularly (M12)."*

10.2.2 Climatic factors

10.2.2.1 Bushfire

People who live remotely are often vulnerable to bushfire. When there is more rain, this means more vegetation, like fast-growing spear grass, which provides fuel for fires. These bushfires pose a significant threat for several reasons. The hot fires that come through Broome every year *“burn out significant cultural sites and habitats for small mammals and ... provide the opportunity for weeds to come in as well (B2).”*

When several fires occur within a short timeframe they *“kill all of the vegetation for a long time and the trees aren’t going to come back ... it causes big destruction (B4).”* A ranger from Maningrida believes that when the land is empty of people, it isn’t burnt regularly, which causes the big late-season fires (towards the end of the dry season) to be more destructive. The opportunity to use Traditional fire management techniques to counter this threat has been recognised. *“I definitely think there’s increased risk with the hotter it gets, you know, for late season fires to increase which is why, you know, having good fire regimes is really important (B2).”*

Some of the blame for accidental fires is placed on tourists who light fires when camping. Kids fooling around and arsonists are also responsible. To counter these threats, education programs have been implemented in Broome and they play an important role in informing locals, tourists and pastoralists of how their activities affect fire management strategies. This helps counter the ignorance, complacency or profit-driven attitudes of stakeholders.

As mentioned in section 10.2.1.2, bushfires have a detrimental effect on bush tucker, making it harder to find locally. To mitigate these effects, the ranger nursery collects bush tucker seeds to produce plants for use on outstations: *“Especially where old people live (N2).”* An elder in Ngukurr explained that she can’t get any bush food – bush plum, green plum, lily roots, stalks – because the fires haven’t been controlled. Others supported her views: *“I ... look for food, I take my grandchildren. We never find anything (N19).”*

10.2.2.2 Cyclones

Respondents’ opinions regarding the frequency of cyclones varied. One respondent from Ngukurr believes that big cyclones are nothing new, and there are many instances of cyclones in the historical records. However, others believe that there are *“more cyclones now (M9).”* There was not necessarily a connection to climate change noted. One respondent from Wujal Wujal believes that cyclones are *“happening for a reason ... I think ... maybe because the white people destroyed some land, or they don’t do their sacred sites (W2).”* She also believes that breakdown of social mores may be responsible. *“And I’m reading the signs ... The young people got no respect for the old people. Even my kids, they got no respect and they’re getting out of control. That’s the sign (W2).”*

It is noted in Maningrida that the old people had the power *“to sing back to cyclone rains or storm or all that ... Traditional song, sing it away (M8).”* However, this doesn’t happen often anymore. A Traditional Owner in Arnhem Land also spoke about how the old people would sing to *“keep the bad weather away”*. He believes that there is a different attitude towards cyclones between *“us black fellas, we see, oh it’s nothing new to us ... It will come and it will go past us ... white man, when they see something they panic.”* They are more inclined to *“pack up and take off (M9).”*

In Broome, a resident remembered that in the old days there were *“terrible cyclones”* but they had *“no warning. We got no radio message ... but we’d cope ... sheltered in*

the house (B14)." She stated that pearl lugger crews were particularly vulnerable and would shelter where they could. Elderly people from outlying communities would come into town to be billeted. Another Broome respondent remembered how people would build humpies in well-protected places and shelter there until the cyclone passed.

According to one official, local residents in Maningrida question the likelihood of a cyclone impacting their community when they watch news reports of cyclones located in Western Australia, or Darwin but heading west. People are aware of warning signs, such as dogs going quiet: *"Half the dogs disappear, and all the birds disappear, then we're just like, 'Okay. It's coming.'*" (M7)." Concerns are abated by volunteer's doorknocking throughout the community and conducting pre-cyclone clean-ups. However, this was noted as not occurring regularly enough in Maningrida, with police concerned about the removal of old cars from people's yards. In addition, communities are still affected by old housing because it is not up to standard.

People seem to be aware of cyclone threats and the need to evacuate when cyclones are stronger. A business owner in Broome reported that the *"majority of us sort of just ride it through (B9).*" Another resident declared that he is happy to stay put due to the panic within town. He stated that he is used to cyclones and, while he doesn't worry about them, he prepares by building his own cyclone shelter. In comparison, other residents believe that there is also a sense of complacency: *"We've been lucky that we haven't had a cyclone here since year 2000. We're getting very complacent now it's been 12 years (B4).*" He discussed past cyclones that were *"really frightening"* and caused big damage. *"Echo Beach ... [was] completely blown off the map."* However, now people are building *"pretty flimsy"* houses right *"in the mangroves (B4).*"

Many respondents raised concerns about the damaging effects of cyclones. These included impacts on biodiversity and ecosystems, such as seagrass beds, turtle and dugong, fish, and birds like Brahminy kites that feed on fish.

10.2.2.3 Drought

In times of drought, Indigenous populations would leave the desert when animals were no longer available and *"head ... up to cattle stations ... [where] there's water, meat ... and all these things (B26).*" Ngukurr elders remembered relocating to Mission Gorge, more than 12km from Ngukurr, during severe drought in the early 1950s. As the drought worsened the Roper River became too salty to use as drinking water or for watering the community market garden and other household purposes. Therefore, people went out in search of freshwater and once found, the mission was relocated. This area, which became known as Mission Gorge, was a local watering hole for many animals and while the mission was located there, Aboriginal people hunted kangaroos, wallabies etc., as they came down to drink.

One respondent from Ngukurr was concerned that the younger generation won't have the knowledge of bush tucker needed to survive future droughts on country. *"They gotta be able to go out and hunt for kangaroo or for ducks and lily seed and everything which is out there (N4).*" With lack of experience and knowledge, younger generations will be less able to cope with climatic change and events such as drought. *"They never had it before (N4).*"

A ranger in Wujal Wujal has monitored stress caused to animals and plants in times of drought. In his experience, animals cope with drought through retreating under big logs or *"hang up in the headwaters (W8)"* until the drought passes. However, there is concern that droughts are worsening. In Ngukurr, an elder stated, *"I reckon there'll be another drought. Very strong now ... this business about no water in billabongs and creeks and lagoons, like it's gonna happen every 50 years (N4).*" A result of increased

drought is increased salinity. *"Gotta watch that drought ... it brings in salt (N4)."* There is also concern that man-made drought will increase if water is increasingly pumped to urban areas. In Broome, *"that country will be depleted of that water, and it's one of the most beautiful ... freshwater places in this area (B8)."* This is a major concern for the future, given increasing populations and prolonged dry periods. Another concern is that when those dry periods occur, the floods will be bigger. *"We know that already – when the country too dry. So when that rain hits, it really pours like watering, like I told you, like a water ... you spill your water with it (N4)."*

10.2.2.4 Extreme heat

Many respondents talked about temperatures getting hotter and how this is affecting/will affect plants and people. However, some officials did not view extreme heat as a high priority risk as they believed that people living in northern Australia are acclimatised to these conditions and therefore have the ability to cope. In comparison, some respondents discussed how residents were too reliant on air-conditioners and were losing the knowledge/ability to cool naturally. On extremely hot days, people opted for staying inside with the air-conditioner running, rather than sitting under a shady tree by a waterhole, as their ancestors had done. This course of action can fail when there is a blackout, as often happens in remote communities. This reliance was also prominent among youth, with a schoolteacher describing an incident where the school children refused to get off the bus during a bush field trip because it was too hot. He explained that they were too used to being in air-conditioned classrooms. This lack of acclimatisation is exacerbated by housing design in remote areas, which is based around a reliance on air-conditioning. A respondent in Ngukurr stated: *"If people don't learn how to adapt to the heat ... they'll become more and more sedentary and just sit in their house and watch TV, and that's a real danger (N8)."*

10.2.2.5 Flood

There was a feeling among community members that future flood events would increase in magnitude: *"I feel that, yeah, it's going to be bigger next time (B8)."* There is also concern that as floods and populations increase, this will create added pressure on community planning, land availability and infrastructure, such as drainage systems. A resident of Broome described floodwater as *"coming up, coming up now, because of all the houses and all the drains coming into this area here (B24)."* Residents were aware of the fact that inadequate planning can exacerbate flooding events: *"They should've worked it out, you know, how the water's going to drain and stuff (B21)."*

To reduce vulnerability to flood in the past, Aboriginal people would simply relocate to higher ground. *"Because they knew when you have a drought, the old people knew we're gonna have a big flood (N4)."* In Ngukurr, however, the first mission was established on the banks of the Roper River and was therefore vulnerable to flood. At times, people *"stayed there with the missionaries and all them mob, until the flood went down (N25)."* However, other people described how their parents would take them from the mission to ensure that they were safe on higher ground during large events. This was particularly evident during the 1940 flood, which resulted in the mission being relocated up to the ridge where it currently stands.

10.2.2.6 Sea level rise

Sea level rise is an increasing threat in most of the communities, but particularly in Broome and Maningrida. A respondent in Broome described using a *"boat so that you could go everywhere through to Broome ... so that's very big tide (B8)."* Another stated, *"It's risen a bit, for all the years that we've been down here. Like, we've been down there 18 years now (B9)."* In Roebuck Bay, respondents spoke of *"high tide, sea levels rise, cyclones and 3 metre surge happening (B20)."* Others were concerned about

“sea-level rise, which appears to me to be occurring. And Broome is very vulnerable (B11).”

There is concern that while *“the old people can read the actual changes, you know”* the current changes are *“unpredictable (M9).”* In addition, the current generation is seen as ill-equipped to deal with these changes because they are losing Traditional survival knowledge. There is also a degree of fatalism from some respondents in Broome about sea level change affecting their homes: *“We don’t have concerns at this stage ... I live day-by-day (B9).”* However, others are frustrated that homes are still being constructed in low-lying areas. *“That’s a pretty stupid place to be putting those things (B4).”* Others are more concerned about landscape changes, such as erosion resulting from sea level rise. *“There’s a lot of pressures on the ... coastal cliffs which are eroding (B11).”* A resident of Ngukurr noticed dramatic changes to the coastal area between 1980 and 2010: *“I used to go down to Wuyagiba down on the coast and what they call the bottom road where I used to come in before, it’s now just tidal flats (N23).”*

Sea level rise is already affecting these communities. One respondent noted that saltwater incursion and erosion of the dunes was already happening and *“it’s only the mangroves and of course the sand dunes that are keeping that water off ... Roebuck plains (B22).”* Although the same respondent noted a positive consequence of sea level rise as being the uncovering of dinosaur tracks due to increased coastal erosion. In Maningrida, a ranger was concerned about water levels. While drinking water is easy to access, *“You dig up anywhere here, you can get fresh water ... [but] if we don’t have the good weather, it will go back to salt again (M9).”* While king tides have usually been seen as a good opportunity for collecting bush tucker, a Dabu Jajikal ranger from Wujal Wujal noted: *“We have lots of water coming in you know, more water from the sea (W5).”* This has been seen to have an adverse effect on bush tucker. It also creates other problems. There are cultural impacts of sea level rise, noted in Maningrida, such as the *“washing out of graveyards at Bottom Camp. I don’t know what they’re going to do with that, all the graveyards. It’s nearly washed out (M12).”*

Potential strategies in Maningrida include relocating further inland, *“as there is a lot of country for people to move into the bush (M3).”* Others called for increased cooperation with government bodies in research initiatives. One elder from Maningrida described how she collected information in a research project measuring sea level rise. Another strategy is to improve the amount of mapping for areas such as Wujal Wujal. A Land Trust employee believes that the lack of mapping makes it difficult to get a good idea of the impact of sea level rise on coastal communities. *“We actually don’t have the skills here to map that area properly in terms of how vulnerable it is to flooding and sea level rise, but it definitely is (W9).”*

10.2.2.7 Seasons

Changes to the timing and intensity of the seasons are widely noted. *“Everyone go by seasons here, seasonal hunting, seasonal things and the seasons not right, something wrong with the weather (B25).”* Others in Broome talked about the fact that a big wet season hadn’t *“happened for maybe 15 years (B8).”* This is a concern because respondents believe that you need *“lot of rains, you don’t need one rain (B8).”* Changes were also noted in Maningrida, Ngukurr and Wujal Wujal. An Ngukurr respondent noted that the length of the wet season has increased to *“six or seven months (N8)”* now. Whereas another respondent described how there was a record wet season one year, and very short season the next.

Being cut-off in the wet season is a common problem for the people in the four communities. *“It is very hard because the road gets closed you know then you got family stuck in town wanting to come back home (B27).”* People spoke of the need for

sealed roads and better bridges to improve access to and from communities. It is expensive to fly in to communities: *“By the time you get to Maningrida and fly back, you don’t have anything [money]. So all this is a factor in this community (M9).”* Without all-weather access, people from outstations are forced to move into town during the wet season to be near services. The result is the *“community is pretty full ... sleep in the house, lounge room (B25).”* This is because *“there’s not enough houses (M6)”* for people who move in during the wet.

“But it shouldn’t be the case, you know. The community should provide accommodation and use ... [it] for wet season to help our mob, so kids go to school, people still work. And then in the dry time, they use that to generate income, you know, for bed and breakfast. But they don’t think that way (W3).”

Others come in for shopping, to *“get food and things for Christmas, but they get waylaid (B26).”* For those who move into town and can’t find accommodation, there are few options. *“This is only hundreds or the thousands that sleep rough and are doing it tough in Broome (B5).”* Once the wet happens they are *“literally trapped there for weeks (B5)”* and this can create enormous pressure on services and resources. While people are aware of the difficulties of road access in the area, *“they’d know that at a certain point of the wet season you don’t even try to go on that road (B26)”*, there also seems to be a *“just go and hope (B26)”* mentality.

Health is a primary concern during the wet season. Significant rainfall means an increase in mosquitoes and mosquito-borne viruses, such as Ross River and Murray Valley Virus. A respondent in Broome said that when the area is under water *“there’s millions of larvae (B8).”* These and other medical issues are of serious concern given the difficulties of transport during the wet.

“Wet time some kid get sick, old people get sick – boat and health truck to pick us up from other side – they should have Doctor and Nurse stay here every wet season at the clinic. Accident could have when go by boat – really high that water. Night time hard to cross (N5).”

In addition, the heavy rain during the wet can impact sewerage and drainage systems. In Broome, a respondent remembered that the sewerage ponds once overflowed into the sea. These kinds of events have health impacts on people and ecosystems.

The massive downpours in the wet season are difficult for communities to deal with. High levels of rainfall, *“20 inches in three hours (B4),”* can have dramatic impacts on the landscape. In Broome, large downpours have *“punched a hole in the sand dunes there as wide as about three classrooms (B4).”* In Wujal Wujal, landslides are common after intense rainfall, and roads and bridges are often damaged. The causeway has been rebuilt many times but occasionally washes away again. While people become accustomed to these weather conditions, they still cause inconvenience and risk. Residents out of town *“just stay home, watch the creek go down, you know, water go down (W2).”* They try to stock up before the wet season but otherwise have to wait for helicopters to bring supplies. They have the option to relocate into town and stay with family but they prefer to stay on outstations to avoid ‘humbug’¹⁰.

10.2.3 Changes in biodiversity

10.2.3.1 Native flora and fauna

Natural events such as cyclones have had a devastating impact on the biodiversity of Indigenous communities in northern Australia. In particular, impacts to native flora and

¹⁰ Requests, demands.

fauna were noted in the aftermath of Cyclone Monica in 2006, with several respondents describing extensive damage that they had witnessed on country.

“Mangrove dead everywhere. That’s what happened when [Cyclone] Monica. When I first saw the island, when they took me out, the second island, I was crying on the boat, I was upset when I seen it destroyed. The whole of mangroves where them Brahminy Kite, that was their home and the Cormorant (M5).”

Another area of interest was around Junction Bay, where an extensive area of bushland was literally flattened for kilometres and shoreline trees are still stripped of life (Figure 8.2). This was of such significance to local Traditional Owners that they asked the Djelk Sea Rangers to take us out so we could witness the devastation ourselves. A local official commented that some of the trees may take “30 to 50 years to grow back (M7).”



Figure 10.2: Trees in Junction Bay that were stripped of all life during Cyclone Monica (2006). This photo was taken in August 2012, over six years since the cyclone impacted the Maningrida region. Photo: Jeanie Govan.

Biodiversity was also impacted by saltwater intrusion as “Cyclone Monica tide, it pushed a lot of salt in our area (M12).” However, all reports were not about loss. One respondent described how he came across an abundance of cockles. “When we walked along the beach there was [erosion], the force of the water and the tide, we were so sad, we wanted to cry. Amazingly what we saw, there were plenty of [cockles] (M2).”

In particular, respondents from Maningrida, Ngukurr and Wujal Wujal commented on the unwelcome increase in crocodiles, even though they acknowledge that they are a part of their environment: “You have to respect, everything that lives on the land here and the water (W3).” In each of these places, it was suggested that crocodiles are more abundant during the wet season, when they can easily travel with floodwaters: “There’s big flood come up, crocodile come up – right up (M12).”

Some respondents were of the belief that human activity and mobility attracts crocodiles into areas: “The crocodiles that’s here, when I was a kid growing up, we never had crocs up this far, never. It’s only since, more visitors come into the area, and they bring their dogs and other pets (W3).”

Flooding has also altered the river systems, impacting riverine flora and fauna. A Ngukurr official noticed damage from flooding for the first time in a 30-year period: “I was up the Wilton [River] yesterday, and what I noticed was all these dead trees in the

river ... What's happening is, landslides are occurring and the whole bank is going into the river. I've never seen it before (N8)." Locals were concerned about how their fishing spots have changed each year due to damage to country and altered habitats, which could be related to flooding and/or feral animals.

The impacts of drought were also noted as detrimental to local flora and fauna.

"Drought for the turtle species, as it starts to get drier they, they go under a lot of stress and they will get in logs. And if that was hollow they would live under there and try and live until the next rain season. But the rain seasons haven't been coming at the right time now so I've sort of been worried about that (W8)."

Others, however, were unsure about what was causing the changes that they were noticing. *"Well I've never been to the reef but I heard there hasn't been much fish lately. But I don't think it's climate change (B23)."*

"Magpie Goose all year round. Some year it's bad season, some years it's good season. Don't know why this is, maybe due to climate, not enough rain, too much water, they might go elsewhere, too many people shooting day and night? (M11)"

A local teacher in Broome discussed changes that he had noticed in regards to the abundance and composition of mudskippers along the shoreline of the bay: *"I've noticed changes there in the last 30 years. And the change is there's more mud. And the second thing is there's not the mudskippers that there used to be. When I first went down there, there were big mudskippers. Big eyes and everything now there's just little tiny ones occasionally (B4)."*

The same respondent also commented on the occurrence of algal blooms in Roebuck Bay and he questioned whether this was a result of a changing climate, or related to pollution run-off from the industrial area.

Many respondents commented on the impact that commercial fishing trawlers and tourists can have on resources within the sea: *"I keep on saying it's those big trawlers, that's where they put their nets down and collect lots and lots of fish at night – take too much (B27)."* While species of commercial value are kept, others are left to drown in nets or are discarded – it was evident that this sort of activity creates a lot of concern for Aboriginal people, due to their cultural connections to land and sea country. For example, an elder was asked about the Swordfish depicted in the paintings and stories at the Ngukurr Arts Centre. She responded: *"They getting extinct because of what the fisherman are doing to them. They catch them and leave them in their net and they just throw them away. Sometimes they get the comb and sometimes they just leave them. We've been studying that and trying to stop fishermen from throwing nets along this river and out on the sea (N1)."*

Similarly, a ranger in Maningrida stated: *"Shark and that get caught in the nets and they get 'em out of there and just let them float away. They even find dead crocs sometimes (M13)."*

Tourism is a part of the local economy in each of our case study locations. However, the tourism sector in Broome plays a much larger role than in the other locations. While recognising its importance within the local economy and welcoming visitors to country, the Yawuru people are concerned about proper management in culturally and environmentally significant areas. *"There's no management on the beach (B24)."*

Several respondents and participants at the Broome workshop raised the issue of tourism impacting biodiversity. One local stated: *"The biggest thing here is that if we wanted to look after our environment – an example, our beaches, for years we've been telling them and giving them examples, like the turtles like to live there, that's their ground – they've been here a long time. Now what we've got is more jellyfish, and they're saying, 'Well, what's that got to do with turtles?' ... And the turtle eggs. We understand now why there's more jellyfish, because there's less turtles coming out, because the environment is not right for them (B24)."*

Broome is a well-known and crucially important region for a variety of migrating bird species, with Roebuck Bay included as a Ramsar Site¹¹ and included on the National Heritage listing. However, development and tourism have infringed upon the natural habitats of local and migratory species. *"Birds I've seen over 110 varieties. Now you only see 35. The reason for that is the bush corridors have been chopped off now because we've got suburbia (B4)."*

"There are thousands of shorebirds that roost on the northern shores and there's competing values: people driving on the beach, netting fish illegally, over-crabbing, driving quad bikes, trail bikes – a growing pastime in Broome which has large impacts on the coast and on shorebirds (B11)."

One respondent stated what many believe – that it is a complex battle when *"there's money involved, so economics versus culture, yeah, it's always an economic thing (B24)."* While it was noted that some effort has been made to educate and restrict people from driving on beaches, the large increase in tourist numbers during the dry season makes management difficult: *"Sunday, I went down to Gantheaume Point. There's 500 metres that they [tourists driving on Cable Beach] could use. There was 673 cars on the beach, and 220 of them had trailers (B24)."* We were advised that the area designated for car parking along Cable Beach was measured from the low tide mark to the dunes. However, due to the large number of vehicles accessing the beach more and more 4WDs were encroaching upon the breeding grounds for a number of species.

Mining was also discussed as an industry causing biodiversity loss in each of the case study regions: *"When the mine opened in 2004/2005 [near Shipton's Flat], we lost a lot of our native wild animals, the swamp turkey, scrub hen fowls, goanna. This land here has been destroyed (W6)."*

In regards to the proposed development at James Prices Point (see section 10.2.6) and resultant increase in population flying and out of Broome (see section 10.2.7.7), one local resident stated:

"On the coast here, the biodiversity, like at Eighty Mile Beach, Roebuck Bay and the west coast of the Dampier Peninsula, where there's all these seagrass beds, and you're growing the best pearls in the world six kilometres west of James Price Point. And you've got two fishing grounds out there; one's called the Peanut, and the whales are feeding and calving in these areas – there's so much we don't know. There's been a potential new spinner dolphin found off the coast of James Price Point. And you've got all the sailfish and marlin. You go out in these waters and it's just incredible. But,

¹¹ The Convention on Wetlands (Ramsar, Iran, 1971), called the 'Ramsar Convention', is an intergovernmental treaty that embodies the commitments of its member countries to maintain the ecological character of their Wetlands of International Importance and to plan for the "wise use", or sustainable use, of all of the wetlands in their territories (http://www.ramsar.org/cda/en/ramsar-about-about-ramsar/main/ramsar/1-36%5E7687_4000_0__).

you know, a lot of this could be deeply impacted before we understand it. We don't fully understand what we've got, and the oceans are under enormous pressure (B11)."

"I don't know what the impact will be but it's very concerning because those mudflats, the invertebrates in the mud feed migratory shorebirds. That's what they [the migratory birds] come for. And then you've got snubfin dolphins, also feed on the invertebrates. And then you've got ... the seagrass, mangals and invertebrates in the mudflats. So they could be impacted too, and this is very concerning. Roebuck Bay is a Ramsar site and National Heritage listed, more science needs to be undertaken on interconnected waters and in the bay to protect and manage it. There's been a real lack of investment in science in northern Australia and a lot of the research that's been done, not so much in Roebuck Bay but along the Dampier Peninsula, has been by industry for industry. So there's not a lot of independent peer-reviewed science (B11)."

10.2.3.2 Feral flora and fauna

We heard about, and witnessed damage from, feral animals across the four study locations. These animals include: buffalo, donkeys, pigs, wild dogs, cane toads, wild horses, goats, cattle and camels. A positive is that some of these offer an alternative source of meat. However, many people expressed concern about the damage they cause: *"Pigs and buffalo, you can see on this swamp, on the billabong, in the jungles, there's a lot of mess, damage. It's really damaged (M6)."* The biodiversity of the four case study locations has been dramatically adjusted by these introduced species, as they consume bush tucker foods such as yams and bush potato and, in the process, destroy natural habitats and breeding grounds. *"The plants and animals ... it's getting less ... Same food source that our local animals live on (M9)."*

Around Wujal Wujal, the discussion on feral animals was mostly about pigs, horses and cattle. In comparison, respondents from Maningrida and Ngukurr talked about buffalo, pigs and cane toads. A Yawuru man from Broome also voiced concern about cane toads: *"Notice the cane toad is moving up this way and most probably in Darwin ... it's on its way here and their behaviour is killing native animals such as crocodiles, lizards and things (B24)."* There is concern in Arnhem Land that: *"No one knows what to do with the cane toad. What do you do? They're everywhere (M15)."*

It was noted that before cane toads invaded Arnhem Land, frill necked lizards, goannas and other reptiles were abundant. However, their numbers diminished since the arrival of cane toads but recent sightings suggest they are coming back: *"We used to have lots of goannas and lots of snakes ... But they're all gone. Yeah, no longer exist. Spiky-tail lizard. But they're coming back. That blue-tongue, I think it's coming back (N1)."* Another respondent commented: *"I've seen one King Brown. It start coming out now, slowly (M6)."*

Some respondents believe that this resurgence is due to the fact that native animals have learnt to live with cane toads. One official commented about the number of dead crocodiles he noticed when cane toads first arrived in Maningrida: *"There were dead crocodiles in the river. All the local people said, cane toads. I haven't seen any dead crocodiles since I've been back [in 2012] (M3)."* This official speculated that perhaps crocodiles have been able to adjust to living with cane toads within the few years that they've been around.

As locals are noticing the slow increase in numbers of native animals, which declined after the arrival of the cane toad, they have a strong desire to protect their resurgence by limiting hunting. *"When I was just at Manmoyi we got ... a goanna. He was big. Everyone was like wow! Because they hadn't seen them for so long. So they were*

really happy ... they didn't even eat it. They just said, "We're going to let it go just so it can keep living" (M15)."

Introduced weeds are overrunning wetlands, creeks and rivers and there is great concern that they out-compete native vegetation while reducing water quality and covering surface water causing knock-on impacts to aquatic life. *"Algae are at Wadjalayi and weeds have got so healthy in the billabong that we can't even go into the billabong, it's too thick (N2)."*

Similarly, a Dabu Jajikal ranger noted, *"Some different plants coming in to this area, some are pests like lantana ... some are from birds (W5)."* *Parkinsonia*, mimosa, rubber bush and gamba grass were also cited as problem weeds. *"And sometimes they see different weeds that we haven't seen before around here (M13)."*

After a heavy wet season, gamba grass creates opportunities for large fires in the dry season which not only cause damage to bush tucker and bush medicine but also have a devastating impact on the communities people reside in. *"Dry season, we're getting a lot of bad fire because of all the weed grow; different weed. Like, gamba grass, mission grass, like that (M12)."* In Broome, the rangers expressed similar concerns noting that some weeds burn at very high temperatures, thus exacerbating fire conditions.

10.2.3.3 Strategies

All study locations agreed that more information needs to be disseminated and knowledge shared between Indigenous and non-Indigenous groups, so that people are able to make well-informed decisions on the best practical solutions for limiting their impact on local flora and fauna. Moreover, all regions want to continue sharing the country with all Australians, but many called for individuals, families, groups, governments and industry to take responsibility in caring for the environment around them. *"Today's life, we waste and misuse things. But for us here, you need to create respecting, and that's what we want to continue doing, so it can provide us continually, you know, and naturally (W3)."*

An Indigenous tour guide commented, *"I get people to reflect what they're doing about life, and that's what we need to do about our environment. We need to believe that it's okay for us to live here. The other thing is we need to make sure that we have this education about where we're living and what type of environment we're having. We've got to take care of it. It really doesn't matter if we live in an economical society. We have to be conscious about this. And if we're not conscious about this, well, then, we're gonna keep killing it (W11)."*

In order to develop strategies that deal with real-time issues causing impacts on native flora and fauna, the Roebuck Bay Working Group established a *"bottom-up approach to engender stewardship with a top-down approach to ensure the inclusion of statutory obligations, regulatory tools and best use of resources (B11)."* This approach was taken to *"ensure greater understanding, build effective relationships across sectors, maximize resources and reduce duplication (B11)."*

Other suggested strategies include:

- Environmental services undertake a holistic management of country to reduce and manage climate change risks.
- Need for recognition of Traditional knowledge and better cooperation with scientists and Indigenous communities. *"Scientists working on it, right now ... but ... [our] people been scientists for a long, long time in countryman side. They can see, they can tell how weather change, they can see flower changing (M12)."*

- Youth education programs. *"I find them really sensitive to environmental issues ... they're the ones you have to work with, your kids (B4)."*
- Recognition and protection of multiple values of vulnerable ecosystems to Indigenous communities. For example, changes to ecosystems such as the protected monsoon vine thickets around the Broome region will result in loss of bush tucker but also the loss of an important cultural site. Moreover, where trees are changing along the coastline this may impact song cycles. *"Other people further down the song cycle they can't comprehend this, it's become very important for the people (B8)."* *"The next generation [is] going to get confused (M2)."* However, cultural heritage is hard to protect *"because you can't see a healing property (W3)."*
- More focus on remote areas and their vulnerability to changes in climate. *"There's a lot of focus done on areas where there's more populations than areas where there's none, you know. Let's face it, that's reality (W3)."*

See sections on rangers (10.2.8.5.1) and environmental management strategies (10.2.8.6) for more information.

Also see sections B1 to B3 in the Appendix for information on loss of biodiversity derived from the Broome workshop discussions on:

- Physical impacts of that hazard.
- Other factors within the community that exacerbate that hazard.
- What can be done?
- Changes that have already been undertaken.
- What else can be done?
- What conflicts exist between making these changes and culture/livelihood?
- Who's responsible for making changes?
- What barriers prevent these changes from occurring?
- How do we get these people to take action?

10.2.4 Emergency Management

10.2.4.1 Communication and warnings

The tropical north is well versed in dealing with extreme weather events: *"The alerts are well established and the towns know what they mean (B16)."* Nevertheless, in an effort to enhance preparedness and response around the Broome and Far North Queensland regions, literature on bushfires, cyclones etc., is actively distributed to local communities by official agencies. This includes information disseminated through schools, tourist bureaus, service stations and hotels. However, some feel that this isn't enough. There is a call for the implementation of more education campaigns across Australia in an effort to increase tourist awareness of bushfire risk in remote locations with respect to properly extinguishing campfires. Concern about bushfires ignited from abandoned campfires was cited as an issue in all case study locations.

In Maningrida, the local SES use doorknocking to adequately disseminate hazard information and advice and calls are made to outstations. One Traditional Owner from an outstation recalled watching the television for news of Cyclone Monica. He also received calls from the police and rangers in Maningrida. In Ngukurr, police are responsible for circulating information on cyclone watches/warnings throughout the community and to Urapunga, when it is accessible by road. Information is provided by phone to the more distant and remote locations, such as Wanmurri, Roper Fishing Village, Limmen Bight and Roper Bar Store. Upon receiving warning advice, Roper Bar Store personnel communicate information to the outstation Badawarka.

The Cairns District Regional Council reported that: *"The basic strategy for warning people at the moment is you either watch the TV, you get on Facebook, you get onto*

the website or as I keep hammering with everybody you have a battery-operated radio and you listen to ABC on the assumption you can get it; I mean, that's the only station we've got that does reach a reasonable amount around the region with some reliability ... but there are no other kind of automated warning systems anywhere in the region at the moment (W10)".

In certain regions, a lack of science and monitoring has impeded the provision of warnings but some officials described measures currently being undertaken to address these issues. For example, the Cairns Regional Council discussed updating their flood early warning systems with *"standalone Wi-Fi, [and] solar-powered radar that looks into the river streams, giving water depth comparisons."* This is particularly useful for determining the extent of flooding across roads and bridges *"and it comes with real-time video and still photography, with white light at night-time, so we can get a pretty good indication of what status those roads are (W4)."*

The lack of monitoring became a concern for officials in Maningrida during Cyclone Monica. *"We were getting information saying, 'It's nowhere near you' (M7)."* Despite these predictions, the community was experiencing very strong winds and were losing communication. This anomaly was explained as: *"We sit in a radar loop ... we sit in an area where they basically guess from their last reading to the next reading (M7)."* During a teleconference meeting, Darwin officials told Maningrida officials, *"Look, we really don't know where this is [the cyclone]. This is the latest reading (M7)."* In response, a local Maningrida police officer opened the door to the station and stuck the phone outside for Darwin to hear what they were experiencing. Darwin's response to this was, *"I think we've found the cyclone! (M7)"* Since Monica, the Bureau of Meteorology has installed a radar facility at Waruwi on Goulburn Island in order to fill this apparent gap in monitoring and predictions (ABC News, 2012).

In 2012, the Cairns Regional Council updated their cyclone brochure, publishing it in ten different languages. Unfortunately, this did not include any Indigenous languages. However, officials within the council have raised that as a concern. Officials have discussed the possibility of partnering with Bumma Bipperra Radio, which is the local Indigenous network in Cairns, and they are keen to broadcast hazard and response information to their listeners if an event is imminent. Apparently, this has not been done before. Nevertheless, according to the Wujal Wujal Aboriginal Shire Local Disaster Management Plan, the Local Disaster Management Group will broadcast warning messages to the community via the Remote Indigenous Broadcast Service, which is designed for local news and local people (Wujal Wujal Aboriginal Shire Council, 2012a).

Regarding communication in and around Wujal Wujal, researchers from James Cook University report:

"Radio and telephone networks servicing the community are very limited. AM Easy Listening is broadly accessible but does not give adequate weather reports, but the region is outside their licensed broadcast area. Advice from ABA is that any reception is quote 'fortuitous'. This reception also varies greatly – a field strength test has previously been conducted showing very poor results. ABC Far North from Cairns, which provides detailed weather reports, is now available by satellite for those with equipment, but is already proving unreliable during rain, and other unfavourable weather conditions. Neither digital nor satellite telephones can be used in the catchment. Most areas have underground telephone systems with a small area above ground. The system gets badly affected in some areas due to saturated ground (Cottrell et al., 2001; p.5)."

Although communication lines were available at many (but not all) outstations we visited, there are often no mobile service networks and only one bush phone available, which proves problematic for residents: *"I can't hear it! There's only one phone in the community. There is no mobile phone coverage (N5)."* Therefore, it can be difficult to get information in, especially when the community is inaccessible by road due to flooding.

Equally important is the means to get information out: *"We don't have any magic kind of alert system to tell us that there's something terrible going on in Wujal or anywhere else (W10)".* When asked if something goes wrong, is there any way of contacting officials, a resident living outside of the Wujal Wujal community commented, *"Nothing. Nothing at all. You're on your own. And if you run out of food, well ... you run out of food (W3)."* However, another official remarked that even if they receive calls for assistance from remote communities after a cyclone, they are more than likely unable to assist because the road is *"totally blocked (W7)."*

Communication issues were also raised in terms of essential services. Some communities experience power-outs on a fairly regular basis, with one reason being that power lines rub together during the wet season. While it is difficult for people to prepare for specific events of such nature, there are certain things that they can do in general preparation, such as always having a battery powered torch and a radio on hand.

As part of their emergency preparation for the wet season, officials provide UHF radio training to relevant staff. UHF radio is a critical alternative during periods of increased cloud cover (i.e. during cyclones and general wet season) as satellite phones are unable to connect to the network. However, the Bana Yarralji rangers have only a satellite phone on their property, which is an issue, particularly during the wet season, as it is unreliable. Instead, they rely on receiving warnings by a) word-of-mouth, from people living off base and b) internet, as there is no radio reception. Understandably, this is problematic given that the internet is hooked up via satellite (cloud cover preventing network connection) and is reliant on power. The ranger vehicles have UHF radios but these do not work well within the valley where the base is situated.

Many officials recognise the importance of connecting into existing communication networks within communities, using a communication tree to disseminate information where it is needed: *"We need really to get in there and work a lot harder and a lot more than what we have in the past ... that communication tree¹² being a fundamental first response, if you like, of that community to take it on ... because it already exists, it already happens. But to formalise it would be our way of getting it going (W4)."*

In order to achieve this, one official described providing educational material at the household level to ensure that the information was up-to-date and correct: *"Just kind of letting people know what's more up-to-date and what isn't because I think we've got a lot of misconceptions around information and, you know, we'll either get it all through the mobile network or we won't. And for more isolated communities, particularly in ... you know, in Far North Queensland social media's not the answer to the whole world (W10)."*

¹² A communication tree is an expanded version of a phone tree. A phone tree is a network of people organized in a pyramid structure so they can quickly spread information amongst each other. The communication process is started by a person at the top who contacts a list of people who each contact a list of other people, enabling information to reach a large number of people in a short time (www.co.monroe.mi.us).

"I honestly don't know how, you know, [an official] in Mossman would think about alerting people in Wujal Wujal to an impending disaster; we don't have cyclone warning sirens, you know, that are automated systems or tsunami warning sirens ... Nobody's really talking about that (W10)."

10.2.4.2 Policy and planning

The local State Emergency Services unit in Maningrida has written doorknocking into their Disaster Management Plan to ensure local residents are aware of an impending risk.

"When we go round door-to-door, we'll try and take Indigenous people with us that can converse in language ... And we also then split the members up into single units, where everyone can go by themselves with a couple of Indigenous fellows, and hit more places, and get information out there. So, yeah, so that's good; that's what's come out of that. And for sure, next time there's a big cyclone, if I'm still here – and hopefully the plan continues on after I'm gone – they'll be used properly (M7)."

Calls are also made to outstations to provide advice and receive information on how many people are out there and if they need to be brought into the community. However, this was not always done in the past: *"That's one thing we learnt from Monica ... we found out there were people at the outstations; but what we never thought about was ... cyclones don't usually go that far inland (M7)."* Due to extensive inland flooding, there was no access to outstations by road, rendering evacuation impossible.

For Bana Yarralji, emergency planning policy does not take into account their vulnerability in terms of lack of resources. Additionally, the way the ranger service has been established prevents any separation between work and living areas. As a result, conflicts and personal issues are brought onsite, which impedes their ability to prepare for, and respond to, emergency situations. This is especially crucial, as they live in a remote area where it is expected that they will be able to operate with a high degree of self-reliance. Although the Cairns Regional Council's level of support is increasing further north, officials recognise that *"the very nature of ... that area and its population ... they're very much self reliant (W4)."*

Limited resources have impeded the development of emergency response plans in outlying communities within the Shire of Broome. However, Department of Fire and Emergency Services are in the process of updating them with community input. Nevertheless, communities have been undertaking their own preparedness initiatives: *"We do our own firebreaks. I mean, we do a lot of the other communities as well, their firebreaks, 'cause we've got the gear here, the graders and everything (B9)."* Fire management strategies also involve back-burning, with local rangers working alongside Department of Fire and Emergency Services officials.

As local government has limited resources within the Shire of Broome, Department of Fire and Emergency Services and Emergency Management Western Australia provide support and assistance to establish a whole-government approach to emergency management. This approach is centred on the *Emergency Management Act of 2005* and the emergency management framework that sits around that Act: *"We advise and assist local governments in, with their land development, recovery plan, exercising, training and, you know, all their special projects such as this (B16)."*

Within the Shire of Broome, sub-arrangements will be developed for the communities of Bidiyadanga, Djarindjin/Lombadina, Ardyaloon (One Arm Point) and Beagle Bay. These arrangements will sit underneath the Local Emergency Management Arrangements that have been developed for the Shire of Broome. The reason for

developing separate sub-arrangements is to “keep [the] knowledge base so everyone’s aware and when the time comes everyone’s nice and consistent and everyone can sort of act quickly and effectively (B16).” Each community version will be different, due to the varying agents that service each area. Accordingly, the plans will take some time to develop. However, the importance of this exercise was highlighted in terms of knowledge being constantly lost every year due to the transiency of the workforce. Currently, a pilot study is being completed for the community of Warmun and, once this is done, a similar methodology will be used to develop the community plan for Bidiyadanga.

“The only issue for us is I’d like to have plans in place as soon as possible. Just so I know that if something happens there’s a coordination there and there’s less risk to life basically. But they’ve also got to understand the myriad of complexities that exist within different communities (B16).”

Similarly, Community Action Groups (CAG) are being established in regional areas within the Cairns Regional Council District. The CAGs have their own operational plans to ascertain their needs while documenting what they’re doing and how they’re coping. This information is shared with the Cairns Regional Council Disaster Centre.

“So then we’re able to formulate a plan as to how to best assist them, prioritise our response, et cetera ... and that’s what is envisaged. It’s halfway complete, and unfortunately, we ran out of time this year, in this off-season, to finalise that. But, you know, we hope to have it finalised and something in place for next year (W4).”

We witnessed a similar situation at the ranger base and caravan park site at Shipton’s Flat.

While several of our respondents raised the issue of racism, one official openly discussed it in terms of emergency management.

“What I have found is that there’s a lot of racism here ... technically the council’s very accepting and very open and has all these Indigenous equality policies and all these things but actually ... population-wise there’s a lot of racism; I hear the most appalling comments and some of them come from some of my colleagues within the council ... most of it seems to be around disaster awareness and preparedness in general; the problems we’re having are around social systems and social gaps because the success of the system relies on communities helping each other at its most basic level and that’s wearing down pretty quickly all over the place. It’s just the way it is (W10).”

10.2.4.3 Preparedness

Information on how to prepare for extreme weather events is distributed via social networks within various communities, but in Queensland it is suggested that this hasn’t ventured as far north to Wujal Wujal from Cairns. An official highlighted that there is a real barrier between social networks along the coast from Port Douglas to the north. Nevertheless, Wujal Wujal has its own Local Disaster Management Plan and within this, it declares that “a comprehensive, all hazards, all agencies approach” will be undertaken “by achieving the right balance of prevention, preparedness, response and recovery (Wujal Wujal Aboriginal Shire Council, 2012a; p. 10).” However, this completed plan is one of many, which are yet to be finished, that will form the Disaster Management System.

From the Cairns perspective, a disaster management official declared that they were keen to find out what people in the north of their region know about emergency management and how they plan for it. *“I’m kind of assuming that because everybody*

else up north is aware of isolation and the problems and the issues and they've been through it before that they're probably better prepared than most (W10)."

This is certainly true for Bana Yarralji, at Shipton's Flat, where they take particular precautions for various hazards. These include ensuring there is a plentiful supply of fresh drinking water and essential food items, as well as reliable 4WD vehicles with appropriate recovery equipment in case evacuation is deemed necessary.

"Our people don't run away from the flood. They go fishing in the river for jewfish, catfish ... That's our culture. But when the river rises up to our house, we go, we leave the house, when our house is not up to standard. Our preparation now is just to stock up and be ready. Get phone numbers and stuff. Same as our cyclone management plan (W6)."

Fire management in terms of the construction and maintenance of fire breaks, is also undertaken by the Bana Yarralji Rangers, along with assistance from the Cook Shire. For the Cook Shire, this is done on an annual basis, if funding allows. Some of the Bana Yarralji Rangers have successfully completed fire management training and are certified fire wardens. If outside assistance is needed, local wardens, who take on an all-hazards approach, are based within the Cook Shire (Figure 10.3). The closest hazard wardens to the Bana Yarralji ranger base at Shipton's Flat, which is in the Cook Shire, are at Rossville and Ayton – within about 13 kilometres and 22 kilometres, respectively. An official noted that this was an excellent idea that was currently missing from emergency management strategies in Cairns Regional Council.



Figure 10.3: In preparation for cyclone season, the Cook Shire Council has compiled emergency response kits, which will be distributed to all hazard wardens. Photo: Deanne Bird.

In Lombadina, boats and machinery are locked up and caravans are strapped down in preparation for a cyclone. Nirrumbuk Aboriginal Corporation provides the resources for car bodies to be removed from communities. Within government tenancy agreements, people aren't allowed to have cars left on their properties for more than a few months and Nirrumbuk have the power to remove them for the cyclone season.

Removal of car bodies in Maningrida is more of an issue: *"We're fighting a battle at the moment to get the cars removed from the community ... as you can see, there's so many here, because for the last three years, it hasn't been done (M7)."*

One official believes that this lack of preparedness makes Maningrida vulnerable to cyclone. In comparison, they believe that preparedness is what saved many lives during Cyclone Monica: *"The good luck of that cyclone was there was so long to prepare before it got to us ... we had literally five days (M7)." And this was accountable to "everyone pulling together (M7)."*

"If you're going to get a big one again, which I'm hoping we never, ever have a cyclone here again. It's going to be about the preparedness. And that's where I don't think they want to spend the money, or they don't have the money. Like, we've heard so many times, the Shire's broke ... when we had the council it was just like, "Yep, we're moving your car. It's going to be at the car dump. If you want parts off it, you can go and get the parts from there." The council were quite firm on, "This is what happens every cyclone season." (M7)."

Since Monica, local councils within the Northern Territory have amalgamated into "super shires" (see section 10.2.8.3 and ABC Darwin, 2012 for details) and, according to reports, the West Arnhem Shire, which encompasses Maningrida, is reluctant to assist in preparation:

"So in the clean-up period, where you're supposed to clean up before the cyclone season starts, the shire reckons, (1) it's not their job, (2) it's too expensive, and (3) they don't believe they can ask people to remove their cars or, or ask permission to remove them. So it hasn't been done. But like, in Monica, cars moved ... boats moved ... they were lifted up and moved ... they're the things we learned that you have to, like, get out of town ... How much does it cost to take the car to the dump with a forklift? ... It's not that much, compared to if a car flies through the air, smashes your \$300,000, \$400,000 house and kills some people ... It's not going to compare to lifting the cars out of the community and taking them to one place (M7)."

Upon our return to Maningrida in January 2013, we witnessed the removal of car bodies from the community. When asked, an official reported that the Bawinanga Aboriginal Corporation was undertaking this exercise because they, rather than the council, have the sort of equipment that is needed.

Significantly, Ngukurr does not have a specific emergency response group or local state emergency services unit like Broome, Maningrida and Wujal Wujal. In Ngukurr, preparedness responsibilities fall upon all agencies within the community (Northern Territory Emergency Service, 2009a). Prior to cyclone season, the Shire organises for corrugated iron and other debris to be cleaned up around the community. The Shire is also proactive in removing trees deemed damageable during cyclones.

In terms of preparedness, a local Traditional Owner of Ngukurr discussed the importance of sharing cultural knowledge about bush tucker with children: *"They have to know because they can't live in their settlement like that. We might have another drought. They gotta be able to go out and hunt for kangaroo or for ducks and lily seed and everything which is out there (N4)."*

10.2.4.4 Prevention/mitigation

Over the past few years, fires have been a major issue for the Shire of Broome, with significant rains encouraging the growth of spear grass, which, when burnt, creates fast, out-of-control fires. However, only Bidyadanga and Djarindjin have firefighting trucks, which are in various states of operation. One official noted that there is speculation regarding a fire station being built at Cape Leveque. In the meantime, the Department of Fire and Emergency Services has provided equipment to ranger groups

to enable them to assist in the management of wildfires. As such, they believe that there is more pressure on ranger groups to become volunteer fire fighters.

“And sometimes those fires are just so massive ... nobody can really do anything about them; I mean, they just end up burning and burning and burning ... they just kind of get ignored because they’re so hot ... unless they’re threatening infrastructure (B2).”

Within Broome, some officials voiced concern about the potential for fires from areas such as Minyirr Park. Because it is close to town, prescribed burns are restricted even though it’s *“been a fair while since they’ve been able to burn I think through there (B21).”* According to officials, this regulation came about *“because of what happened down south ... fires around Margaret River so we’re not allowed to burn within five k’s of the town or populated area (B21).”* This issue was also raised during the Broome workshop with officials citing recommendations arising from the Keelty report (2012). However, it was reported that efforts are being made to *“develop some sort of a system so that we can burn in town (B21).”*

The Maningrida Emergency Response Group took the initiative and raised money for fire protection training and equipment, including the purchase of a fire truck (which is no longer operational). Their responsibilities are to protect property, including outstations, if they believe they can arrive within a reasonable time. However, given the distance to some properties from Maningrida, this is often not realistic. Large-scale fire mitigation is handled by the Djelk Rangers.

In addition to the loss of their fire truck, the positioning of fire hydrants around town also impedes the Maningrida Emergency Response Group. They are supposed to be 50 metres apart but some are 200 metres, which obviously doesn’t work well with their 30 metre hoses. *“And wouldn’t it be better to invest in a fire truck again? ... if a house does burn, you’re not paying \$300,000 – \$400,000 to replace it (M7).”*

Other mitigation work in Maningrida has included the removal of shallow-rooted trees, such as Poinciana and Mahogany, which were an issue during Cyclone Monica (Figure 10.4). This practice was deemed necessary because *“underground, they ripped up every pipe in the community basically; and aboveground, they just took down every power line (M7).”*



Figure 10.4: Trees brought down in Maningrida during Cyclone Monica, 2006.
Photos: courtesy of the Maningrida Emergency Response Group.

In Ngukurr, one of the Traditional Owners called for fire mitigation work to be undertaken around small clumps of sandalwood: *“I’ve been saying that someone*

should grade it around. You know. Keep the fire, away from there. To protect them. Otherwise we won't be able to find any [sandalwood] (N25)."

While there is increasing pressure on ranger groups to double as voluntary fire fighters, this is problematic due to the size of the bushfires and the lack of fire fighting equipment in communities.

For mitigation in relation to increasing wet season access to communities, see section 10.2.5.2.

10.2.4.5 Response and recovery

Respondents highlighted various means of response. An elder of Ngukurr proudly described her father's reaction to the relentless wet season of 1939/40 – he came and collected her and her sisters from the mission girls' dormitory, located on the Roper River, and evacuated them across the river and up a mountain: *"We've been camping there now, waiting for the flood to go down (N25)."* While the rest of the mission people evacuated to Manugani/Mt St George:

"They stayed there with the missionaries and all them mob, until the flood went down. But us mob, my dad and all my sisters and my mummy, we went across on a canoe to that hill. Across there where that mark is, but sunrise side. Yuwayi, it brings all the memories back. Makes me sad too (N25)."

A Traditional Owner from West Arnhem Land remembered sheltering in place when large storms approached Maningrida: *"We stayed in the house, we were cramped in a small area all my brothers and, you know, my sisters ... we all sheltered up in a small corner. 'Cause maybe the smaller little bit of corners would be the strongest part (M2)."*

Similarly, another Traditional Owner described living out on country when he was young and how he stayed safe during cyclones: *"I was safe. I had a good family, they know the weather. They know what they were doing. They heard noise and told me to stay inside (M11)."*

In a more recent event, a resident recalled going inland at the news of Cyclone Monica. He had looked at reports on the internet and decided to take his family away from the coast. *"I knew it was coming, so I took off. Then we came back the next day. We seen trees and leaves all along the highway (M13)."* When asked if many people left Maningrida he responded, *"Not really. Some did (M13)."* He was then asked if he would respond in the same way if another cyclone was predicted to hit Maningrida, to which he replied, *"Oh, yeah (M13)."*

One official stressed the need for reciprocity of information to aid response and recovery in remote communities: *"Information is being put out ... before the event by that communication tree and then, afterwards, we're hoping for the reciprocal turn out, where that information flows back to the coordination centre (W4)."*

However, if a disaster occurs and locals are able to communicate a call for help, it is questionable how long outside aid will take to reach those in remote locations. External partners cannot always guarantee resources will be available if there is widespread devastation across the region: *"If it's something really big, there's just not enough resource to go around (W10)."* Moreover, access may be impossible even if resources are available. This is particularly evident in a place like Wujal Wujal, where road access is often restricted due to flooding (and maybe landslides) and air rescues are difficult due to the local topography exacerbating bad weather conditions. Nevertheless, officials in Cairns stated that they had the means to administer food drops to

communities (using light aircraft, helicopters or coastal/shoreline drop-offs) if they needed to resupply before road access was available. However, the Bloomfield valley, in which Wujal Wujal is situated, becomes heavily clouded-in during periods of substantial rain, precluding food drops by any type of aircraft.

"The thing that's difficult for remote communities is the isolation factor puts them at more risk over time so it's hard to get there for re-supply and to deal with, you know, triple 0-type emergencies and things like that ... I don't think it would matter what the council did or any other emergency service did it's just going to be really difficult to resupply and deal with places that are further away, you know, given that you can't necessarily get from Woree to Edge Hill for two days (W10)."

To put it quite frankly, the above official stated: *"This is just entirely my opinion; I suspect that most of the council has fuck-all interest in, you know, the north of the region really (W10)."*

In addition to dealing with evacuations in the lead up to Cyclone Monica (see section 10.2.4.6), there was an issue with house fires. As the wind started to pick up, houses were still connected to mains power. *"They were arcing and causing fires in the houses ... some dodgy electrician stuff. So, we were going and using the fire truck for those things, right before everything went down (M7)."*

In the days after Cyclone Monica, the main concern for the Maningrida Emergency Response Group was *"water and power, and getting the clinic up and running, and then hopefully opening a shop (M7)."* Reopening of the school was their last priority but this effort was impeded by the presence of asbestos.

Local residents were unable to withdraw money from the automatic teller machines in Maningrida due to the power outage. Therefore, they had no money to buy essential items for cleaning up. Maningrida Emergency Response Group stepped in and purchased hoses so they could hose out debris and mud from their homes. Of greater concern was one man they purchased a power cord for, so he could hook up to his neighbour's house for electricity to run his nebulizer.

"We had to, like, actually buy him a power cord so he could lie on a sheet, on a tarp, outside his fucking totally trashed house ... the only thing we could do for him was, get him a tent from school ... give him like a fucked-up swag that one of us could find, that was basically wet anyway, and hook him up with power. And, like I mean, he was a really old man, you know. He was devastated; he cried and cried and cried. So, and then there were houses like this, that you just had to go in and give them ... like, we were buying brooms, rakes for people, hoses (M7)."

This man passed away not long after Cyclone Monica, as did another elderly man who had also lost his house. The official speculated that they may have come to an early death due to the stress and trauma they experienced following Cyclone Monica.

"These guys were happy living in tents in fuckin' very crowded conditions after we lost 15 to 20 houses [see Figure 10.5] ... for months and months and months. And it took Balanda people to get the ABC out here to actually give a shit, before Indigenous people started to go, "Yeah, where are our fuckin' mattresses? Like, we'd like to sleep."(M7)."



Figure 10.5: Some of the homes that were destroyed in Cyclone Monica. Photo: courtesy of Maningrida Emergency Response Group.

The above statement is supported by online news reports from the ABC (see ABC News, 2006b; ABC News, 2006a for details). Despite this specific lack of assistance, it was reported that government help did arrive within a few days. The Northern Territory Emergency Service together with PowerWater sent in groups from Darwin to assist with the clean-up. However, an official noted that no other outside help arrived: *“The police didn’t even get reinforcements (M7).”* Assistance also arrived in the form of clothes and bed linen. One official speculated that this mostly came from ex-Maningrida citizens because they knew how long the government response was going to take.

10.2.4.6 Evacuation

“Because you’ve got 400 people, you know, nearly 500 people living in the community. There’s no safe house. If there was a warning given, saying you know, something big is coming, where are they going to take our people? The authorities need to think about putting something away from the community that can accommodate us for a certain amount of period ... They can’t just pick us up and take us to Cooktown or Cairns (W3).”

It is, however, a different story for remote communities on the Dampier Peninsula. If there is a category 4 or 5 cyclone heading their way, they will be evacuated. Residents are evacuated by air (helicopter) or road (if open) to Derby or Broome. This is typically done 12 hours before the cyclone is predicted to make landfall. Evacuees are admitted to one of Broome’s four refuge centres, with Broome Recreational Aquatic Centre being the most recent addition to the network. The Department of Child Protection provides assistance, with containers stockpiled with bedding, blankets and food packs. They also provide local welfare support plans for communities. Because Broome is a service centre for mining in remote regions, there is a decent capacity for helicopter and rotary aircraft, which are called upon for assistance if evacuation is deemed necessary in outlying communities and outstations within the Shire of Broome.

Nevertheless, some residents in Ardyaloon did not believe a cyclone would impact them as they typically go *“around us ... cyclone would never go flat bang into rocks because it would ‘finish up’ (B27).”* Another resident from a different outlying Broome community knew that he would lose his roof in a large cyclone. However, he was adamant that he would not take shelter in town due to the mass panic of some residents. *“I got no worry about cyclone. But you definitely don’t go in town. The panic is in the supermarket first. And then everybody lining up in the airport to go (B8).”*

At one of outstations that we visited in Maningrida, their emergency response procedure is to evacuate to the one local house that is built to cyclone standard. The local Traditional Owner did not consider evacuating from the outstation an option: *"All the time, we live here. And it doesn't matter what, what storm is, you know, but we still stay here (M6)."* Even so, local officials based in Maningrida have the power to call for an evacuation of the outstations if a large event is predicted to impact the region.

"It's up to the OIC. The OIC of police is always in charge of everything, so they make that ... call. But it is definitely now something we have to take into account. And now, I think, with last year's wet seasons, all the flooding, we're going to have to take it into account a bit more in respects to not just cyclone, cyclones coming, but wet season time (M7)."

Evacuating Maningrida is also not out of the question. Due to the remote location and population size, evacuation, if deemed necessary, must be undertaken many days in advance. Prior to Cyclone Monica making landfall in 2006, emergency management officials believed the best response would be to evacuate the community. However, local officials knew that it was too late.

"That order's about two days too late. Like, you know, to evacuate 3,000 people, way too late. And the same with Milingimbi. You know, they were asking on the day of the cyclone, whether we should have evacuated Milingimbi and all that. It is way too late for them; they're just going to have to bunker down and hope for the best (M7)."

Past experience from other cyclones ensured the local disaster response teams in Maningrida took action early to guarantee that residents were in shelters well before they needed to be.

"We got everyone we needed to into shelters well before time, which we'd learnt from other ones where, you know, if a cyclone's coming late at night, we'd go, "Oh well, let's just move everyone four hours before the cyclone." Then we'd be trying to move people at night; it was ridiculous. So we learnt from that (M7)."

However, the refuge centres did not escape damage. During Cyclone Monica, many people sheltered in classrooms at the local school. There were around 160 people sheltering in one section of the high school – four classrooms with 40 people in each. At one point, an official stepped outside to take a break and in doing so, witnessed the roof of the neighbouring building *"peel off (M7)"* and fly towards the classrooms. It came to rest draped across the building where the 160 people were sheltering, piercing the roof as it landed (Figure 10.6).



Figure 10.6: A section of roof on one of the high school buildings ripped off during Cyclone Monica and pierced through the roof of a neighbouring building, where 160 people were sheltering from the storm. Photos: courtesy of the Maningrida Emergency Response Group.

"I knew the whole roof had landed on top of it [the shelter] ... then I went to the first classroom. And by this stage, we'd well lost power, so it's pitch black. Got my torch, opened the door, and I've gone, 'Where are all the people? Where are all the people? There you are.'" Forty people in one corner just like ... And I'm going, 'Well, what are they looking at?' I shine the torch up there, and there's beams that are smashed through the shelter roof into that room ... Go to the next room; same thing, in the second room. And because, like, all the beams had come through from the high school pointing down ... it's pissing rain [into the classrooms]. And I'm like, we've got to move 80 people into the room where there's already 80 people. And they're at their max at that. And so we tried to move all the 80 into those two rooms. And then for the next three hours, it just went ... because it was connected as a roof, it couldn't fly any further; it just went smash, smash, smash. Quietened them all up, that was good. But, yeah. It was fuckin' scary (M7)."

Despite the vulnerability of northern Australia to cyclone, there is concern about the inadequacy and limited capacity of refuge shelters. Our research revealed a lack of shelters, coupled with a lack of ablution facilities within existing shelters. Considering that evacuees often take refuge within these buildings for up to ten hours, toilet facilities are essential.

"Especially now we've got the local law, we go in, in daylight; no matter when the cyclone finishes, we come out in daylight. Which is way more safer because you can't let people out in the middle of the night. 'Yeah, cyclone's over. Watch those wires you're stepping over.'" And, 'You're not going back to a house? Well, you'll be right.' You can't do that! (M7)."

However, in the larger centres like the Shire of Broome and the Cook Shire and Cairns Regional Council, (which the latter two surround Wujal Wujal to the north and south respectively) residents are encouraged to seek shelter at home or with family and friends. This is because refuge facilities are not built to accommodate large numbers of people, or withstand the conditions: *"I mean, most of the places we put people bar one at the moment are no safer than being anywhere else outside of the storm surge zone; it's just a big building (W10)."* Nevertheless, both the Cairns and Cook Shire have designated refuge centres that are built to withstand category 5 cyclones.

If, for instance, people from Wujal Wujal have already come into Cairns and decided to sleep rough¹³, in the event of an impending disaster they are picked up under the Cairns Homelessness Hub program and taken to a refuge centre¹⁴. According to one official, this worked well during Cyclone Yasi (which was only a Category 1 in Cairns). To ease demand on refuge centres, the Cairns Regional Council has partnered with St John's Ambulance: "*St John's Ambulance are working on some role with us for places of refuge predominantly so we've got a bit more help during emergencies (W10).*" However, people living in isolated places, such as Bana Yarralji in Shipton's Flat, must be self-reliant.

In Ngukurr, Shire officials questioned who had the authority to certify which buildings have been brought up to cyclone standard. It appears that there is a lack of information being supplied to the Shire when new buildings are developed and old buildings are refurbished. This is essential information, given that the community needs to know where to go in an emergency. Moreover, if considered necessary, residents from Numbulwar and Urapunga will be evacuated to Ngukurr, increasing the space requirements at designated shelters. At the time of fieldwork, the local school was the only designated refuge centre for cyclones. While the school is closed for up to three weeks during Christmas and New Year, a master key is left with the Police. As with the other communities, all new houses in Ngukurr are built to cyclone standard, eliminating the need for many local residents to evacuate to the school.

For sudden extreme weather events, in addition to evacuation by government, people have developed their own evacuation strategies. In the past, they would go to well-known sheltered areas when a cyclone was coming, build humpies and wait for it to pass. With the arrival of cars in communities, "*there were mobs that drove out of town, thinking that would be safe, which is the usual thing; there will be families that get in their cars and go bush (M7).*" Self-evacuation by airplane is beyond the reach of most. "*Some Balandas even sent their families out. See, they have that luxury. Aboriginal people didn't have that luxury; they couldn't quickly find \$600 per person to put their kids on a plane, or whatever, you know (M7).*" Another issue identified at the Broome workshop was the problem of accessing and evacuating remote locations. It is difficult to know where everyone is, particularly on outstations.

While an official in Cairns feared that after a big cyclone "*we might have a mini Innisfail, where a lot of people don't come back (W4),*" relocation is not seen as a strategy available to all and is actively opposed by some Indigenous respondents.

"*If somebody says, you know, 'We can't help Wujal Wujal, they got to come and relocate to Cairns,' then ... we don't really want to do that unless I have to, you know. Because this is where I live, and this is where I want to hopefully die and be buried here, you know? (W3)*" This strong connection to country and the resulting reluctance to evacuate/relocate must not be discounted in designing emergency management strategies.

Of note, many officials were asked about segregating various skin/language groups in order to respect avoidance relationships. One official remarked that during Cyclone Monica, "*They [Aboriginal people] didn't care. They just all go together in a situation like that (M7).*" However, a local Aboriginal resident, who was working as an official at the time of Cyclone Monica, stated that he ensured family relationships and cultural protocols were followed: "*We asked the family who lived in older [houses] to move into*

¹³ Also known as "long-grassers" in the Northern Territory.

¹⁴ One official commented that the technical term for evacuation centre is 'places of refuge'. Here we mostly refer to them as refuge centres or refuge shelters.

the cyclone code houses. Some people were okay, others were, no didn't want to move in with that clan. Take us to this mob here? (M2)" He went on to explain:

"I check it out with the group. How are you mob going? How many of you have got cyclone-coded houses? What about these people here, they sleeping in this house, can they come here? "We got a lot of family already." And then I'd go to another one. "So, those mob there, they got people occupied there, but they want to get those people to move in with you, would you accept them?" "Which family? Oh, this family here, skin?" (M2)."

Overall, officials indicated that all measures would be taken to respect Aboriginal culture during evacuations.

10.2.4.7 Strategies

We found that most government officials working in emergency management were not from the local area. While some had been living within the community for many years, most were fairly new to the region (within the last 5 years). Although they had visited outlying communities and outstations, they recognised that they lacked personal experience of dealing with extreme events in these areas. As such, many believed that working with local people and the existing knowledge within communities is essential for increasing community resilience to extreme weather events and slow onset changes.

"[There are] strategies that people have used up there that have been quite successful, I'm sure, and that aren't readily available to me or to my knowledge. So, it comes down to that information flow, backwards and forwards, where we want to really take advantage of their resilience that they've shown in the past, and work that into a Community Plan. Because the Community Plan that's going to be in operation for the Daintree is different to the plan that's going to be in operation for Babinda, obviously (W4)."

"That's always interesting going from that as well, I mean going back, the whole resilience that has built up over thousands of years, you know, so it's nothing new ... It's just a different world now, but that's all ... that's why arrangements that we're developing for the remote Indigenous communities, that's why we're leaving it so reliant on the community to sort of make sure the community version is correct, because they're going to know a heck of a lot more than what we will. So we went to make sure that all that knowledge is ... if they're happy with that, is in the actual arrangements (B16)."

However, Queensland officials were a little more sceptical about the commitment of government agencies working together with local people. *"Here it's more complicated for lots of reasons in terms of so many different groups and different languages and this, that and the other but I don't see any integrated planning around that which, you know, does make things quite difficult for remote communities and that (W10)."*

Respondents recounted stories from the old people about relocating due to climatic events. In Broome, a respondent described elders: *"Only thing that will like knock them out from living there is a big wave, or ice (B23)."* In the present day, relocation due to slow onset changes is not necessarily at the forefront of people's minds. A resident of Broome doesn't think about the need to move due to sea level rise, stating that she: *"live[s] day by day (B9)."* However, other people are more concerned about these events. In Maningrida, the fact that graves need to be shifted *"because some of those graves are starting to erode (M3),"* signals that people are aware of the need to move due to the encroaching shoreline, which was severely eroded by storm surge impacts

during Cyclone Monica. A respondent believed that *“people will move elsewhere when it gets bad ... Maningrida people will just set up camp where they want (M3).”* This decision is made easier due to:

“The land ownership stuff ... It enables Aboriginal people to have a lot more clout over what actually does happen, and so ... if they want to set up a camp somewhere inland they just go and do it. They just go down, knock some trees down and set up a camp, very close to water and all of that, and they don't have to ask anyone's permission to do it ... there's plenty of country here for people to move into. You know, it's not like a big city somewhere where you've got to pay millions of dollars to get a new bit of ground or something (M3).”

Other strategies include:

- To help Aboriginal people return to their homelands following a disaster, CentaCare offers emergency relief assistance. This includes the distribution of food vouchers, clothes and money for emergency travel.
- In an effort to reduce bushfires around the Broome region, there has been a coordinated effort between the police, Department of Fire and Emergency Services and Department of Environment and Conservation, which officials report has resulted in a great reduction of bushfires.

Although the remoteness of our case study communities sometimes impedes their ability to recover when relying on outside assistance, it has also increased their resilience and ability to adapt. Locals have experienced extreme weather events in the past and have learned survival skills from their ancestors who have lived there for, sometimes, thousands of years.

Nevertheless, there are many barriers impeding people's ability to prepare, respond and recover. These include:

- The transient nature of emergency service personnel – plans developed by one group may not follow through to the next.
- Restructuring of council areas – leading to the centralisation of services, thereby increasing vulnerability in remote locations, as essential services are not on-hand. Moreover, it appears that some agencies are either unaware, or have assumed, that outlying communities are up-to-date with emergency management strategies, when, in actual fact, some officials found that they had not been informed of new procedures and did not know what to do. Inconsistencies within regional areas are also apparent in relation to emergency management procedures due to the restructuring of councils and centralisation of services. This can cause major issues during disaster events if various groups are unaware of each other's particular roles and responsibilities.
- Limited money coming from State and Federal coffers for disaster preparedness and mitigation works, particularly in the aftermath of Cyclone Yasi and Queensland flooding in 2010/11. We would expect that following the 2013 flooding in Queensland, there will be even less money available for Far North Queensland.
- Remoteness of communities and outstations – it is difficult to know where everyone is. The major towns are known but some of the outstations are not and it proves problematic to locate everyone when there is a regional fire or impending cyclone.
- Lack of emergency management support from regional centres – despite some efforts, it appears that there is little support from Cairns reaching as far north as Wujal Wujal. This is concerning, given that Wujal Wujal Aboriginal Shire Council relies upon Cairns Regional Council for disaster assistance, as per their Local Disaster Management Plan.

Also see sections B1 to B3 in the Appendix for information on cyclones/storm surges, bushfires and drought derived from the Broome workshop discussions on:

- Physical impacts of that hazard.
- Other factors within the community that exacerbate that hazard.
- What can be done?
- Changes that have already been undertaken.
- What else can be done?
- What conflicts exist between making these changes and culture/livelihood?
- Who's responsible for making changes?
- What barriers prevent these changes from occurring?
- How do we get these people to take action?

10.2.5 Infrastructure

"They're taking me to Canberra, they asking me, "What do you want to do with the homelands?" ... Yeah, I lived all of my life, I've got houses there. House and proper road and ... electricity and water ... everything. We're not living out like a rough element ... those things are vital to us, too. We need them too, now, we were taught about them. Like, water, power and sewerage (N4)."

10.2.5.1 Electricity and water

Many of the remote communities obtain their power from diesel generators, while the smaller outstations also rely on solar power. Bores provide drinking water.

"The solar panels sometimes work, and sometimes it doesn't work because we don't have enough solar to actually generate the battery from the sun ... which is good for the environment ... if there's no clouds around, probably the battery will generate enough power for about two weeks, three weeks. After that, the whole thing dies (M9)."

The solar power program delivered to outstations is referred to as the 'Bushlight Program' (see www.bushlight.org.au/ for details) and many sing its praises.

"This Bushlight program, that's made a huge difference to power availability to people in the bush, and mostly it's without diesel power too, which is great ... the Bushlight program has made a big difference to those communities ... it's made life ... much easier for people in the bush (M3)."

The main power source in the larger communities of Maningrida and Ngukurr is diesel. The Urapunga outstation relies on power supplied from Ngukurr, as they do not have solar. Prior to the start of the wet season, large stocks of diesel are trucked in to maintain power to the communities when road access is no longer available. Nevertheless, power outages are common when lines are brought down during strong winds or when power lines rub together during heavy rain. Following Cyclone Monica, a team from Darwin's Power and Water Corporation took two days to reconnect electricity to the health clinic and three days for one of the shops. However, water remained an issue: *"As soon as it went back on, everyone was like, "Drink it," and then people got sick (M7)."* To reduce the damage to power and water in future events, the Maningrida Emergency Management Group removed trees that they considered to have the potential to rip up water pipes and bring down power lines.

A Ngukurr official noted: *"We've gone from a power supply that you know, was probably really only looking after three or four houses, maybe five, and an office, to a normal power supply you'd expect anywhere in Australia; water supplies you'd expect anywhere in Australia; sewerage you'd expect; roads, roads could be better, but you know (N8)."*

The outstation of Urapunga relies on power from Ngukurr. When asked why they do not have solar at Urapunga, a Traditional Owner explained that they hadn't asked for it. However, given the commitment of the government for funding into outstations, this Traditional Owner stated:

"I have a meeting with senior people this week to talk about things – the future of our place. What we want ... the government are funding outstations now. This year and next year, so we don't want to miss out on some of the funding. We're not going to ask for many, many things ... We just want to ... just everything for start. Like housing and ... solar lights (N4)."

One Traditional Owner from Ngukurr pointed out new bores, which will add to Ngukurr's drinking supply. *"And there's a big, big spring up on the top of the hill there. Plenty of water there all the year round (N4)."* Although water is pumped from the Roper River, bore water is considered better drinking water and large tanks were recently installed to ensure an adequate supply for the community. A reliable clean drinking supply has also been established for Urapunga. *"We're right now. Because they found the water up here, just up the hill there – from the shop straight up – they found fine water. It'll last for 100 years. Spring water. Plenty of water ... we've got a lot of drinking water now (N4)."* In relation to a changing climate, this Traditional Owner later commented: *"We won't be short of water this time; it'll be something else (N4)."*

One of the foremost concerns we heard repeatedly was the *"unbelievable water consumption (N8)"* in Ngukurr. According to one official, *"We're over 1,000 litres per day per person. It's outrageous. It's causing real problems ... our pumps are going 24 hours a day ... it's not sustainable (N8)."* This was, in part, due to people hosing their gardens in the middle of the day. However, it was primarily attributed to the fact that the mains water system was quite old and unable to cope with the added pressure from new homes and additional water tanks. *"So you blow a pipe further down the line. And there's been a fair bit of that (N8)."* To help combat this, residents were asked to report any leakages.

One Ngukurr elder discussed how when she was a child, water was used wisely within the community and elders monitored its use. *"They made sure that we didn't waste the water ... they used to pump the water out for them, for us. They made sure the water wasn't wasted (N1)."*

In regards to Wujal Wujal, one official noted that the community is well catered for in terms of having new sewerage and water treatment plants.

The only comment regarding Broome was in relation to the gas supply, which is located at the local garbage tip. According to one official, thousands of dollars are spent covering the steel dumped at the tip if a cyclone is imminent to prevent it from becoming flying debris which can pierce the gas tanks.

10.2.5.2 Access – airstrips, bridges and roads

"I think communities prove resiliently adaptable ... They will adapt their processes and their requirements and their services [as the climate changes]. The one that needs attention is access (W7)."

Cook Shire officials described mitigation works to improve roads (Figure 10.7a) and bridges between Wujal Wujal and Cooktown in an effort to increase wet season access. However, in the aftermath of Cyclone Yasi and the Queensland flooding in 2010/11, local officials were sceptical about how much money would be available for

Far North Queensland to continue disaster mitigation works such as these. *“I had a politician say to me the other day ... “Don’t count on any money until after 2015.” Which is a worry for us, ‘cause we rely on it (W7).”* Nevertheless, in May 2011, disaster funding to the value of \$5,900,000, \$3,600,000 and \$309,000 was allocated to the Cairns Regional Council, Cook Shire and Wujal Wujal Aboriginal Council, respectively (QRA, 2011).



Figure 10.7a: Roadwork between Cooktown and Wujal Wujal to reduce flooding across roadways during the wet season. 10.7b: The temporary causeway across the Bloomfield River linking Wujal Wujal to southern communities and outstations. Photos: Jeanie Govan.

The causeway at the Bloomfield River, which links Wujal Wujal to southern communities and outstations, was destroyed during Cyclone Yasi. Access across the Bloomfield was limited to a passenger-only ferry and some 4WDs for 15 weeks, until a temporary crossing was constructed (QRA, date unknown). While some respondents commented that the new section of road to the north of Wujal Wujal has helped improve wet season access, many believe that the interim causeway is inadequate (Figure 10.7b). *“We get very big king tide and it goes back up the river and that’s what takes all that stuff out ... washes away the cement. Not a very stable bridge. Some of the big columns are loose (W12).”* Currently, people are too scared to walk across the causeway at night because *“crocs coming right up there, and so, yeah, sometimes if you drive through Wujal at night there’ll be, you know, you might pick people up who just need a ride across (W9).”* There are plans to improve it, however, residents complained that they have been waiting for improvements to this causeway for many years.

Similarly, several respondents highlighted that discussions had been ongoing about the possible construction of a bridge over the Roper and Wilton Rivers in order to provide better access during the wet season. To-date, however, work has not begun and community members are yet to see any plans. Some respondents commented that there was too much talk from the government and not enough action.

Respondents remembered that the old Ngukurr airstrip was located in town but several planes *“got bogged there (N6)”* so they moved it to an area that is not vulnerable to flood. One official recalled living in Ngukurr during the 1970s, when the old airstrip was open and there were regular flights to and from Darwin: *“Communications were fantastic. We had about four or five flights a week on a DC-3 (N8).”* Currently, the airstrip is used only by charter planes, often for government or mining business. The reason for the old airstrip and regular service was that *“the roads were so bad (N8)”*. When asked how they are now in comparison (and considering that there is no longer a plane service in and out of Ngukurr) the same respondent replied, *“There is no difference in the road out here than there was 40 years ago ... it hasn’t gotten any*

better, out this way (N8)." Despite not knowing what was going to be done, there was certainty that the Federal and Northern Territory Governments had designated money for the work: *"At least finally something's going to happen. I mean, two years ago we were cut-off for seven months. So if we can get it back to about a month, that's no big deal (N8)."*

Another official in Ngukurr highlighted the importance of improving the crossings over the Roper and Wilton Rivers. In particular, they believe that the crossing at the Wilton River should be improved to enable residents of Urapunga access to health facilities, food supplies and police support, when needed.

Along with access roads to the community, roads *within* the community are also in need of work. In Maningrida and Ngukurr, we drove along roads in various states of disrepair. *"The bitumen's eroded to the point where, you know, it was this big, now there's that skinny little bit of bitumen in the middle because ... that maintenance hasn't been done (M3)."* Adding to problem roads in Maningrida are those located in the new subdivision where *"none of the roads are drained ... there's no storm drains or anything like that. You've just got bitumen which, as water flows over bitumen it gradually undermines it ... then it collapses and it gets spongy ... that's an ongoing issue (M3)."*

Furthermore, the barge landing in Maningrida is also being eroded away. According to an official, the Shire has been approached to get the barge landing repaired because it is becoming dangerous. *"We go down there every Monday and unload, unload the barge and there are holes this deep ... so the vehicles unloading the barge just drop down the hole (M3)."* However, the Shire believes it is the Northern Territory Government's responsibility and vice-versa. *"In the old days the government ... the Maningrida Council would have applied to the government for funds and go down and fix it (M3)."*

Communities and outstations on the Dampier Peninsula are well accustomed to being cut-off for at least a few days each wet season and when this occurs, *"you got family stuck in town wanting to come back home (B27)."* Some hope that one day the road from Broome to Ardyaloon will be sealed the whole way, although others oppose the idea. *"Some people say too many tourists come, but tourists already been here for so many years, so what are they complaining about? (B27)"*

In comparison, a local Traditional Owner and business owner living in Shipton's Flat north of Wujal Wujal commented: *"We are now working ... trying to work in partnership to get the road sealed, because we're now moving back on country. And we would like to have visitors also coming up here, on a smooth ride and experiencing our part of the Nyungkal country here (W6)."*

Up at the outstation Buru at China Camp, which is about an hour's drive up a fairly steep path behind Wujal Wujal, with several creek crossings, one official commented: *"They're always just hanging in there in terms of having a road that actually works for half the year and, you know, they're always trying to get some funding to support themselves up there and it's really quite hard (W9)."*

All-weather airstrips are located at some of the remote communities and outstations we visited to enable access in and out and food drops when roads are impassable due to flood. At Urapunga, however, the airstrip is typically flooded during big wet seasons. When asked what residents in Urapunga do during the wet season, a local Traditional Owner replied: *"We stay here, and we'll go nowhere. We can't go nowhere, the Roper Bar fills up full ... And this is like an island (N4)."*

Maningrida has a regular flight service between Darwin with Air North and Broome has an international airport. An airstrip for the Bloomfield Lodge services the Wujal Wujal area.

People living in the four case study locations are used to being cut-off, so they cope with it. In remote areas, government and emergency services expect people to be quite self-sufficient. *"They do understand that they're kind of cut-off from the rest of the region ... and that's just part of the deal of being here (W10)."* Nevertheless, they are frustrated that more isn't done to improve the situation with infrastructure, like roads and bridges. However, in Queensland, where flash flooding often occurs, the velocity of the water *"makes infrastructure immunity very difficult as roads can get totally washed away in one event (W7)."* At a time of reducing budgets and growing populations in high-risk areas, this makes *"physical access ... an ongoing difficulty (W7)."*

10.2.5.3 Stormwater and sewerage

Stormwater run-off was highlighted as a major concern in Broome. Many respondents stated that run-off from roads was polluting Roebuck Bay. *"Like the heavy industrial use area, their drainage, yeah, it's just going into the bay (B24)."* In particular, increased run-off is thought to be responsible for pesticides and fertilisers washing into the bay. One respondent reported that pollution increases food sources for algal blooms of *Lyngbya*, which can form an anoxic blanket over the seagrass causing a large die-off, which in turn impacts marine life living and feeding on the meadows. Moreover, run-off entering stormwater drains from land developments and unsealed roads can result in the iron in pindan becoming bio-available to *Lyngbya* during the hot clear weather experienced during the wet season. See section 10.2.3 for more information.

A Yawuru respondent described other issues of stormwater drainage in Broome, in relation to new housing developments: *"There's 4,000 people there. They never talk to the Aboriginal people about the planning of that. The biggest planning problem they've got today is the drainage, how it's going straight into the bay (B24)."* This respondent also described saltwater coming in around the detention centre because it was built below sea level. Tourists often get caught out in the Chinatown area when large tides come in and flood the low-lying streets.

The Yawuru Rangers believe drainage will be a major concern for Broome with respect to climate change impacts: *"A lot of people use the bay and it's just like ... connects with the loss of biodiversity; it's like if you get more run-off, more algae, more nutrients in the pool some things will take off (B21)."* There was also a call for better drainage around Minyirr Park to help prevent flooding during the wet season. In regards to the new highway running alongside Minyirr Park, one ranger commented: *"[the Shire] should've built it a bit higher build a drain alongside running with it ... I think it's just poor planning ... they didn't really I think care about Minyirr Park as such ... Like I reckon they've built the highway too close (B21)."*

To ease stormwater issues in Djarindjin and Lombadina, we witnessed the army undertaking a specific project that was funded through FaHCSIA. *"That big intersection up there ... they're going to fix that for us. And they're going to do stormwater drains, so come wet season, all the water just runs straight down here. So we're ... trying to divert all the water (B9)."*

In addition to the previously mentioned drainage problems in the new subdivision in Maningrida, there is concern about the sewerage ponds being vulnerable to sea level rise. *"The area down there where the sewerage ponds are and things like that ... that would probably go under (M3)."* According to one official, there were discussions about

doubling the size of them when the new subdivision was developed, but that hasn't eventuated. *"That's probably due to lack of money. It's a very expensive business putting those evaporative ponds in (M3)."*

Many Ngukurr residents voiced their concern about effluent from the sewerage ponds running into a local billabong called Wadjalaiyi, which is an important area where women collect bush tucker. Since the sewerage effluent has been running into Wadjalaiyi, the women have not been going there. A local elder commented: *"They're a little bit scared of eating that ... and some people who study sewerage and water, say there's nothing wrong with the water (N4)."* However, he was of the belief that the run-off is ruining the billabong and was sceptical about the quality of water. *"It's making it thick and the Lilly seed growing really big and thick. They're all right. They're good eating ... but the water, worried about the water. I don't know about the water (N4)."* A senior ranger also expressed his concern: *"We can't even go into the billabong, it's too thick. Before the sewerage pond was there we didn't have any algae (N2)."* There were talks about the water quality being tested by the Department of Primary Industry but the senior ranger was of the opinion that *"it needs to be tested again (N2)"*.

The issue of smell from the sewerage ponds was also raised during our visit to Ngukurr. One local lady commented that old people used to go down to the billabong Wadjalaiyi and collect turtles, yams etc. but the smell became too strong so they don't go down there anymore. They were not sure if the smell was bad for old people and children's health. However, it was reported that following complaints, the problem was addressed. According to officials, there was a line rupture and the treatment system was not working, which caused the odour.

10.2.5.4 Strategies

In regards to Broome's stormwater issue, one respondent suggested constructing underground drainage debris-catchers, so that, at the very least, large-scale rubbish would not end up in the bay. He was also of the opinion that the means to filter out chemicals, such as excess fertiliser, is problematic and suggested that officials should seek advice on how to treat chemicals before allowing them to return to the sea. One suggestion was to let the water soak through wetlands, and allow the plants to extract the harmful chemicals.

Roebuck Bay Working Group, in conjunction with Yawuru Rangers, has been working with children and schools to explore, understand and educate on human behaviour and the impact of litter and pollutants going into stormwater drains. This group was strategic in their approach, with a project now visiting the high schools in Broome.

"We talked to the kids about the stormwater drains and we developed a beautiful big stencil with a dugong and a salmon and "Keep Our Bay Clean" in the middle because we felt that the dugong and the salmon were culturally important ... because we are a fishing community so we thought that way we'd connect with people. We got the students, their teachers and parents to select drain inlets in their suburb ... and then the Yawuru Rangers and I went out and painted them all, all the drain inlets with a big blue Keep Our Bay Clean logo. It's like on the footpaths so the community makes the connection between their property and pollution entering the stormwater drains and flowing and causing problems there such as Lyngbya blooms ... Last year, students went into the drains next to their school and cleaned up the rubbish. They just did one kilometre and took about 90 kilos of rubbish. And they then connected that one section was rubbish blowing off their lunch area, and the next section was a building site and there were pallets and cement dumped in the drain and they could see it all. And so I put them in the paper, I write about them and we make films and ... that is ... a great

way of connecting with the community. That's how we work. We're community oriented (B11)."

In regards to the issues with sewerage effluent running into the Wadjalaiyi Billabong in Ngukurr, we acted upon information received during the scoping trip by initiating discussions between water quality testing researchers at Charles Darwin University and NT PowerWater. This led to the development of a proposal to test the water quality. The proposed project is entitled 'Wastewater in wetlands: protecting health and culture in Ngukurr, NT'. If funding applications are successful, the project will combine expertise across government, research and local communities with the specific aims to:

- Extend the current program of wastewater monitoring to Ngukurr.
- Test bush tucker collected from the wetland for potential threats to human health.
- Determine appropriate solutions to improve cultural sustainability of the sewage treatment in Ngukurr, including an assessment of alternative discharge sites.

Upon our return to Ngukurr, officials discussed other potential solutions, which included:

- Discussions around a joint project between Centre Farm and Yugul Mangi Development Corporation to use the effluent for a community farm/garden.
- A suggestion to divert the water away from the pond during the flooding time: *"Instead of coming to the creek and coming into the water, billabong, they should run that, make it run-off that a way. To where it's low; go down over the hill. And it will keep on running (N4)."*

10.2.6 Mining

"Our greatest threat is the gas hub. Environmentally, socially, yeah, it just hinders our culture (B24)."

The impacts of mining are wide-ranging and complex; they impact on many of the social, political and environmental issues discussed within this report. In many cases, respondents reflected negatively on the effects of mining, for these people mining is seen to be a significant driver increasing vulnerability to future climate change impacts. However, in other cases, mining was discussed positively in terms of the opportunities for employment, community development and resilience.

In Broome, mining was a topic discussed passionately by many of the respondents due to the proposed development of a new gas multi-hub processing plant and port (Woodside) near James Price Point, 60km north of Broome (see text box 10.1 for a detailed description of Woodside). Because of the dominance of the issue it will be covered here in more detail than mining activities in the other case study locations.

The Woodside hub will be the largest in Australia and, potentially, the largest in the world. The possible development of a large port along with the gas hub would open up the Kimberley area to greater exploration. *"The Premier talks a lot about developing the Kimberley's resources, so his intentions are clear, he wants to industrialise the Kimberley and a large port at JPP [James Price Point] will be an outlet for the export of minerals etc. (B11)."* Respondents noted that the development of the port was an even greater environmental disaster than the gas hub. *"This isn't about gas. This is about having a massive port facility that they can ship, basically, everything in the Kimberleys out of. So ... gas is just a façade (B22)."*

The key opposition to Woodside was the environmental impacts of exploration, extraction and dredging, and the threat of oil spills. *"Why can't we just have a pristine environment for at least one part of the world? (B23)"* There is also concern that

impacts on the coast will be difficult to assess accurately given the lack of “*understanding of what is in the ocean* (B11).” Hence, there is an urgent need for more research. Mining also impacts on song lines, which “*give life to trees, animals and people* (B8).” The potential negative effects on biodiversity are covered in section 10.2.3. In addition to the direct impacts from the mining, it was noted there would be considerable negative change to the culture and environment of Broome brought about by a dramatic increase in Broome’s population (see section 10.2.7.7).

If the port goes ahead alongside the gas hub, there will be increased infrastructural developments such as roads and rail to support the increased mining.

“[The] idea of the port is to use it for opening up more mining inside the Kimberley ... and then we get a road connecting the Kimberley and then we get the whole catastrophe coming here. And then the whole show will blow up ... You might as well kiss this country goodbye (B8).”

“We went to a forum that was held here in Broome for three or four days, and they all just talked about economic development. That’s all. They want a train line from here to Kununurra ... They just want to industrialise everything (B24).”

Tensions within the Broome community have occurred in relation to Native Title claims and royalties (see section 10.2.8.1). Respondents noted how the community consultation process and the voting by the Traditional Owners had divided the community.

“It’s been quite a hard time for our community with the proposed gas hub at James Price Point, it’s torn the community apart (B11).”

“So the Traditional Owners, look there were 600 of them and only 300 of them voted I think. And it was pretty close, 60/40 I think it was that they said, “Yes we want this to go ahead.” (B4).”

“The trouble is when you pay some people and don’t pay some other people, you’re going to get drama, no? ... some driving around in beautiful cars and others have nothing (B8).”

A teacher in Broome outlined his concern over agreements reached between Traditional Owners and Woodside. Although he can see the financial benefits, he doesn’t think Indigenous people should have to compromise their environment in order to increase their standard of living.

“Look I can see Aboriginal people’s point of view, half of them say we were forced into making an agreement and if we don’t make an agreement we were going to get nothing so we might as well get \$1.3 billion dollars. And it’s going to help Aboriginals develop and get education but why shouldn’t they have that anyway, why did they have to sell their land off to get it? (B4)”

Another issue in relation to mining is the perception that environmental studies carried out by the Environment Protection Agency (EPA) for the mining industry, and Woodside in particular, are inaccurate, incomplete and biased in favour of the government. Respondents talked about consultants doing shoddy work by not really ‘looking’ at what’s in front of them, and not seeking input from Traditional Owners with in-depth knowledge of the area. One Broome resident expressed his anger:

"I accuse this government of corruption. Complete corruption. You can write it down left, right and centre because every department, now EPA was the last one. The EPA done studies about the whales. When they do studies about the whales? When there were no whales here. So how many whales they see? (B23)"

One respondent noted that there didn't appear to be any provisions for climate change within the Woodside planning documents: *"They're going to have massive issues with the, you know, rising sea levels ... they haven't dealt with it at all in this EPA report ... It doesn't even get a mention, climate change (B22)."*

Respondents in Broome also discussed the potential increase in petroleum exploration at the Canning Basin. There are currently approximately 70 wells in operation but *"there's a potential for 100,000 wells. And my understanding, when they drill here, they can only get a certain amount, so they've got to drill another one to get that certain amount (B24)."*

Apart from employment, one benefit of the mining communities around Broome was the increased capacity for helicopter use, which was useful in the event of a natural disaster. *"The beautiful thing about Broome ... there's quite a decent capacity for helicopter here ... those big super choppers holding 36 people I think ... it is quite a challenging environment to do emergency management and especially response ... there's decent resources up here that can be made available when that happens (B16)."*

If the development of the gas hub and port progresses as feared, many of those interviewed consider Broome's future to be bleak.

"We don't live normal lives in Broome anymore ... Difficult times. Yeah. Difficult times to be a normal person and run your job and also try and make a difference to your community; to try and keep the community strong for its future and look after its best assets, which really are under pressure. With this proposed development, I believe, our best assets will be under extreme pressure, our incredibly biodiverse coast, our tourism brand and industry, our community, small business, from rising rents, wages competition etc. (B11)."

Text box 10.1: Background information on Woodside

Woodside Energy Ltd (Woodside) leads a consortium (including BHP Billiton, BP and Shell) as the Foundation Proponent of a Western Australian State Government project to develop an on-shore Liquid Natural Gas (LNG) processing plant for gas derived from the Browse Basin, which is located off the west Kimberley coast. Chevron was part of the consortium, but their stake in the Browse Basin was purchased by Shell in August 2012 (Garvey, 2012).

The proposed site for the development, called the Browse LNG Precinct, is located near James Price Point, 60km north of Broome. The plan is to build a common-user facility, servicing at least two proponents, which is capable of producing up to 50 million tonnes of LNG per year. The proponents would share use of the port, roads, infrastructure corridors, support services, offices and workers' accommodation. The concept of a common-user facility was designed to avoid the development of processing facilities at multiple sites by different proponents. Benefits to the nation were intended to include revenue and jobs, as well as environmental management and "benefits to Traditional Owners acknowledged to be the custodians of the land (WA Department of State Development, 2010 - Part 1 p. ES-3)." Additional construction would take place outside the LNG Precinct to accommodate the increased population

in the area, including houses in Broome, expansion of government services (education, health, police, customs and quarantine), commercial services (shops and leisure), and transport infrastructure (airport and roads) (WA Department of State Development, 2010 - Part 1; p.ES-3).

The site selection process considered several options, including floating processing facilities, sites in the Pilbara and the Northern Territory, and 43 sites in the Kimberley. The floating option and those sites outside the Kimberley were considered too costly (WA Department of State Development, 2010 - Appendix B7 pp. 50-51). An analysis of the Kimberley region short-listed potential sites at North Head, James Price Point, Gourdon Bay, and Anjo Peninsula. Of these, the region in and around James Price Point seemed to offer the best opportunity.

The Browse LNG Precinct

The proposed Browse LNG Precinct would involve setting aside a fenced exclusion zone of between 2,700 and 3,500 hectares for the processing facilities, workers' accommodation, port facilities and associated infrastructure. A further buffer zone of 3,000 hectares would be set aside as a non-exclusion zone of restricted access, to provide a measure of safety around the facilities. This is much bigger than, for instance, Woodside's Pluto LNG project in the Pilbara of 200 hectares (WA Department of State Development, 2010 - Appendix E3; p. 118).

Gas from the Browse Basin would be piped ashore from a number of fields and processed in facilities called 'trains' into different products. At start-up there would be two or three trains with an initial capacity of between 8 and 15 million tonnes per annum (mtpa) of LNG. This would grow to as many as 15 trains with a capacity of up to 50 mtpa over the life of the project. This compares with the production 4.3 mtpa from the Pluto project. Browse Basin reserves are estimated to be 280 million tonnes of gas and 370 million barrels of condensate.

It is estimated that a work force of 2,500 to 3,500 would be required to construct the first phase of the LNG Precinct over three to four years, and 460 to 700 staff would be required for operations. The peak construction work force would reach between 3,500 and 8,500 in multiple peaks over the lifetime of the project, depending on the option chosen.

The occupations required during the construction phases would include both skilled and unskilled labour. The main relatively unskilled positions would include labourers, concrete finishers, kitchen hands, cleaners and security staff. In addition, it is expected that for every direct employment position, there would be an additional indirect employment position generated to service the population attracted to the region.

The Decision

The State Government negotiated to use the proposed site with the Kimberley Land Council (KLC), which they said 'represented' the Goolarabooloo Jabirr Jabirr Native Title claimant group. The registered claimant group, represented by Joseph Roe and Cyril Shaw, however, claimed that the KLC 'has no authority to negotiate with anybody about the development of James Price Point' (Roe, 2009). In September 2010, the State Government responded by commencing formal land acquisition in the absence of agreement. The process, under the Native Title Act 1993 takes six months, after which, if there is no agreement, the matter is referred to the National Native Title Tribunal (NNTT) for arbitration, which could take a further six months.

Joseph Roe, the current 'Senior Cultural Law Boss of Goolarabooloo Jabirr Jabirr country' (Roe, 2009), said that the vote to allow the development to take place at James Price Point was invalid. He said that there was no prior warning that such a vote would take place, the Goolarabooloo Jabirr Jabirr were not well represented at the meeting, and people who had no claim over the land in question were allowed to vote. This was corroborated by the published agenda for the meeting on 15 April 2009, which mentioned only one item of business: 'Update on Negotiations about the Premier's Nomination for a Gas Precinct around James Price Point' (Wall, 2010).

Roe (2009) said that 'no amount of money could compensate for loss of their heritage.' He said that it was unacceptable that Traditional Owners should be asked to give up their heritage for benefits from the development, such as improved healthcare and education, which are 'services that other Australians receive as birth right.' Roe said that the Goolarabooloo people were 'not opposed to exploitation of the Browse Basin gas reserves,' but that there were alternatives to James Price Point that may be cheaper. Indeed, according to a 2012 report by investment bank JPMorgan, the Woodside-led consortium would save \$9 billion in capital costs if the LNG processing were to be carried out using Floating LNG (FLNG) technology, rather than the land-based development at James Price Point (Burrell, 2012).

Impacts of the Browse LNG Precinct development at James Price Point on Indigenous communities

The negative impacts of the Browse LNG development include the loss of access to land and water used for economic production and cultural activities, the effects that the development would have on wildlife and other resources used by the people, and the use and production of toxic materials and wastes. The loss of Traditional areas could lead to spiritual damage and feelings of shame, and could result in severe personality disorders, which disrupt families or whole communities.

The influx of outsiders, whether FIFO (Fly-in Fly-out) workers, permanent workers or tourists, has the potential to cause great harm to the environment and to the Traditional residents of the area. They bring a greater fire risk, due to the increased number of people in area, and the responsible body, FESA, already feels a lack of resources to cope. Outsiders often speak different languages, understand little of the Indigenous culture, and have no commitment to the community. They earn much more than Indigenous people, and often use the money on drugs and alcohol, to exploit local women, or to gain control of local community institutions. This can result in a degradation of self-respect in Indigenous people, and breakdowns in their social structure. More generally, locals fear that the influx of people will result in the raising of the cost of living and house prices in Broome and the Peninsula, marginalising further the poorer Indigenous population.

To the good, the development would provide opportunities for gainful employment and provide an alternative income stream through additional support payments, such as royalties. However, the record of employment of Indigenous people in Australia has been poor in the past for many reasons, such as their lack of skills and training opportunities, lack of adequate accommodation, their reluctance to be away from home and forego cultural activities, and employers' racial attitudes and drive to maximise profits. The payment of royalties can also cause social tensions if they are not distributed equitably. If the payments are made to individuals, the tendency to spend the money on luxury goods, such as alcohol, results in highly negative outcomes. On the other hand, if the payments are managed well, so that both individual and community needs are satisfied, the impacts can be positive.

The strategic assessment process used for the Browse LNG Precinct development began well, with the State Government funding the KLC to establish the Traditional Owner Taskforce (TOTF), which consisted of representatives of the Kimberley coastal Native Title groups. Decisions as to whether a potential site was acceptable for building the Precinct were to be made by the Traditional Owners of the site, while the TOTF was tasked with ensuring that the Traditional Owners had sufficient knowledge to make an informed choice, and that the selection process was culturally acceptable to the Indigenous communities in the region. However, the process of seeking approval by Traditional Owners was dropped by the State in October 2008, and the TOTF was excluded from the strategic assessment process, suggesting that once again Indigenous people of the area were likely to be marginalised (WA Department of State Development, 2010 - Appendix E3 p. 27).

Consent for building the LNG Precinct was initially intended to be based on the principle of Indigenous Free Prior Informed Consent (IFPIC), which was felt by the TOTF to be an appropriate standard for the approval process (WA Department of State Development, 2010 - Appendix E2 p.7). However, the agreement that Traditional Owners of James Price Point gave for the establishment of the LNG Precinct did not abide by the IFPIC standard. This is because, according to Woodside's own assessment documentation (WA Department of State Development, 2010 - Appendix E2 p.9), the Traditional Owners were under threat of compulsory acquisition by the State in the absence of agreement. This carried severe time constraints so that many issues could not be resolved or even appreciated, and the added threat that the offer of State funding would be withdrawn if agreement was not reached. Many Indigenous people were left fearing that their voices carried no weight, their interests would not be served, and promises made in the agreements would be broken (WA Department of State Development, 2010 - Appendix E3 p.141).

However, O'Neill (2012) believed that the provisions of the agreement reached by the parties on 30 June 2011, were 'far better than those most Traditional Owners are negotiating in Australia, and contain better compensation than Traditional Owners are entitled to under compulsory acquisition provisions.' Parties wishing to prospect on Native Title land must abide by the *Native Title Act 1993* (Cth). This gives Native Title holders 'the right to negotiate' with companies, but not the right to stop development. This means that companies can, and have in the past, provide relatively poor compensation for their activities.

The agreements for the James Price Point development, however, include \$268 million from the State Government for the Native Title claimants and for regional development over 10 years, and in excess of \$1 billion from Woodside (WA Department of State Development, 2011 p.132), with investments into education, health, housing, employment and training, and protection of culture and environment. Besides the monetary compensation, the agreement grants substantial freehold land to the claimants and the return of the precinct land once the activities are completed. Further, the agreements ensure that no other LNG processing site will be developed along the Kimberley coast.

The reasons for such an advantageous deal, according to O'Neill (2012), included the fact that it was a high-profile project, which was a major priority for successive State Governments. It was a project that was viewed as 'swamped in rhetorical goodwill towards Traditional Owners.' O'Neill also suggested that a history of 'humiliation' in the Kimberley led to a strengthening of culture, pride and dignity in the region, so that leadership was strong through the Kimberley Land Council, the Kimberley Aboriginal Law and Cultural Centre, and Language Resource Centre. The Kimberley Land Council itself had gained experience in negotiating agreements on behalf of native

claimants through disputes such as the Noonkanbah dispute, which dealt with resource extraction on native land.

The final investment decision by Woodside and its collaborators was supposed to have been made in 2012, which would have allowed LNG processing to begin in 2016-2017. However, the decision has been delayed to mid-2013 at the earliest (Garvey, 2012). If the FLNG option were to be pursued, an option thought to be attractive to Shell in particular, then the investment decision would be delayed further.

Although not to the same extent, problems with mining were also discussed in other communities. A respondent in Wujal Wujal advised there was no consultation about important sites when a mine re-opened in 2004. *"Didn't respect the wishes of the people. They didn't say, 'Show me the burial sites, or the scar tree'¹⁵. Ignorance ... greed ... money! (W6)." The Bana Yarralji Rangers discussed their concerns about the long-term environmental impacts of mining in the area. Despite being only intermittently operational, the Collingwood mine, through being located in the Upper Annan Catchment, has impacted water quality through oil spills, soil erosion and the extraction of groundwater. Particularly in the wet season, overflow from unused mining dams is an ongoing concern. The Bana Yarralji Rangers have limited ability to deal with these issues.*

In Maningrida during the fieldwork, it became known that over 40 ocean parcels off the coast of Arnhem Land had been declared offshore drilling exploration sites. *"I just found out yesterday, that oil company coming, and going to dig it all along here, NLC don't know ... Parks don't know ... Federal government, I reckon, yeah. We just find out yesterday they're goin' in our backyard (M12)." A local community based action group (Protect Arnhem Land), is currently raising awareness within the community and fighting the mining proposal (see text box 10.2 for more details).*

Text box 10.2: Background on the mining exploration in Arnhem Land

The following is an extract from the PROTECT ARNHEM LAND Facebook site.

<http://www.facebook.com/ProtectArnhemLandNT/info>

Over 40 ocean parcels around the entire coast of Arnhem Land have been declared as offshore drilling exploration sites. The company we are aware of named Paltar Petroleum are an unconventional exploration company who have submitted requests to the Australian Government for permission to explore this sacred region for oil and gas. Paltar Petroleum fulfilled their only legal requirement of public notification by means of a small newspaper article in the NT News newspaper stipulating their intention to commence proceedings to apply for permits to explore parcels of offshore exploration interest. Also contained within the notice was a very brief explanation on the objection process to the proposed grants stating that objections must be lodged in writing within a two month period from the date of notification.

The Aboriginal groups whose waters have been targeted for exploration interests do not receive or generally have access to the NT News; nor do they possess the English language comprehension necessary to fully understand the implications of the contents articulated within the notice. For the vast majority of these clan groups, English is at least their 4th or 5th language. There are at least 12 different Indigenous languages within the Maningrida area alone. To expect their feelings about this proposed use of

¹⁵ A place with one or more tree(s), living or dead, that has been modified by Aboriginal people by removing the bark or wood resulting in the formation of a scar. This sort of modification was and is frequently done for the making of implements, tools or other materials that were used in Traditional cultural practices (Dept of Aboriginal Affairs, www.daa.wa.gov.au).

their lands to be represented by written notices sent to government, within a two month period of the issuing of a statement, in an incomprehensible language, in a publication not widely received, let alone understood, is ludicrous.

This lack of understanding results in the alarming situation that Aboriginal land owners have not received any formal notification or explanation regarding the proposed explorations on their estates and have missed their only legal opportunity, within the time frame allowed, to submit an objection to the grants.

Seismic testing, drilling and fracking are all exploration methods and real threats to the environment and marine life. Crocodile breeding grounds, turtle breeding grounds, coral reefs, rare fish species and sacred sites are just some of the remarkable features of this unique and sacred habitat. The *Aboriginal Land Rights (Northern Territory) Act 1976* (Cth) provides the basis upon which Aboriginal people of the NT can claim rights to land based on Traditional occupation. Unfortunately the 'Land' is defined as finishing at the low tide watermark.

In May 2012, approval was given for a new iron ore mine on the Traditional lands of the Yugul Mangi people (ABC Rural, 2012). The mining company, Western Desert Rose, have confirmed 350 million tonnes of iron ore in the region, and believe that figure could double. It was estimated that the construction of the mine would employ 300 people and, once completed, approximately 250 jobs would be available. The Northern Land Council negotiated the agreement with the mining company on behalf of the Traditional Owners. It was stated by the chief executive of the Northern Land Council that, *"From a percentage perspective for benefits for Traditional Owners, it's greater than any other current negotiations with Native Title agreements in Western Australia* (Kim Hill, Northern Land Council, (ABC Rural, 2012))." A Traditional Owner was quoted as stating, *"There's a lot of hope the project will improve the lives of Indigenous people in the Ngukurr region. We hope that we will benefit in our jobs, more housing ... because most of our people are on Centrelink payments, which is not giving them a large amount of money* (Grace Daniels, Ngukurr (ABC Rural, 2012))." Environmental impacts include the diversion of a stream course into the Towns River and the construction of a haulage road between the mine and the Bing Bong Port. However, the Traditional Owners have negotiated with Western Desert Rose to ensure that all sacred sites will be protected (ABC Rural, 2012).

Respondents in Ngukurr, especially those who were employed by the mines, were, on the whole, positive about the mining that was being undertaken on their lands, *"They are supportive; not all of us. Yeah, you know, they want the work ... My son has been working out there. He's a heavy traffic driver. My oldest* (N1)."

Ngukurr was felt to be in a very strong position to take advantage of the employment opportunities at the mine *"because it's positioned in a really good spot ... with two big mines, possibly three, no more than 40 kilometres away. So in terms of growth, in terms of jobs, in terms of real paying jobs, not the \$400 a week but the \$1,500 a week jobs or \$2,000 a week jobs, those opportunities are there* (N8)."

Another noted how everybody in Ngukurr wanted to work, however, prior to the mines and their associated economic development there had been little opportunity. *"Shit yeah ... everyone wants to work. What we want to do is to get everybody employed and then, hopefully, before I go back to Queensland I can put a hand grenade in the Centrelink office. The results of generational welfare dependency have been totally disastrous* (N23)." (See section 10.2.8.4 for more information on employment).

However, it was noted that it was unrealistic to expect Indigenous people to be able to work a 48-hour week due to their cultural obligations. Therefore, in order for the employment of local Indigenous people at the mine to be successful, a job-sharing roster would have to be agreed.

"If Europeans think that people here are going to work for 48 weeks of the year and then have four weeks off, it just doesn't work. Because the cultural ... you know, all of the issues involved ... But if you could build up a pool of labour – so there's 50 jobs, okay; we've got 100 people trained, though. And there'll be this turn around ... if you get ... if a person was working 36 weeks to 40 weeks a year, that'd be good, I reckon, and they would be happy. But because just those cultural obligations, you have no say; and if you don't turn up, you're blamed (N8)."

Rather than royalty payments, the compensation will be paid via a "Community Benefits Agreement [which] is so many million per year. And it's split between Numbulwar, Hodgson Downs, Ngukurr and Urapunga, and sort of doled out that way. And it doesn't go to individual; it's for community purposes (N8)." This money can then be used for community-based projects, such as fluoridisation: *"It should've been here ten years ago; let's go and spend \$150 grand and get all that installed (N8)."* Other economic benefits to the community discussed by respondents included a contract won by the Yugul Mangi Development Corporation to supply a concrete batching plant and two agitators along with drivers on contract to Western Desert Resources for the development of the mine and for the roads: *"We're doing all of the culverts, flood ways and drains, things that have to be concreted ... Engagement with the mining industry is a game changer, a total game changer for this community and south-east Arnhem Land (N23)."*

However, negotiations and discussions about monetary compensation were felt to be difficult for Indigenous people, as their land is priceless. *"Because ... us Indigenous people don't like to talk about money a lot, you know; we can talk a lot about our land, but not money. Because our land is very precious to us. Yeah. Without our land, we wouldn't have any identity. Our land gives us our identity (N1)."*

10.2.7 Social issues

10.2.7.1 Alcohol and drugs

Alcohol, kava, petrol sniffing, marijuana, tobacco, glue and aerosols were the key substances mentioned as having a negative impact on Indigenous people. Ngukurr was noted as having one of the highest rates of smoking in the world. In particular, alcohol and marijuana were noted as among the leading problems facing Indigenous communities on a day-to-day basis.

The excessive consumption of alcohol was considered a major issue due to its health impacts, accidents, fighting, domestic violence and family breakdown. In particular, respondents noted the effects on children due to the disruption of family life. *"I seen a lot of countryman mine, my countryman been passed away from drinking too much. Getting royalty and drinking. Get a flash car, roll over. Lot of people have been dying (M12)."*

"Well, I don't like grog. I just don't like grog, I tell you. It's wrecking the people and the kids. Like, kids don't go to school and they look at the mummy getting a hiding and the daddy belting mummy and baby and everybody in the house. Busting up house, we don't want that (N6)."

Marijuana was felt to be a fairly recent problem, becoming common in Ngukurr during the nineties. It was also noted as a drug that was more prevalent among youth.

“And drugs weren’t ... people didn’t touch marijuana in the seventies and eighties. It was the thing you kept away from. It’s really much a nineties thing. People saw it around, but no one here. Same on the Tiwi Islands, no one would touch it; now, it’s huge (N8).”

“And the major problems for the locals mob is the drugs now, and alcohol, yeah? I’d say both ... But ganja’s the most. It’s what [is] affecting the younger ones here for the ceremony (N7).”

The link between alcohol, marijuana, children underperforming at school and, particularly, underage pregnancies was evident in Maningrida. However, cultural sensitivities prevent these issues being addressed through better sex education or the use of contraception.

“We try our best, move into the new house. Keep away from smoking and drinking and teach our children ... but kids not listening so much anymore going drinking and smoking (M1).”

The communities visited each had different policies in place to control the consumption of alcohol:

Maningrida

In 1969, a licensed beer club was opened and it operated until Maningrida became an Alcohol Restricted Area under the *Liquor Act 1979* (NT) (Brady, 2008). Within the general restricted area there is no licensed liquor outlet and alcohol may only be brought into the area on possession of a permit. A Permit Assessment Committee, comprised of community members, assesses applications and makes recommendations to the NT Licensing Commission. Permits are subsequently issued by the NT Department of Justice. Permit holders can collect an allocated amount of alcohol on Alcohol Distribution Day, when the fortnightly delivery by barge transport arrives. Permit holders can only possess or consume alcohol at their home or at the home of another permit holder.

Ngukurr

A wet canteen operated in Ngukurr in the 1970s, but was shut down by elders after issues of violence and theft caused problems in the community. Ngukurr is now an Alcohol Restricted Area under the *Liquor Act 1979* (NT). The community is dry to all types of alcohol and has not had liquor permits since 2005. This was due to perceptions in the community that the system was discriminatory in favour of white workers. However, the community is currently discussing trialling a licensed club. Any changes to the current alcohol management plan require the approval of the Federal Indigenous Affairs Minister, Jenny Macklin, who has recently signalled that minimum Alcohol Management standards, designed to reduce alcohol-related harm, will apply (Macklin and Snowden, 2013).

Wujal Wujal

In 2002, Alcohol Management Plans (AMPs) were developed for nineteen of Queensland’s discrete Indigenous communities, including Wujal Wujal. The AMPs employed a variety of strategies to reduce alcohol-related harm, including declaring the communities Alcohol Restricted Areas under the *Liquor Act 1992* (Qld). This means that no alcohol is allowed in Wujal Wujal Shire and severe penalties exist for possession. The restricted area includes public and private places, including

foreshores, internal waterways and roads (Dept. of Aboriginal and Torres Strait Islander and Multicultural Affairs, 2013). Bona fide travellers passing through the community can carry alcohol in their vehicles if they meet certain criteria. These include securing alcohol in the vehicle, being able to prove a destination outside the restricted area, and only stopping at the carparks at Wujal Wujal Arts and Cultural Centre and Bloomfield Falls (Office of Liquor and Gaming Regulation, 2013). The Queensland State Government is currently reviewing AMPs.

One respondent told of how in Maningrida the non-Indigenous residents had argued against the introduction of the permit system. *"We had a bit of an argument with the local Balanda [non-Indigenous person] here, this is our community mate, going to change. Whatever we going to drink, you going to drink. Heavy beer, mid strength, table wine, you going to have to do the same (M2)."*

Although the Alcohol Management Plans had helped, it was noted that in some cases the problems had merely shifted elsewhere. *"If you want a drink, you're not restricted here. Only in the wet season. You can get down to Cape Trib, you can get to Helenvale, you can even get to Cooktown, Cairns or wherever (W3)."* Respondents discussed the flow-on social impacts and dangers of people leaving communities (permanently and temporarily) to access alcohol. Concerns over this form of migration included worrying about friends and family who may get into trouble in Cairns, Katherine, Darwin, Broome, etc. One Broome-based respondent commented that many Indigenous people who left their communities and lived in Broome on a temporary or permanent basis had come so they could drink. There was also worry over those who drove to licensed areas to pick up alcohol, as they were likely to drive under the influence on the return trip. Despite these dangers, respondents agreed that the AMPs were an improvement on past situations.

"I wouldn't want the AMP to be taken away from our community, because the community has come this far. And it would be pointless it would be silly to destroy such hard work ... Keep it as it is, you know. Because I think people are just really understanding what the AMP's about, you know. I mean, we're always going to have a few who doesn't ... young people who's always going to, you know, test our system, test the limits. But you know, trying to go back to the old ways is so ... it destroyed so much home (W3)."

One respondent discussed how they had chosen to live with their family in more remote outstation locations in order to escape the problems of alcohol and drugs.

"In Maningrida you know lots of problems, especially the kids – fight, trouble, you know ... Come up with big trouble and problem and it is affecting every individual families. I don't have time for that. I want to live like this, you know, in a peaceful place ... the big problem is people are ... having problem with ganja, kava and alcoholic. I know myself all I want to do now is protect my land and I want to protect my people and I want to live you know where I'm living ... we want to live like this (M6)."

Volatile substance abuse (VSA), (sniffing of petrol, glue, aerosol propellants, etc.) was also viewed by respondents as a problem, particularly with youth. It was felt that it had declined due to the restriction of materials that can be brought into communities, introduction of Opal (fuel with almost no lead and low levels of aromatic hydrocarbons), and greater monitoring and support services.

The use of natural chewing tobacco and methylated spirits was felt to have declined in Ngukurr.

"Methylated spirits was the big thing. So that was, if you couldn't get alcohol, conventional alcohol, you drank methylated spirits. And it's something you don't hear of now, and it was very regular to smell it on people's breath; they'd come up to you and you'd smell methylated spirits. And I haven't smelt that smell for 20 years ... and people used to eat a lot of that pituri. You don't hear of that anymore, that natural tobacco (N8)."

One of the problems noted with the management of alcohol in Ngukurr was the lack of official and community-based enforcement to stop people bringing it in illegally. *"Community people need to be the ears and report it but no one is willing to report it (N9)."*

"But there's also the changes with this government at the moment, and talking about freeing up alcohol restrictions and all types of things, so it's all messy (N8)." Furthermore, residents and officials in Ngukurr noted that there had been a large increase of alcohol in the community over the previous month. This was related to the fact that the new Northern Territory Government, when it came into power in September 2012, abolished the identification cards people needed previously to purchase alcohol, and the 'Banned Drinkers Register'.

10.2.7.2 Communicating with youth

A number of respondents discussed problems around engaging and communicating with Indigenous youth about cultural and environmental matters. This was felt to be a recent generational change and due, in part, to the influence of Western culture through media, music, and other social pressures.

"Now, to look after our kids we need to understand what they do with their time ... So the first thing that they do when they get up from sleep is turn on the stereo or the DVD ... But they get their influence from what they see and what they hear. No wonder their hat changed because that's what they understand (B24)."

A teacher at the Broome high school considered the changes he had seen over the previous 30 years and in particular noted the limited numbers of boys undertaking the initiation into manhood ceremony. When he first arrived at the school, all the young boys would undertake the ceremony.

It was widely felt that due to the decline in cultural involvement, youth were no longer as in-touch and knowledgeable about the environment as they had been, which also has a negative influence on their well-being.

"Now, the kids, when they did come here, we wanted to find out how much they know ... So we asked them who is the number one hip hop artist in the world and they gave us the top 50, without breathing. Now, it's pretty impressive, eh? So I said, "Oh, that's good," and I said, "Oh, you know that tree?" and they said, "No," and, "What about that one over there?" "No." "I'll give you an easy one," "No." And we tell them that they can tell us something that lives on the other side of the world and yet they can't tell us anything in their own backyard (B24)."

"I don't think the kids really know very much about a lot of things like the bush and seasons or any of that stuff. Maybe they're not interested or their parents aren't passing that down. I think that's a shame. Because I think when you are in touch with the land and in touch with the culture it makes you strong inside. Yeah and if you haven't got that you become a bit empty (B4)."

Respondents noted the implications of this for climate change adaptation and risk reduction. As youth were less exposed to the environment, they were unaware how the environment could take care of them. They were, therefore, considered to be less resilient. In particular, the Broome teacher noted that youth were less able to deal with the heat than they had been in the past. The school had been retrofitted for air-conditioning 15 years previously.

"[The] heat wasn't a problem and dirt and mud, and everything else was not a problem. And going out all day and just not worrying, easy. You got a different kid today. They got iPads, iPhones and all this sort of stuff you know ... They didn't even want to get out [of the bus], 'Oh no it's too hot out there.' So that's a change ... I mean we didn't have air-conditioning in this school for 15 years ... The point I'm making is in those days the kids knew a lot, now I don't think they know much (B4)."

However, it was noted that the key to climate change advocacy and education lay with children, as their attitudes could be changed far easier than those of adults. *"Adults are a lost cause I reckon because they've already made up their mind and climate change is no good and it's just stupid and all this stuff but with the kids here, it's such a privilege because you can change attitudes (B4)."* The teacher noted that often the children would recount inaccurate things their parents had said and through debate in the classroom all the children's understanding would be improved. *"I find them really sensitive to environmental issues ... they're the ones you have to work with, your kids (B4)."*

The Youth Diversion Program was discussed very positively by one respondent who had worked on the program as a facilitator in Oenpelli. The program works with young people to heal rather than to punish and is an alternative to the formal court system. The scheme is voluntary and the young offender can either undertake community service or work with the victim to restore the harm done (NT Relationships Australia, 2013).

The success of the program was considered stronger when a local Aboriginal person from the community is involved. *"My background was youth diversion and volatile substance abuse. It's working with youth, mainly all the sniffers (N3)."*

Although the scheme had been very positively received in many Indigenous communities, it was not currently in place in Ngukurr. However, the respondent who had been involved in Oenpelli mentioned that he was trying to get the scheme started and was applying for funding.

"And youth diversion – that's why I was trying to push this mob ... like that program, youth diversion for keep this mob, young people, busy. So, if you make the wrong choice that's, you know, you've got to try and fix it ... And they can set it up here ... When I come here, I'm saying, 'Ah, no youth diversion, that's maybe why they getting bored.' (N3)."

However, although the youth diversion program was not in operation, the respondent discussed other youth-based strategies he had been working on with the Ngukurr youth. In particular, he discussed a song and music video that was put together on an old laptop: *"That song called, well, our main anthem, you know, for Yugul Voice, is Never Gonna be the Same (N3)."* The song describes the need for Indigenous communities to recognise that their lives have been changed irrevocably and instead of fighting and fearing these changes they must move forward. The following is an extract sung by the respondent during the interview:

"Life ain't easy being a blackfella, living and trying to understand two law ... It's never gonna be the same, never gonna be the way it used to be ... 'Cause our world a changing and we're experiencing ... watching our young ones intoxicate their life by influence and drugs and many other substances. Why it have to be this way? All that waste and loss, you know, it's never gonna be the same ...

You know it's never gonna be the same, so let me explain there's gonna be all this change. It's hard to maintain, it's a shame that people have suffered enough from all this pain. We need to step up and say what's right despite 'cause our people have suffered and suffered their whole life. I know what it's like. I've been through this life and all those problems, troubles, just like that, just like that, they say, but I know it's possible to change your whole ways, so let's pray for more strength 'cause the future will never be the same again. So change ...

As a young man I can see all this change, it's my generation, didn't even reach the next stage. It's a shame. Look at me 'cause I stepped into this game. Never move back, move forward and react. Do good and you'll earn your whole respect. Trust me, you see, 'cause I've seen what I've seen, and all my brothers living in my community, they're doing crime, breaking in and street fight ... and living that thug life – what life? Do you know what's right? I think it's time that you should think twice."

"We filmed it, we edited it, we even dubbed it and everything (N3)." See Yugul Voice – Never Gonna Be The Same (YouTube, 2012).

With similar aims to those discussed above, the local Yawuru utilise Minyirr Park in Broome to run cultural camps and educational workshops with school groups and young offenders. *"We teach them about behaviour. Lore ground, when aged 14/15 they become a man Traditional way. They see that Aboriginal man drink, fight, bash up wife and go to jail. We teach them how to behave like a Traditional man in our environment, not in the other environment (B24)."*

10.2.7.3 Education

Respondents discussed the impacts of the intervention and the centralisation of services on children's education (see section 10.2.8.3). One respondent noted that in 2005 there had been approximately 12 schools in the bush in north-west Arnhem Land (around Maningrida). However, this had decreased to approximately two. *"We had a little school in each community but now they're trying to do things like call them hub schools ... and then trying to bus the kids in from around the area (M3)."* It was felt that children were less motivated to attend schools outside of their community. The hub school was felt to consume greater resources in terms of transportation costs and wasted time picking children up: *"You spend so much time just running around picking kids up and making sure they get to school ... more than you do actually teaching (M3)."* In addition to the schools closing, encouraging teaching staff to work in remote areas was difficult. This issue was also felt to impact on the recruitment of health staff in general. However, there is now a policy shift and drive to support outstation communities, including schools (see section 10.2.7.6 for more information).

"We're trying at the moment to do a massive school push back to outstations, and just get them back on their outstations, and going to school out there, because a lot of outstation kids won't go to school here (M7)."

An example of the wisdom in supporting outstation schools is well demonstrated by the success of the school at Urapunga, an outstation school within the same administrative area as Ngukurr. Respondents noted that Urapunga school, which is run by three teachers who live in the community, *"gets the best scholastic results in the region."*

(N8).” Over the past two years, Ngukurr has seen an improvement in their ability to retain teaching staff, due, in part, to investment by the NT government through the ‘Smart School Award’ (where a \$15,000 reward is provided for innovation in Indigenous education (Department of Education and Children's Services, 2012).

A couple of respondents spoke of an obvious divide between older generations, who were well educated, and younger generations. This was largely due to the strict missionary and religious school teaching that had been common for the older generations. However, once this style of teaching declined, the education system was felt to lose direction until fairly recently.

“I mean, people’s education just seemed to be better in those days ... There was that period during the early eighties ... up to 2000, where you really talk about a lost generation, where everything collapsed in remote communities, certainly in the Northern Territory. But I understand it also happened in other places, too. And it took a long time to resolve that. And really, they were only just in more recent times, the last five or six years, it’s really starting to turn around now. So it was probably 20 years where things were pretty bad (N8).”

However, respondents noted that the benefits of a Western education were limited if Indigenous culture was not taught alongside. In 2008, the former NT Education Minister, Marion Scrymgour, introduced a controversial policy making it compulsory for all schools to teach through the medium of English for the first four hours of every day. This effectively put an end to the bilingual teaching that had been common in many schools. The policy was heavily criticised and on 4 June 2012 it was revoked and bilingual teaching reintroduced. The policy had been adopted on the assumption that bilingual teaching reduced literacy rates. However, critics claimed this was unfounded.

An Indigenous education expert from the University of South Australia, Professor Buckskin, who has completed a review into Indigenous literacy, was quoted within the Sydney Morning Herald as stating:

“I don’t understand why the Minister made that determination ... There was more evidence to support bilingual education than there was against it. There is a national trend around the world to retain Indigenous languages. This is a real step backwards ... What we have to instil in our Aboriginal children is a sense of place ... These communities are some of the strongest in terms of having their language intact. We need to ensure we are giving them the capacity to maintain the strong language and that we don’t erode that. Western schooling knocks that out of Aboriginal children ... Bilingual education is based on helping children become proficient in their first tongue before learning English. “There is no proof that English only will result in better literacy results.” (Sydney Morning Herald, 2009).”

A number of respondents commented on the importance of children learning both languages and cultures side by side and to enable this, bilingual teaching is essential. If children only learn about the ‘white’ world, they are lost within their own communities and struggle to fit into either world. However, the school curriculum remains dominated by ‘white’ teaching and is felt not to teach children enough about their own culture. One respondent stated that it was the responsibility of parents to teach children about Indigenous culture but that due to various social pressures this isn’t happening. The use of Indigenous teachers and assistant teaching staff was considered highly beneficial for combining Indigenous and non-Indigenous learnings.

“And I told the school, I said because of what is so-called intervention, I said to them, “I’ve got every right for my son and daughter which part they’re going to learn.” And I

said to them, "If they're going to learn Balanda [non-Indigenous] world and they've got to learn my culture as well." Because that's what make them strong. If we have the best of both worlds (M9)."

"So I was saying to Urapunga Principal, "You not teaching children too well learning. You only teach them white education, which is gonna spoil them in the finish." ... About half past two, three o'clock, they finish with the ... white learning, finish ... They learn our stuff. And, well, you know, our parents are getting too lazy too now ... they don't really see them children ... they're the ones that should teach our children (N4)."

"When you know your language and your culture, especially language 'cause that's what keeps the culture together. People are making a big attempt now to get Yawuru language introduced in schools here ... And the way people can speak in Yawuru now ... is pretty amazing (B4)."

One non-Indigenous Broome teacher discussed his experience of teaching Indigenous children. He stated that although they were quiet in the classroom, they would open up in the bush, where the teachers did most of the learning. "I have learnt so much. I've been here for 34 years and you might think I know a bit but that's only because Aboriginal people have taught me. I'm only spouting back what I've learnt (B4)."

"And when you are a Kartiya, white person from down south you know nothing about the bush and the climate or anything. And when you come here it's a bit presumptuous to try and teach science when you really don't know anything. In the classroom here they were pretty quiet ... it was a strange environment ... When we took them bush, the boot was on the other foot. We felt really like insecure ... And all the time you'd be learning and all the bush tuckers ... So you couldn't help but learn about what these kids were telling you ... All the kids used to teach us stuff (B4)."

In Ngukurr in the early 1980s, the white teachers were ordered to leave the community due to the non-Indigenous teachings and lifestyle practices they were engaging in: "He ordered in a DC3, called all the teachers into the council office and said, "There's a plane coming at five o'clock, all you people be on it." (N23)." Instead, 26 local Indigenous people were selected and trained to teach. "Of those 26, 12 ended up with a Degree in Education and Arts ... it was a really great thing. They were Indigenising the education system (N23)." However, the system has gradually been Westernised again and is staffed predominantly by white teachers. This is due to the policies of the Education Department to instil teaching that follows the national curriculum.

One retired member of the Education Department commented on the use of the *National Assessment Program – Literacy and Numeracy* (NAPLAN) test within Indigenous schools. It was felt to be unfair and a breach of human rights to compare Indigenous children, who do not speak English as their first language, with mainstream English speaking Australian children. "It's just appalling, appalling ... Education has lost the plot. Aboriginal education has totally lost the plot (N23)." The respondent felt that it was unrealistic to apply a national curriculum education system "designed for the people that come from the North Shore in Sydney," to Indigenous children in remote communities "who come from a totally different linguistic and cultural and every kind of background." He felt that Indigenous education had made a return to the assimilation policies of the 1950s, and instead should be celebrating Indigenous difference and creativity. "This community's got so much to offer the rest of the bloody world ... [instead] they're doing this rubbish that they're not interested in, not going to do them any bloody good (N23)."

Lack of job opportunities and welfare dependence in remote communities was also noted as a barrier to children's education and aspirations. A business owner in Wujal Wujal was concerned that having everyone on Community Development Employment Projects (CDEP) creates bad role models. This respondent questioned the motivation of children when returning to their community from regional educational institutions when they see everyone on CDEP and few job opportunities available. *"Why would you go to school when ... they can't get me a job, you know? 'I'm going back to CDEP? Which aunty/uncle/brothers/sisters been doing for yonks,' you know. So there's a challenge ... the kids can see what's happening here (W3)."*

10.2.7.4 Health

Many respondents discussed the relationship between the health of country and the health of people. The two are inexorably linked. It was stated that in order for Indigenous communities to adapt to future shocks and stresses, the country and the people need to be healthy.

"We really need your country to be healthy and people to be healthy to be able to ... sustain and adapt to those changes in environment ... keeping country sustained but also the people that are on the country it's sustaining them as well so that's really ... that's a key aspect (B2)."

An example of the connection between healthy country and healthy people was illustrated by two respondents, who discussed the link between the destruction of dragonfly breeding grounds and the resultant increase in mosquito larvae brought about by development in the Broome area.

"So the old people explained that here in Broome, it rains, and after the rain, there's puddles laying around. What breeds in there? Mr Mosquito. What eats the mosquito? It's the dragonfly. So that particular site was the site for the dragonflies. And providing that's the right environment, the dragonflies could always come out; if you put something on there, nothing can come out ... So five years down the track, we may have three times more mosquitoes carrying disease (B24)."

A number of mosquito-borne viruses were noted in Broome, including: Ross River, Barmah River, Encephalitis and the Murray Valley Virus. It was estimated to take about two weeks from a heavy rain/flooding event until a boom in the mosquito population was noticed.

Similarly, respondents discussed mining on their land and the direct link with the health of Indigenous people. One respondent discussed the recent news that there may be mining in the area around Maningrida: *"That oil company coming, and going to dig it all along here ... if they make something here, there'll be no hunting ground, no camping ground, nothing. A lot of people sick ... is really too much for countryman ... Could be a lot of asthma, cancer (M12)."* The increased revenue from mining royalty payments was also perceived as a problem if the money is not managed well by the community.

Another example of the health link between country and people came from respondents discussing the poor diets of their fellow countrymen. Previously, hunting and the collection of bush tucker would have been commonplace, but as people have lost touch with their country and culture and have been introduced to Western food this has declined heavily. *"People don't know or they lost their knowledge. They not, you know living on fresh meat or good food ... When take-away opens parents get a whole lot in take-away ... That's how they got sick (M8)."* Now people predominantly source their food from the supermarket and rely on *"the cheapest things which are bread and flour, biscuits and also take-away; I see a lot of take-away being eaten down there*

sadly (B26).” The consumption of sugar-based drinks was also noted as a problem, particularly among young children: *“The consumption of Coke here [Ngukurr], according to outback stores, is the highest in Australia (N8).”*

In comparison to Ngukurr, the community at Numbulwar eat considerably more bush food: *“The shop’s never full, and there’s so much Traditional food eaten all the time; turtle, dugong, just fish, you name it (N8).”* One of the outcomes of the varied eating habits was the difference in the levels of anaemia between the two locations. Much higher levels are recorded in Ngukurr. The lack of exercise associated with not accessing country for food, or accessing country by vehicles, was also noted as a significant factor impacting on health. *“But that sedentary life, that’s a real issue, you know (N8).”*

A significant decline in the self-production of food was noted. Community vegetable gardens had been commonplace, with respondents discussing gardens at people’s houses, outstations or at the mission buildings. *“Most of our old people had their own garden in their own house ... I can’t see any garden at anybody’s house. We had everything ... Nobody really get sick, like, you know? (N6)”* One respondent in Ngukurr remembered their vegetable garden *“producing enough vegies. A tractor and trailer used to come down there every afternoon to pick up the stuff (N4).”* However, this has declined because key people have passed away or moved on and access to cheap food at the store is too easy. In Ngukurr, in addition to people finding it easier to shop at the store than grow their own food, recurrent flooding was noted as an obstacle: *“As far as there the water came up, and that’s when it took all our vegies away. And now today nobody has vegies in their garden around the houses ... I don’t know – too lazy. Depend on Munanga [non-Indigenous food] now (N6).”*

The overcrowding of homes was noted by respondents as a factor impacting on people’s health, often due to heightened stress levels from sleep problems and tension. Illnesses were also felt to impact the population harder as people were living in close proximity, making it easier for viruses to spread.

“But also the level ... of illness is four times greater in the Aboriginal community against the mainstream white community ... we usually get two weeks a year off for sick leave. People here, four and five, you’re overcrowded in a house, it just ... bang, a whole family’s out (N8).”

The centralisation of medical services has had a major impact on the accessibility of health care to regional and remote Indigenous communities. For example, before the Broome hospital was upgraded, Derby was the central hospital attended by people from Fitzroy Crossing. Now, people have to travel from Fitzroy Crossing to Broome. Although those who have a medical appointment are provided with accommodation, family and friends accompanying or visiting have to find their own.

Since the centralisation of maternity services, pregnant women are required to travel to be near the hospital when they reach 37 weeks’ gestation. However, as they have to pay for accommodation, many stay at the overcrowded homes of family and friends. The implications of this are that some women are now hiding their pregnancies to avoid leaving their communities for uncomfortable conditions and potential homelessness.

Dialysis also brings people into regional centres, as remote communities are not equipped to treat patients. Understandably, family members of patients highlighted their concern about this forced separation during a time when family support is critical. Similarly, the elderly often require services only available outside of the community, with some people noting that they often wait in hope that their ailment will subside

rather than seeking help, especially if problems occur overnight. *“Doctor and Sister don’t come here and visit – had sore eye yesterday but I read my Bible and ask God to take the pain away – that’s what I do (N5).”*

One Traditional Owner from Wujal Wujal discussed assisting community members with the financial burden associated with relocating for medical reasons because they want to be able to help themselves and their community through their own enterprises, rather than relying on government handouts. *“We want to help ourselves ... help our families when they have to relocate for health reasons ... they still have to have food on the tables. Even just getting from A to B, you know, to the hospital for their appointments (W3).”*

Hiring and retaining good staff, in particular Indigenous employees, at the Ngukurr health centre was noted as a problem and, as a result, residents are dissatisfied with the provision of health services. The cause of the problem was commonly thought to be because the majority of staff are non-Indigenous.

“There may be one Aboriginal person working in the clinic, might be two. This is really bad, really bad. On a remote community like this, population of 1,000, you should have at least three or four, at the minimum ... the service hasn’t been good and people haven’t enjoyed working there. So it’s a case of, you’ve got to turn it around (N8).”

Similarly, accessing dental care is also difficult and in Ngukurr *“they talk about not having a dentist for three years ... And there’s so many people here who need dentures so they can eat something (N8).* According to one official, the dentists visit Ngukurr for only eight days each year, which is nowhere near enough to service the teeth of 1,000 people.

The multifaceted issue of poverty (overcrowding, poor education, poor nutrition, unsanitary conditions, use of alcohol and drugs, etc.), a loss of cultural practices, degeneration of the environment, increased stress and poor healthcare provisions have led to an inequitable divide between the health of Indigenous and non-Indigenous Australians. Many respondents noted the higher rates of mortality and morbidity in Indigenous communities, as compared with mainstream Australia. However, one respondent felt that the government statistics were actually conservative and not reflective of the true values.

“On Palm Island ... men’s life expectancy got down to 41. Don’t believe any of the statistics you hear about the average Indigenous people live 17 years less than white people, rubbish, rubbish. You don’t want to know the true statistics ... you go community to community and check out how long people are living (N23).”

Illnesses discussed by respondents included:

- Diabetes and renal failure, due to unhealthy lifestyles (diet, alcohol, smoking and lack of exercise).
- Poor mental health, increased levels of stress and suicide.
- Trachoma, an eye infection that causes the eyelashes to turn inwards leading to blindness, is predominantly spread through poor living conditions. One respondent noted that 38% of the community in Lajamanu have trachoma. It was felt that the high rates were exacerbated by the lack of a swimming pool, where children can swim and wash the dust out of their eyes.

Other health conditions more prevalent in Indigenous than non-Indigenous communities include: cancer, respiratory disease, notifiable communicable diseases

(TB, hepatitis, measles, malaria, etc.), circulatory system diseases, rheumatic fever and rheumatic heart disease, and ear and hearing problems (AIHW, 2012).

10.2.7.5 Mental illness and suicide

Respondents noted that for a number of social reasons, mental illness and suicide were relatively recent and increasing problems in Indigenous communities; male youth suicide in particular.

One Broome schoolteacher commented that prior to 1993 there were no recorded instances of youth suicide in Derby. However, since that date there have been 84 cases. This respondent felt that one causal factor could be that they had returned to their communities after being in boarding schools in Broome *“and sometimes when they went back to their communities it was a let-down you know. And perhaps they got into places they shouldn’t have got into (B4).”*

Respondents noted that one of the drivers for suicide was retribution. If the person felt wronged by others this was a way to exercise revenge, as someone would be blamed for the suicide and therefore would face consequences.

“One little boy one day they took something away from him, other families, and the mother got angry and, you know, and he went and got his shirt – that tree is still there, I can see it when I’m home or when I’m walking around – and hung himself with a shirt. Very sad, really, really sad (N6).”

Respondents also discussed that young people were suiciding following relationship breakups. It was thought that this previously didn’t occur as frequently because elders would always make youth discuss their problems (see section 10.2.7.2 communicating with youth).

10.2.7.6 Remoteness/resources

The issue of resources and remoteness are cross-cutting and underlying themes in many of the topics discussed by the respondents. As they are covered in detail in other sections, these issues are mentioned only briefly below.

The majority of respondents asserted their desire to live on country and many spoke with passion about the benefits for country and people. It was stated that their connection to country is stronger in remote areas where human distractions and development are limited or non-existent.

“You’ve got open water, there’s beautiful waterlilies. It’s just ... it’s just paradise. The colours ... and no human beings ... It hasn’t got smell from human beings, you know? And it’s a strong country. It can easy ... grab you and ... take you away ... We got that spirit living in our country (B8).”

However, it was noted that some, especially the younger generations, find the lifestyle difficult and miss the amenities that come with living close to town. *“You know, maybe a lot of people don’t want to live here because it’s too far from town (B8).”* Barriers included the lack of investment in homes, water, electricity, sewerage, road networks, shops, health and education, etc. (See section 10.2.8.3 on the centralisation of services). Respondents also discussed the wet season and being cut-off and isolated in communities. *“So when the rain season comes everybody’s isolated. No one can do anything really except just wait (M9).”*

“I think about three, probably a couple of other stations, Yilan, Ji-marda on the other side of the Blythe region. The population would probably be less than 200 maybe, in all

of those regions. The reason is simple. We don't have any basic service to keep us going. I'm talking about shops, road facilities, all these stuff, that keep us going. So a lot of the family members tend to go out to ... and live at Maningrida. So that's a huge problem (M9)."

Resourcing remote communities so they can run Indigenous corporations and ranger programs is challenging. *"Buru [community at China Camp] struggle for so many years on its own, and they have to, like, work as a team, you know. They just got to find the funding for their own corporation, for their own community. Not many support from outside organisation like Wujal (W2)."*

Financial resources from government were noted by respondents as geographically determined by population numbers. *"That's what it boils down to. In the end, it's just a numbers game (W7)."* Indigenous communities are often small and do not generate high rates. The Cook Shire was noted as covering *"an area as big as Victoria, and only about ... less than 5,000 people. So we need more numbers. We need more money (W7)."* Therefore, *"I suppose the politics ... is that, you know, a lot of effort is put into populated centres and areas, and we can't go everywhere (W4)."*

"The people who live at Buru, up at China Camp, which is about an hour's drive up from Wujal, you know, that sort of area, it's quite, they're always just hanging in there in terms of having a road that actually works for half the year and, you know, they're always trying to get some funding to support themselves up there and it's really quite hard, yeah (W9)."

Any government investment in infrastructure requires a financial return: *"We start every year with an operating deficit of about \$5 million ... we have to get government grants ... So, unless it's going to return something, they're not even interested in giving money out these days (W7)."* An example of this challenge was provided by the Cook Shire Council. Although they would like to install a sewerage treatment plant in Ayton and Rossville, *"there's just not the justification from the funding bodies (W7)."* Even in Cooktown, the treatment plant was running at a loss of \$600,000 a year. This was because it had to meet certain standards of drinkability and safety and, although it could cater for a population of 6,000, was only servicing a town of 2,200.

Despite significant barriers to accessing sufficient funding for many aspects of Aboriginal life, one respondent noted that they are richest people on earth because of *"the wealth of richness of the natural environment (W3)."*

10.2.7.7 Population change/mobility

Indigenous people are highly mobile for a variety of reasons. Moving around country continues to play a major cultural role in educating and informing countrymen about the environment.

"These things are very important ... when they're going places, you know, walkabouts and stuff ... they see something, oh it reminds them that, "Okay, you know, in a couple of days' time we're going to be eating or collecting this," or, "This is ready for that." So they, often ... and that's how we grew up, you know ... knowing what's around you. Without that knowledge and not knowing, you're not caring and respecting the land ... being able to have that knowledge enables you to be a, you know, caretaker of the ... book of knowledge. Yeah, a book of survival, and a book of just caring for ... respecting the land, you know. That gives you the goodness (W3)."

Some people have to move to larger towns or communities due to health reasons and/or better access to services. Shopping, education, recreation, and visiting

purposes account for a large aspect of the mobility of family groups. The availability of alcohol and avoidance of tensions and dysfunction were other factors influencing movement.

In particular, it was noted that since the centralisation of many government services, the short-term movements of people in and out of towns and regional centres has increased dramatically. In Broome for example, new neonatal, maternity and mental health units have all recently opened, meaning that more and more people are accessing healthcare in Broome.

"Some are for hospital visits ... a lot of families come in to visit the people they have in prison and ... the dialysis centre was set up here and the people from Fitzroy Crossing first of all they usually start in Perth and then as soon as there's accommodation up here they sort of move up this way and occupy the hostel up the other end of town there (B26)."

Relocation following the death of a family member is also common. *"People move away when something bad happens like when someone dies. They move to a place where there's family. But we black fellas have family everywhere. Biggest mob (N1)."*

People move for education: *"I want to send the kids down Townsville ... when they get to about Grade Eight. I'm going to send them down that way up in the tableland area, Cairns. I want them to be able to have a better education (W2)."* A respondent remembered how he moved into Maningrida to *"learn more but didn't learn much (M11)."* The rules and regulations enforced on people subject to the NT Intervention (e.g. the Basic Card and Centrelink Payments based on children's school attendance) have also been contributing factors to movement from outstations to growth towns like Maningrida. *"Well, actually what happened with the intervention started ... my family, they move up Maningrida, they having school up there (M6)."*

In Lombadina it was noted that because they didn't have a high school in the town, youth would attend the school in Broome. *"And then we encourage them to keep going, once they finish school. I mean, it's not a place here for a young, 18, 19 year old ... Or somebody in their 20s, say (B9)."* However, it is hoped that these youth will one day return to Lombadina, bringing with them their education and life experiences to contribute to the community.

"We encourage our kids to go and live life, and come back when they're probably, you know, my age, in their 40s. Then come back and contribute or live on the community land, yeah ... They got the best of both worlds (B9)."

Weather also has a large impact on 'why' people move. All four of the study locations are cut-off in the wet season, which means a movement of people from outlying areas into the major towns of Ngukurr, Maningrida, Wujal Wujal and Broome, causing overcrowding in those communities.

Many Broome respondents discussed the lack of accommodation in town for people visiting on a short-term basis. This was noted as a particular problem in the wet season, when people often stay for an extended amount of time. It was believed that during the wet, people predominantly come from outstations around Fitzroy Crossing and are happier to be based in Broome than their communities (see section 8.3 on Broome population movement).

Although there are plans for a camp and a hostel, these have yet to come to fruition. It was noted by one CentreCare official that approximately 50% of people who approach

CentreCare for assistance are from out of town. The homeless drop-in centre run by CentreCare provides a cooked breakfast on Monday, Wednesday and Friday mornings. In addition to this, the Catholic Church provides a Sunday lunch. It was stated that the need for the service is great, as there are always 40-50 new people coming through the door every week. Attendees are predominantly those sleeping rough, although people with accommodation but limited financial resources also attend on occasion. Although, one CentreCare official noted that Broome locals are shying away from the breakfasts in order to avoid humbug from outsiders.

CentreCare also runs a homeless outreach program, "Broome rough sleeper". Once people have participated in this program for two years, they are eligible to go on the waiting list for social housing. However, it usually takes another three years to be allocated a house. CentreCare prioritises five houses per year for mental health patients. It was noted by one of the religious officials interviewed that the relationship is simple and the more services that are concentrated in Broome, the more people will be 'sleeping rough' on the edge of town, in order to access those essential services. However, although the government is investing in the centralisation of services, they are not investing in reducing the negative social impacts that follow. One potential solution is the improvement and sealing of the roads between Broome and communities further up the peninsula. However, one respondent noted that the issues of many of those who were sleeping rough within Broome will not be solved simply by improving access to their communities alone and other underlying issues need to be addressed.

People also relocate to regional centres for work, which is often scarce in remote settlements. Respondents discussed the population changes in remote areas and the shift of people to the regional centres (see section 10.2.7.6). *"That was something like 10, 15 houses here. And on the other, on the other side where we were, that would be another 10, maybe ... We had a lot of people here, but they ... Most of them are in Darwin ... Looking for the bright lights, or something (M9)."*

Respondents noted a number of environmental and social problems that have occurred, and will continue to occur, in the Broome area as the population grows. Issues that have arisen due to poor planning, short-sighted development, and a lack of Indigenous consultation, include:

- Water quality problems in the bay due to an increase in pollutants. *"The biggest planning problem they've got today is the drainage, how it's going straight into the bay (B24)."*
- An increase in bushfires from campfire and cigarette ignition.
- Increased erosion and degradation from motocross (quad and motorbikes).
- Destruction and disruption of natural environmental systems due to the development of industry, housing, infrastructure and recreational activities.
- Poor assimilation of cultures due to the development of segregated communities. The impacts of this for risk reduction and adaptation are that the new population will not learn about the environment and local culture, and native people lose access to their country.

"They put an eight-foot fence around that big property, and inside there they've got six-foot fences around their neighbours. So when they put that big fence up there, what that told us is that they were scared of the native people. Because we've got two Aboriginal reserves on either side, which denies these people access to country. So these people are locked into their own world. They don't want to move into these people (B24)."

The potential increase in population from the expansion of heavy industry on the Dampier Peninsula was a primary concern for almost all respondents. Aside from the direct environmental impacts of the industry, the effects of the changes to the population within Broome were also discussed with concern. *"So, you know, more people, more issues, it's as simple as that (B11)."* One respondent noted that there could be *"six to eight thousand fly-in, fly-outs coming through the Broome Airport and a lot of these people will probably move to Broome (B11)."* Another respondent stated that, *"They told us that 700 executives would be living in our community, and when I hear that, that really scares me because these people would be on \$250,000 a year (B24)."* The considerably higher wages of these people means that they will expect bigger homes and a higher standard of infrastructure. Therefore, the development and new infrastructure required to support the new population was felt to be significant. In particular, residents worried that increased pressure for land development will see the opening up of environmentally sensitive areas, such as the northern shore of the bay, where there is a Ramsar site.

These people also have a greater disposable income to spend on recreational activities, including fishing. *"That brings in big boats and it brings a lot of money for fishing gear. And I think there will need to be an increased presence on the bay to protect the fish stocks and to manage the marine park (B11)."*

In addition to the development, a number of social and cultural issues were discussed. The fly-in fly-out or short-term residents are not considered to have the same level of investment in community life: *"They are unlikely to live in Broome and get involved in community work or be community-minded (B11)."* It was also noted by a respondent that they will have very different expectations of what they would want their community to look like: *"When they drive down the street and they see native people with snot hanging out of their noses, this behaviour is not acceptable. You guys need to clean it up. We're the biggest ratepayers in the town (B24)."* Although the new population will be transient, the impacts to the environment and culture of Broome will be lasting. *"There is a very solid, long-term population here and most Aboriginal people are here for the long term. They'll die here and this is their home, but for a lot non-Aboriginal, it's not the case (B11)."*

"And it depends on the mentality. The mentality has changed since I've been here, you know. It's not as friendly as before ... Lot of people come from down south, never knew about the Aboriginal people much. They have a big ... you know, crazy ideas about Aboriginality ... So we tried to be a place where, you know ... we tried to be as human as possible. But you get elements come down south who bring the rubbish here (B8)."

"We won't see this country back, it will be gone forever (B23)."

Another interesting population change noted by respondents is the movement of white people into their communities. This was perceived as an issue when white people take up jobs, particularly those within Aboriginal corporations, which would otherwise be filled by Indigenous people. *"Used to ... long time ago used to be Aboriginal run this Wujal Wujal Corporation, you know? ... but now, these days it ... they've got white people there in the office and controlling the council (W2)."*

10.2.7.8 Overcrowding

Respondents in all communities described growing up in houses with plenty of family. In Ngukurr, a respondent described how they had four or five families in one house because *"in cultural we have to live ... together (N4)."* However, he went on to say: *"We don't want to live like crowded, but we want to live in the family too (N4)."*

Overcrowding is an ongoing issue in communities, largely because the new housing has not taken these cultural issues into consideration (see section 10.2.8.2) *"The house too small ... can fit one and a half people in there (N4)."* This creates situations where, *"You've got 30 people in this house, people walking over your children ... so you put up a tent inside and you sleep inside the tent inside the house. Some of these houses had four tents inside them. This is Australia, you know? (N23)"*

In the Northern Territory, a respondent makes the point that tenancy agreements state that only 2.6 people are allowed per bedroom. If you marry into a family and want to move into their house, this creates overcrowding and breaches tenancy agreements. He described how *"we kicked up a stink about it ... they all came down and listened and did nothing (N23)."*

As discussed in section 10.2.2.7, movement into communities during the wet season contributes to overcrowding. The undersupply of housing is compounded by the size of community leases, which in some cases, is already at capacity. Moreover, in communities like Wujal Wujal, some available land is unsuitable for building, further restricting the development of housing. A resident of Wujal Wujal described how *"everyone in the houses are close to each other ... you're blocked in (W3)."* According to a Land Trust employee: *"It's really unhealthy and everyone's sort of bound in there together (W9)."* In addition, extreme weather events can render housing uninhabitable. An SES worker in Maningrida stated: *"These guys were happy living in tents in ... very crowded conditions after we lost 15 to 20 houses (M7)."*

When people are forced to live in close proximity, it exacerbates existing social issues and community tensions. A resident of Maningrida has seen negative impacts on community members, such as *"break-ins ... [and] countrymen fighting among themselves (M9)."* He put this down to the close proximity of different clan and language groups *"in one little area ... which is not acceptable ... in our way of life (M9)."* The effect on children is also noted: *"Everybody squash in one house – they don't think about the kid (N5)."*

One Ngukurr official noted: *"One of our blokes said to me the other day ... 'When I come in here, I'm never going back.' He said, 'I'm going to live here, I want to stay here, live here, work here all the time.' He said, 'Too much pain at home, too much pain.' You know, living in a crowded house, living in all the stress, humbug, all that. So, he wants to go to mines, he's going to stay there and work for the rest of his life (N23)."*

Being able to maintain some distance from unhealthy lifestyles, diets and behaviours in the overcrowded communities is providing impetus for movement to outstations: *"More healthier life, rich life really (M9)."*

10.2.7.9 Livelihoods and employment opportunities

After the missions, *"the government controlled everything ... the superintendent was boss (N8)"* and he decided who was given jobs. For those not on the missions, their memories are of older generations who were *"hard working people, up early in the morning and did what they did. Up by 3am and came home late in the afternoon (W8)."* A ranger from Wujal described how his father worked on the cattle stations in the days before helicopters were used, just *"packhorse bringing cattle in (W8)."* In some communities, incomes were supplemented by food gathering.

The contrast with today's welfare state is marked. Many older respondents from all four communities are angry and frustrated at the loss of initiative and pride caused by welfare dependence (see section 10.2.8.4 employment policy).

For those who wish to start businesses in remote communities, there are several barriers. Resources and government assistance for small business can be difficult to access. A business owner in Wujal stated: *"When we started our business, we didn't get no handouts from no government people. We started on our own, you know (W3)."* She was sustained by her aspiration to challenge herself and make a difference. *"We didn't think we'd still be surviving today with nothing, you know, from nothing to something (W3)."* Tenure can also impact on business development, with barriers to leasing agreements, as well as the inability to raise capital from Aboriginal lands.

A resident of Maningrida described how people moved to where the resources were located: *"Because of food stuff, sugar and tobacco, they went following machine – like Oenpelli, Katherine (M10)."* Today, this migration continues with movement to regional centres for employment.

To keep kids in the community, there must be jobs for them. Respondents from the four communities are concerned about the lack of opportunities for youth. In Maningrida, a mother worried that: *"Kids finish school and they don't go on for training (M1)."* She hopes that her children will go away for training and then *"come back Maningrida (M1)"* but there are not enough jobs. In Wujal Wujal, a respondent said that her nephew has left school *"but there's no way he's going to come here and just walk into a job. Nothing. And it's really ... sad (W3)."* A father from Maningrida hopes for jobs for his kids: *"They're learning a lot, they using iPad and ... computer (M6)."* So the challenge for these communities is *"about finding a way to use those skills but to stay on country as well (M15)."*

A crucial employment option for remote communities is the Working on Country-funded Indigenous Ranger Program. One respondent described how they *"were taught there's only like, you [non-Indigenous] guys were entitled for that job, or to work as rangers; not us Indigenous people (N1)."* Now, there is great pride in the work of the rangers and they play a vital role in not only environmental management but also community outreach and education. Youth at the local school at Maningrida aspire to be rangers due to the high standing of Djelk Rangers in the community.

For Indigenous people in positions of authority in communities, it can be difficult to enforce that authority. An official in Maningrida believes this is because they are dealing with people they know. *"Could be your own brother ... when you bust them, your partner's going to hate you for life. She's telling me you go and sleep on the floor outside with the dogs (M2)."* This can also be an issue for family-based businesses, where family relationships, age and gender can affect work relationships: *"Man don't like woman to be boss (W6)."*

While there is high Indigenous unemployment in the four communities, some respondents voiced concern that non-Indigenous employment doesn't suffer. In Broome, a respondent described the government *"needlessly (B28)"* employing people. *"For goodness' sake, all the people that you see walking around ... with their shirts with their logos ... 'Tell me, what do you do?' ... what do they actually do (B28)?"* The perception is that these workers are just part of a self-perpetuating 'Aboriginal industry'. *"It's big business (B14)."* *"Aboriginal incorporated big, big business (B14)."*

A respondent in Wujal Wujal believes that *"they're taking Aboriginal [council] job away from ... the Aboriginal people. It's not fair, you know (W2)."* This means that locals have to move away to find employment. *"That's a big ... sad thing (W2)."* She attributed this to the *"Aboriginal young boys and men ... they got tickets. But now, not allowed to drive that machine. They get the white people to drive the machine, you know, and Aboriginal workers have to go (W2)."* Similarly, a business owner in Wujal Wujal voiced

her frustration: *"Our mob needs to be up-skilled, you know (W3)."* However, there is no incentive for people to get licences when local contractors are brought in to clear power lines or land. *"How ... [are you going to] encourage our mob to look for other employment than here, you know? (W3)"* Officials in Ngukurr said that many municipal workers lack the driver's licences they need to perform their jobs. This is crucial, particularly when the police enforce rules on driving ride-on lawn mowers across the road.

While mining is a major employer in places such as Broome, there are many concerns about the impact it is having on the communities. The industry creates some jobs for Indigenous people, however, mining also relies on a large fly-in-fly-out workforce with 6,000 to 8,000 workers travelling regularly through Broome airport. One respondent noted that these workers don't put the money back into the community. Because of this, *"the gap between well off and poor has gone bigger ... all this talk about jobs and jobs and jobs. Any developer come to this town offer jobs? The reality is how many local people are actually working within the hotel industry or within in the pearl industry and it is mainly people who fly in ... we don't really like that you know because who fly-in fly-out take the money with them bugger off and don't put money back into the towns, they don't give, hey? (B8)"*

With regards to climatic changes and increasing frequency of extreme weather events, livelihoods will be negatively impacted in a number of ways. Sea level rise is a threat in Broome, with parts of the town centre at risk of inundation. This will impact businesses and jobs. They are also at risk from storm surge, cyclone and flood, given Broome's low-lying location. More generally across the communities, increased rainfall and flooding will cut road access, negatively impacting agriculture, mining and tourism industries. Similarly, drought will prove challenging for industry, fishing and aquaculture.

10.2.7.9.1 Strategies

An official in Broome commented that too many Government-funded schemes fail because their duration is limited. In particular, this is a concern for ranger groups reliant on government funding (see section 10.2.8.5.1).

In Ngukurr, approaches have been developed that allow high school students to explore employment options before they leave school. For example, students attend stock camps where they learn to ride horses, drive tractors, operate slashers, forklifts, and weld. This training places them in an ideal position to apply for jobs as soon as they leave school.

With a lack of existing jobs, there is a need to support emerging businesses. One community member in Maningrida has been unable to obtain government support to establish his bicycle business and has set it up by himself. To save costs, he is utilising the school bus to collect materials. *"If you want people to work, let them make their own businesses ... I've got one kid's father that gets ... on the school bus every morning and he goes to the shop to get more bike glue, because he's started his own [bike business] (M7)."*

One community has developed its own construction business with assistance from Indigenous employment programs in an effort to get people off CDEP. The company is also developing tours around the local area to tap into the tourist market. They see themselves as mainstream and emphasise that they constantly need to win government contracts. While this is stressful, it creates independence.

The reasons that people start businesses are significant. A business owner in Wujal Wujal started her business after *"listening to the old people trying to protect the area. Like, because the Yalanji only just been recognized recently, too (W3)." She spotted a market opportunity, but also a way that the business could help her to work "alongside with the government of trying to manage the area (W3)" and protect its cultural values.*

A Ngukurr elder described how she was instrumental in starting the women's ranger group after ill health forced her to resign from teaching at the local school. She *"thought of other ways of teaching people (N1)." She and others started the ranger service in a local building, gradually gaining resources and skills. A key component of their success was motivation: "I gave [the girls] all a piece of paper each, and did a circle in the middle of the paper ... and in the circle, I've written, "Commitment" ... you've got to have it in your head. Because once you have a job, you like that job, you are committed to it. Your job can be committed to you as well (N1)." Support for bottom-up local initiatives is crucial to ensure that they can continue.*

Flexible work arrangements are implemented in the workplace to suit Indigenous priorities. A resident outside of Wujal Wujal undertakes part-time employment at the local art centre. This means she doesn't need to come into town every day, but she can still get some income. *"But I do it, you know, for my pocket money, things I need up here, like food and fuel for the ... vehicles (W2)." In Maningrida, women are employed as cleaners through the Babbarra Women's Centre. The head cleaner explained that childcare arrangements are made with extended family so the girls can come to work. However, during the wet season, husbands help out, and the women come and go depending on the seasons and spiritual business. This flexibility is important for young mothers.*

Similarly, at Yugul Mangi Development Aboriginal Corporation, an Indigenous-owned corporation that owns businesses including a shop, concrete batching plants and motel, flexible working arrangements are the norm. *"That's what we do, so we're very flexible (N23)." They find this improves worker motivation, "because they really started taking hold of their workplace, you know? And they just kept finding more and more to do (N23)." This official declared that there has "never been a problem ... There's lots of ways of looking at work. You know what I mean? (N23)" They are also working to "build up a strong corporate arm, profitable and creative, we need to be meshed into the mainstream economy, employing and training people, where people are owning and running their own businesses (N23)."*

Working with the tourism industry is another approach that is proving effective. Traditional owners outside of Wujal Wujal are keen to work together with tourism businesses operating on their sea country. They want people to respect the reef and recognise them as Traditional Owners. *"Taking tourists out there ... we the Traditional Owners ... go out there and talk to those people ... so we can give them out information, what to do and what not to do on our country (W13)."*

Alternatively, others have formed partnerships with research institutions and universities. A Land trust employee described a model that could prove useful for Eastern Yalanji lands, where *"they have a unit set up where they go out and do the research and they provide the vehicles and all that sort of stuff, but they had also their rates of pay (W14)." This allows Traditional Owners to be involved in research on their lands, but also to benefit financially from it. "When I did research with ... my [Indigenous] co-researcher, she was actually paid a wage. And that's ... what I wanted. I wanted her to be my co-researcher rather than somebody who was just helping me out ... because ... she was the one with the knowledge (W14)."*

10.2.7.10 *Healing*

Traditional Aboriginal healing concerns not only bush medicine but also the dances, songs, ceremonies, music and paintings that connect people with the spiritual world. Bush medicine and bush tucker continue to play an important role in people looking after themselves, their families and other community members.

Aboriginal people have an extremely strong spiritual connection with the land. One of the main purposes for coming back on country is *“Teaching own laws and customs, and healing journey (W6).”* Healing within the Aboriginal world has the same meaning as everywhere else but Aboriginal people feel energy when they are on the right country – because they are home. Respondents recounted numerous stories of Aboriginal people away from country and family who wish to return home because of the strong connection and sense of well-being they get from being on country. *“I want to move back with the kids, living here to look after our country and healthier lifestyle. Live off the land or try to encourage to get my three clans together. I don’t like forgetting the country and the kids, because I think it’s important to look after them, maintain them properly (M5).”*

Aboriginal and Australian history is living history and people still carry trauma from past events. To provide protection and a refuge for local Aboriginal people, missionaries established the community of Ngukurr. An astute, elderly lady grew up in those times: *“And we are very thankful with the Lord who brought them here to us, otherwise we would have been all shot, our fathers and mothers and our tribe (N25).”* Like many cultures, some Aboriginal families and households have explored other forms of religion and healing. *“Christianity is a beautiful thing because it connects with our culture (M9).”*

Relationships within Aboriginal communities are highly intricate and their breakdown can have devastating effects on the social, emotional and physical well-being of individuals and their families. Through music, some people are trying to find ways for others to share their feelings and help heal when experiencing challenging situations.

“We [Yugul Voice] did one song called Insomnia relating to relationships between young couples – not a love song, but we try to detail in a different way about that person worrying. But there’s other things happening there. If that boy worrying about that girl, he’s staying up all night thinking about her, and a lot of these thoughts going through, like suicide and all them mental health thoughts, and that’s what we was trying to detail in that song, Insomnia (N3).”

Respondents felt that life at outstations and small communities provides a better sense of well-being as it is less chaotic.

“At Maningrida it’s happening. It’s part of the chaos system now. I mean we have our own laws that’s in place, but they still misuse that. So a chain of that circle is starting to break. But when they go back to outstation, they listen more and respect what’s around them. Because they become a different person when they enter our homeland and homeland is a better way of teaching young kids about survival, about policies. They can hear, they can think better. Out here sometimes when you go out to the beach somewhere, you see the good sense of you’re alive and well (M9).”

Life at remote communities is thought to be healing because normally it is just ‘family’ living in these areas and not a mix of clan groups. *“There are a lot of different clans all together in Maningrida. And they’ve all got history and different arguments and things from the past (M15).”*

The various ranger programs, governments and some Aboriginal organisations based in the study locations have contributed to individual and community well-being through the work programs of caring/looking after country. In particular, the ranger base at Shipton's Flat has developed cultural walks not only for visitors but also for Aboriginal people to utilise and heal.

10.2.8 Policies

"Policy is probably the biggest factor here ... and if the policy is not good, you know, I will say, 'Well hang on, what are you going to do about this?'" (M9).

Changes to temperatures and seasons, along with threats to biodiversity arising from climate change will impact heavily on remote Indigenous communities. This section looks at how the wider policy environment affects the underlying vulnerability and capacity of these communities to adapt to climate change.

Government policy impacts heavily on remote Indigenous communities across northern Australia. Indigenous Australians are subject to high levels of regulation in many areas of their lives, including land ownership and tenure, housing, education, employment and environmental management. Often, there is a sense of powerlessness when government officials living in distant cities make decisions about their communities and lives. A common theme from respondents is the need for a greater say in how to deal with the events that they are experiencing. *"They had what they called a process of consultation but it wasn't really consultation they just came up and told the people what was happening (M3)."* This approach results in policy initiatives that fail to address the specific conditions and concerns of Indigenous communities, increasing their vulnerability to change and risk.

The Federal Government's Emergency Response in the Northern Territory in 2007 is an excellent example of the problems that arise through poor consultation. Confusion remains in the community about the rules, regulations and changes of the renamed policy, now called *Stronger Futures*, with many residents still opposed to it.

"I'm not a very big fan of intervention. I've been always against it. When it started off everything was really good, everybody was working together, but when all the intervention came and went, everybody split up into two groups. And that was a bigger problem, a big factor in ... all communities. Some supported it, some don't. I don't support it. We were never consulted properly. Everything was done in closed doors, and even though the ten-year extension of the intervention, we rejected it. But the government said 'No,' you know. 'Stuff you, we'll just go ahead and do it.' Sorry for that language, but we'll just go and do it, so that's a huge problem. And it's going to be huge for us for another ten years (M9)."

The consequences of lack of consultation are two-fold. When Indigenous communities are excluded from policy decisions *"the frustration grows and the anger grows and the disaffection grows and the lack of empowerment continues (N23)."* It also means that there is no facility for incorporating Indigenous understandings and strategies about the issues that affect them. A respondent from Maningrida stated, *"From our perspective, we are the oldest race in this world. And the Australian public, the government should actually see that and appreciate that. We're trying to preserve the little what we've got (M9)."* Indigenous-led approaches to reduce climate change impacts can only be supported if they are heard. Thus there is a need in current policy for meaningful consultation processes and greater support for approaches combining Western and Indigenous knowledge. While *"life ain't easy being a blackfella, living and trying to understand two law (N3),"* empowering Indigenous communities will allow them to better adapt to and reduce their risk from climate change impacts.

10.2.8.1 Tenure and Native Title

The Native Title process has allowed Traditional Owners to fulfil their aspirations to move back to country and acquire some Traditional rights regarding the use of that country. The process of moving back on country is enabling Traditional Owners to care for country utilising Traditional ecological knowledge and to implement strategies to address environmental concerns. However, the Native Title process can be long and divisive and after a determination is made, land trusts are rarely given adequate resources for land management.

Native Title and associated tenure arrangements can act as barriers to aspirations to live on and care for country by creating layers of complex regulation over Aboriginal land. One respondent from the Eastern Kuku Yalanji Land Trust described how a long Native Title process resulted in a series of Indigenous Land Use Agreements (ILUAs) being reached between many stakeholders. Much compromise was needed to allow the process to move forward and the development potential of the land returned to the Eastern Yalanji was severely constrained. In addition, Native Title legal constraints prevent the land trust from leasing land to individual or small Native Title-holding groups, so Traditional Owners are not able to use their land as equity to raise finance for business purposes. One business owner from Wujal Wujal expressed her frustration in trying to utilise her land:

"They reckon this particular area is under some type of tenure that is so confusing. And for us bama, we are saying, "This is our special place," you know, sacred site. So how do we ... how can we get this sorted out? Because this where ... this place attracts lots of visitation (W3)."

Another issue is the quality of land being given back by Native Title. The Aboriginal freehold land (known as the 'Pink Zone') transferred to the Eastern Kuku Yalanji for domestic, community and commercial use has been described as 'leftover' land. This is because it is steep, swampy and isolated from services (Wallace et al., 2011). A land trust employee said that one of the blocks given back to the Eastern Kuku Yalanji peoples is *"literally intertidal and shouldn't have ever been surveyed as an ordinary freehold block (W9)."* This reduces opportunity for housing expansion in safe areas and results in people residing in locations that are affected by storm surge. *"So you know things like sea level rises and things like that are going to be ... quite a big threat on that country (W9)."* In addition, the land handed back may not be in good condition. Respondents described being given land that was infested with weeds and feral animals. This is not easy to deal with given few resources. All these factors impede people's ability to move back on country and use or care for it.

On the other hand, in Broome, one business owner sees Native Title rights as a bargaining chip for Aboriginal businesses: *"If you want to come in and do works, well, you give us first preference, 'cause this is our land (B9)."* However, a common theme is the concern that Native Title rights don't give enough power to Indigenous communities to respond to development pressures on Indigenous land. A respondent from Broome talked about how Traditional Owners can be excluded from planning processes and their wishes overridden by developers who can destroy sacred sites. Native Title *"just gives us the right to negotiate (B24)"* and sometimes *"the economics beats the culture (B24)."* So *"when we want to protect our sacred site, it'll be gone, from that mob (M12)."*

The complexities and drawn out processes of putting in Native Title claims are exacerbated by the difficulties in understanding all the implications of Native Title, at the time of application and in the future.

"With Minyirr Park, the State Government, they were going to give us freehold. So everybody said, 'That's good. No worries.' But the lawyer said if we accepted the freehold, it extinguishes Native Title ... That means the government could come in and compulsorily acquire this land ... So the people said, 'No, we want to conserve it.' So ... we wanted to hold the title to the land (B24)."

A consequence of people moving back on country is the re-establishment of cultural ties and connection to country lost through policies of removal. *"All the kids been in the missions ... Only the old people were left in the country (B23)."* However, a related negative consequence of moving back on country is tension between Traditional Owners and existing Indigenous residents, relocated to reserves. Respondents in Ngukurr discussed how residents are resented by Traditional Owners who see them as having no right to live there or look after the land. This is also an issue in Wujal Wujal, where tension between Traditional Owners and Indigenous residents¹⁶ can flare up in conflict.

In particular, when large mining operations and huge potential resources are at stake, conflict is common. A teacher in Broome outlined his concern over agreements reached between Traditional Owners and Woodside over the James Price Point LNG Precinct.

"Half of them say we were forced into making an agreement and if we don't make an agreement we were going to get nothing so we might as well get \$1.3 billion dollars. And it's going to help Aboriginals develop and get education and but why shouldn't they have that anyway, why did they have to sell their land off to get it? (B4)"

A religious worker from Broome discussed the serious infighting within families. This conflict is not just caused by Woodside but also by other mining activities, money and the legal implications of land rights. *"Trying to work out whose family is whose ... is causing lots of fighting (B18)."* One respondent talked about an alternative approach called a Community Benefits Agreement (on Native Title land) where the royalties go towards community projects rather than motor cars.

Another concern is that mining companies are not using the correct channels to apply for licences. *"They should go through [Aboriginal] Land Right[s Northern Territory] Act [1976 (Cth)]... go through right channel first (M12)."* Other respondents expressed frustration that there is little consultation about mining on their land. *"I don't think they've asked me, 'Can we go and do some exploring?'" (N6)."* Another is cynical about Indigenous consultation processes. *"We know what is exploration ... when they explore, they go ahead and that mining (N1)."* The government is seen as being too keen to grant licences without considering the wishes of the Traditional Owners and potential impacts on hunting grounds, camping grounds and health, as well as damage to the environment and sacred sites. They are more concerned about money than the environment. But as one respondent stated, culture and land is more important. *"If you take away all our land, we have nothing (N6)."*

"And I said to them, 'The land is just right. You come and put your blooming hole in there and how it's going to look after what you've done?' It won't look like, you know, as it was before ... 'Can you go back to ... Canberra and dig one of them holes there?' (N6)."

¹⁶ In this instance, we are referring to Indigenous people who reside on Aboriginal land that is not their country. That is, they are not a Traditional Owner of that land. This situation was initially brought about by the creation of missions and reserves (see section 7.1.1).

One respondent described how the courts and government ministers have changed regulations and planning policies 'on the fly' to prevent Traditional Owners objecting to proposed mining developments. There is much frustration that the concerns and rights of Traditional Owners are not being acknowledged. There is a strong need for policy that reinforces the rights of Traditional Owners and empowers them to make decisions about their lands. Climate change adaptation requires land rights and land use rights to be strong; otherwise communities are never in a position to drive change, but merely react to it.

10.2.8.2 Planning and housing

Planning in remote communities is essential to ensure that future climatic changes can be absorbed with less impact. However, lack of planning has resulted in ad hoc development and infrastructure that hasn't kept pace with growing communities. Until recently, Aboriginal communities in Western Australia and Queensland were not covered by conventional planning schemes, and developments in these communities tended to happen on an ad hoc basis rather than in a planned context: *"And then all of those things are just going to start to increase as, you know, it gets hotter and there's more flood or storm surges and cyclone events and, you know, it's more pressure (B2)."* Several barriers exist which serve to impede effective and inclusive planning practices.

For example, good planning is impeded by the lack of mapping information about communities. An employee of the Eastern Yalanji Land Trust discussed the need to *"get some really nice mapping up on the screen in front of everybody so they can see exactly what's actually there that's available for development (W9)."* He sees this as beneficial for helping the community to make decisions about *"how to allocate that land, thinking about future generations as well (W9)."* This is particularly important in areas where much of the land is *"creeks and swamps and really steep slopes (W9)"* and therefore not good to build on.

Another issue is the exclusion of Indigenous people from planning processes, meaning that the needs of Traditional Owners and requirements of remote area planning are not considered. Residents in and around Wujal Wujal would like to be more involved in planning and development for homelands, housing and enterprises. One resident wanted to know: *"How do we fit into the planning scheme? (W8)"* He believes that *"people in planning think that Aboriginal people are not capable of doing things."* Another stated her frustration with drawn-out, complex bureaucratic processes: *"The planning is dividing us. I don't want to work in separation ... We have to look at a holistic approach. We need to plan a future for the livelihood of those people ... We've gotta be very careful of our planning (W6)."* Similarly, a Wujal Wujal business owner was frustrated by her exclusion from planning and development decisions that directly impact her business. This is because she resides outside the community lease (DOGIT) and is ineligible to run for council.

"I want to help my people but I can't because I don't live on the community ... And that's the saddest part. And I believe in if you're a Traditional Owner ... and not residing on an area ... you should have the same right ... to voice your opinion (W3)."

Positive models built around inclusion of Traditional Owners in planning processes do exist. The Dampier Peninsula Planning Project operates through a process of Traditional Owners identifying their concerns and making recommendations on how they should be managed. The objective is to move away from being *"passive recipients (B2)"* towards a system of Indigenous regional governance, where Traditional Owners can prioritise the projects and investments that they feel are important. However,

despite *“people feeling really empowered and impassioned by the process ... [and] really aspiring to a whole new way of doing business (B2),”* the government was *“totally overwhelmed (B2)”* by this approach.

Approaches like these could allow better cooperation and knowledge sharing between Indigenous and non-Indigenous stakeholders. One respondent in Broome stated: *“Our environment could be protected if we had some understanding with the Shire (B24).”* He gives the example of a clash that occurred over the proposed construction of a three-storey building. When Indigenous elders protested that the planned site was a location for dragonflies, there was confusion on the part of Shire planners. He then explained that, *“Our environment depends on these people, too, with the knowledge and understanding. But ... they’re in there for the economics. They’re not there for the benefit for the community and environment (B24).”*

In Wujal Wujal, a respondent called for more thinkers and community planners to be trained in the community. The assumption being that if they are local, they will have a better idea of what the community needs. *“Because the community ... you know, we are the ones who are going to be living in the communities. We know from history, we know where we want to go, you know (W3).”* Local participation and input into planning is important, but additionally there is a need to *“release some red tapes off it, you know. Because that’s very exhausting (W3).”* Programs like Bushlight are praised because they provide infrastructure appropriate for bush living. Using solar power means reliance on diesel is reduced and more cost-effective, sustainable options enable families to lower costs. A respondent in Wujal Wujal, who designed and built her own house, stressed the need for environmentally friendly design. *“You know, if you have someone there to design houses that can help, you know, fit in with the environment, whatever natural ways you can ... I’m sure it can be done (W3).”* She described how her house makes use of natural airflows to reduce the need for air-conditioning.

Lack of consultation in Indigenous communities means that housing design is often inappropriate for Aboriginal lifestyles, remote areas and weather conditions. In Ngukurr, a respondent talked about numerous problems they have experienced with government-built housing, including houses being too small, lack of shaded outside areas, lack of trees to shade houses, and bans on lighting cooking and ceremonial fires. He suggested that housing could easily be designed to accommodate many families by providing a communal kitchen and laundry and spaces for camping outside. Another issue is houses being built too close together, which impedes water run-off during the wet season and airflow in summer. Respondents stated that some of the problems arise from lease agreements. *“When the Housing Commission leases a block, this block which is from my grandparents, that gives her the right, him or her, the right to say, “You can’t do this on your, on that land, that lease.” (N4).”* Additionally, long delays for housing repairs and maintenance are frustrating. *“Waiting long time – wet season what are we going to do – leaking, water fall through roof – need a good floor, need good verandah, need good light (N5).”*

The issue of housing design is crucial, especially considering ongoing temperature rises and increasing extreme weather events. However, lack of consultation means that sustainability issues do not seem to have been taken into consideration. Respondents who discussed the Strategic Indigenous Housing and Infrastructure Program were frustrated that homes seemed to be *“designed to absorb power (M3).”* Residents have installed air-conditioning systems in the windows because the houses are too hot, and the orientation of housing ensures that the houses are in full sun all day. In Ngukurr, a respondent described how houses are not even provided with space to install air-

conditioning so *“people have got to knock [a few blocks out of] the walls (N23)”* to fit the air-conditioner.

“But, you’ve got to pay for that yourself. Power bills are rising constantly. People here can’t afford to feed their families, let alone feed their families and air-condition the bloody house. There are so many models for, you know, environmental housing and good housing design and all sorts of things, and they go and do that, [spend] \$40M [on housing that is inadequate] (N23).”

Moreover, drainage is not well thought out. New subdivisions in Maningrida suffer from road collapse due to lack of storm drains.

A Ngukurr official declared that while the government says there was consultation, the reality is government officials said, *““This is public housing, you will get what you’re given, there will be no negotiation,” unquote (N23).”* While it is good that money is being spent on replacing old houses that *“were really badly designed in the first place (N23)”*, the new housing that has been supplied is also badly designed and doesn’t meet the needs of the communities. *“No-one is asked what sort of houses they would like to be built (M3).”* Respondents felt that the needs of the community are second to the priorities of the government.

“What happens is the government decides on a policy, then they’ll quietly go to forward estimates and they’ll say, “Well, within 18 months’ time we’re going to be doing this.” In the intervening 18 months, they’ll send out their people ... to the communities to convince the people that what they’re going to do was actually their idea. So they go through a ‘consultation’ process ... but already the decision’s made, long before. And ... then they say, “We consulted widely with the Indigenous people and they have told us this is what they want.” ... And then people ... back in the community ... say, “What are they doing? We didn’t ask for this.” (N23).”

10.2.8.3 Centralisation of services

The current ‘centralisation’ of services in larger towns is a direct result of the Federal Government’s policies, primarily the National Indigenous Reform Agreement and the suite of National Partnership Agreements that sit under this umbrella agreement. There is much discussion about what these agreements mean for remote communities and there are concerns that without local Indigenous councils and representatives, more control will be taken away from remote communities. People feel that they don’t have any input into policy decisions that are affecting them. Instead, people that aren’t from their community are running their lives. *““Oh, it’s another NBP meeting.” All right? And I asked a lady out there, who works out there a fair bit, “What’s an NBP meeting?” And she goes, “No Black People.” (B16).”* A respondent in Broome commented: *“Those Shire representatives, the European ones, they’re not going to get buried here. They’re going to get buried somewhere else. But they’ll make a decision here that hinders us (B24).”* One respondent described how under the old system *“the Maningrida Council would call a meeting and ... the whole community would go and ... we’d thrash it out (M3).”* But the local council staffed by Aboriginal elders from the different language and clan groups was replaced by Shire representation, *“which resides somewhere over there, and there’s a little office here which is full of white fellows and they, they have no real commitment to the place. They come and go (M3).”*

One respondent said that Shire representatives should engage with the community and *“work out from there (B24).”* This respondent believed that they should consider protocols and recognise that their responsibility is not just looking after the people but also the environment. *“They need to have that sort of responsibility put on them, not only for the development of the people, but for the consideration for the animals (B24).”*

Where local political control has gone, there is the perception that when decisions are made elsewhere they can be inappropriate for local conditions and compound existing inefficiencies. A respondent in Maningrida gave an example of how the change from council to shire means *“there are two representatives from each area, or something like that, two or three. And it's amazing how little they can get done (M3).”* The effect on people is not so much lack of services but that they feel they have no say in what kinds of services are being provided.

Centralisation also impacts outstations. It is easier for the government to supply services centrally, despite the fact that outstation living is beneficial in so many ways. Respondents spoke about how assistance is needed for outstations, rather than reliance on government grants. An official described how the Country Liberal Party was supportive of outstations by increasing funding for infrastructure as well as a set sum per house for repairs. The money is to be channelled through agencies such as Bawinanga Aboriginal Corporation in Maningrida, which will allow them to *“carry out the work in the bush, which is ... a significant amount of money (M3).”* If the repairs can be carried out by local employees, it can help to increase capabilities and incomes.

Another respondent in Wujal Wujal saw the positive side of the push to centralisation, where it can result in building and capitalising on existing infrastructure. *“You can build up one single big road to Wujal and put big bridges on it and all that sort of stuff (W9).”* However, he also suggested that while this could work in a changing climate, *“most of the Eastern Yalanji people we work with, aren't going in that direction. They're actually going the other way saying, “We want to get out of Wujal and we want to be up at Zig Zag, you know, with more space around us living on country and we want to be out at China Camp.” (W9).”*

On 22 February 2013, the NT Minister for Indigenous Advancement announced that the government will boost financial support for outstations that haven't had the necessary support since the 1970s. Anderson was quoted on ABC Darwin as stating: *“We are aware it would be more expensive to have people living in hundreds of small communities gathered around the Territory than restricted to a few dozen towns but the benefits are potentially great. Benefits in health and well-being and social harmony.”* At the time of writing, the details of the increased financial support are yet to be released. (ABC Territory Radio, Friday February 22, 2013)

10.2.8.4 Employment

Many respondents raised the issue of employment on country, with much criticism focused on CDEP.

“You know, I come from the days before Centrelink, before this ... absolute nonsense that's been put on our guys to now, you know ... And I know exactly what's happened. You talk about “closing the gap” you want to “close the gap” you close the Centrelink office. It's certainly meant for the aged and for, you know, the sick, no problem. But, they will spend billions on welfare and they will spend nothing on economic development (N23).”

In Ngukurr, some officials feel that CDEP has failed the community. *“While people keep getting paid not to turn up the work system will fail. People can turn up once a fortnight and still get paid (N21).”* A business owner in Wujal Wujal is concerned that there is now little motivation or incentive for people to continue on CDEP programs, as they can no longer 'top-up' their earnings. They see other non-Indigenous Australians being given the dole for nothing, so why should they work for the same money?

"Government provided not only CDEP, they had extra top-up. It gives them full-time jobs. So everybody who was on CDEP worked five days a week. That was good, because ... people were having extra money; they could afford to buy extra things for their housing, they could go places if they needed to (W3)."

Frustration is directed at the welfare system and the detrimental effect this has on communities. A respondent from Broome described how her generation had a strong work ethic after being in the workforce from the age of fifteen: *"We're despondent about, all the sit down money [handouts]. And it's destroyed [that generation] (B14)."* One respondent declared that there is a loss of initiative in the younger generation. She believes that the youth think: *"We don't have to learn to read; we don't have to learn maths. We're Aborigines; Government will keep us." People have the idea that everything will be taken care of for them (B14)."*

One of the difficulties is the lack of jobs available in remote communities, as well as *"jobseeker systems ... built for the cities (B18)."* However, for people who have come off CDEP and into full-time employment, there is a sense of independence. One business owner and Traditional Owner in the Shire of Broome told us that coming off CDEP is stressful because you don't know where the next dollar is from, but it leads to a greater sense of control and management. She felt that local communities need to show initiative and be more proactive in chasing business. Similarly, respondents in Ngukurr discussed how the rangers were getting off CDEP. In doing so, they are able to earn more money than they did on CDEP, and have the opportunity to work as rangers.

10.2.8.5 Environmental management

Multiple, overlapping, policy regimes make carrying out natural resource management activities on Aboriginal land extremely difficult. Compliance with all the legislation has proven problematic, given the limited resources of Indigenous Ranger groups. It is also difficult to comply with environmental planning policies due to the short time frames allocated for consultation with many Traditional Owners. One Land Trust employee said that there is a need for strong individuals in the community to solve complex land and sea management issues with the many stakeholders who are involved. These people should have a high level of planning and consultation skills, as well as access to resources to facilitate the planning process.

Many respondents talked about their desire to move back on country and care for country. However, in order to live on the land, and have a sustainable livelihood, there can be a lot of *"red tape that confronts Yalanji Bama (W9)."* For Eastern Yalanji, the barriers include: *"conservation zoning under planning schemes, like remnant vegetation, and Native Title itself ... [as well as] legal technicalities ... which has stopped Jabalbina [the land trust] being able to lease land to individual groups or families of Native Title holders who want to ... build businesses or build houses (W9)."*

Respondents expressed concern that when Indigenous people are not living on country and it has been taken over by national parks, it lacks people to manage it in that same day-to-day way. For example, a respondent from Maningrida discussed putting up fences to keep buffalo out of sacred areas and how there is a need to be on country to maintain the fences. *"You've just got to build a really strong fence, really tall fence, and ... check it all the time (M6)."* Indigenous rangers play an important role in managing environmental threats through being on country and being strongly connected to the environment. A Djelk ranger from Maningrida talked about how they *"know every place, my people, you know, they're one with the land, you know (M6)?"*

10.2.8.5.1 Rangers

The various ranger programs were noted by many respondents as essential to protect country that in turn protects people. Rangers were considered to be continuing the work that Indigenous people have been doing for tens of thousands of years. *"Keeping country sustained but also the people that are on the country it's sustaining them as well (B2)."*

"In order for you to survive, you got to respect the nature itself, and in return the nature will respect you. Now that's why we've got rangers. They are part of that solution to the problem, but, I suppose resources is another factor ... That's why we trying to have rangers you know, we're trying to record all the data, all the stories to protect it, to try and preserve it ... they're doing what our forefathers have been doing. But using technology to make it possible (M9)."

"When I was born, my mum left me behind with my grandfather and grandma. I become a really bush mob. Using countryman knowledge and that taught me a lot of things, from bush tucker, animal and plant, and also how to respect country. And that's how I come up to be a ranger because I've been doing this land management when I was a kid. My people then show me for beginning, and when I got a ranger job, I seem just really easy, similar (M12)."

The rangers play a fundamental role in environmental and cultural management, including: managing feral animals and weeds, monitoring illegal fishing, recording and protecting sites of significance, establishing cultural walks, administering public access and accommodation and undertaking management of early season burning. For many of these activities, they utilise knowledge that has been passed down for generations. For example, the following ranger discussed his knowledge of the right times to burn country:

"Start early April/May – coolest time and south-east breeze from the Gulf, the same wind that comes from QLD Gulf to the NT. We use that wind to do slow burning coz heavy dew in the morning and heavy dew in the evening. Only time we can't light fire is with this wind now (N2)."

To try to control the numbers of feral animals, rangers *"normally do buffalo culling each year to try and drop the numbers down. With the pigs as well (M13)."* However, it is recognised that *"if you don't kill them, that population will double ... especially with pigs because pigs can breed twice a year and they often have nine or ten young ... the growth gets out of control very quickly (M3)."*

In many instances, it appears that ranger programs established in the four case study locations are the only effective means available to Indigenous people to protect country. The rangers work closely with other government services, particularly the Australian Quarantine and Inspection Service (AQIS) in monitoring threats to biodiversity and agricultural industries. *"A lot of people say, 'We're on the ground here; we're the eyes and ears for them.' For everyone: Customs, AQIS, or even government, and all around Australia (M12)."*

An important initiative is the 'Ghostnet' program being run in Ngukurr and Maningrida to clean up discarded fishing nets in addition to other flotsam and jetsam: *"They reckon Customs was towing an Indonesian boat and then midnight, the rope cut-off and they lost it (M12)."*

"Picked up two tonnes when working with Ghostnet Program, lots of nets, plastic thongs and bottles (N2)."

"When I went, '97 or '98, Indonesian boat here, fishing. And then when they seen me, they pull it out, the net out, big, steel net, shark net (M12)."

Another central role for rangers is the sharing of cultural knowledge among Indigenous and non-Indigenous communities. In addition to sharing knowledge, communication is important in order to identify and put into practice sustainable, culturally appropriate models for Traditional Owner groups. *"It is about managing the risk ... to ... sustain and adapt to those changes in environment (B2)."*

All the ranger programs were limited in resources. However, while some programs were well established, others were new and faced uncertain futures. In particular, the Bana Yarralji Rangers based near Wujal Wujal, and the Yawuru Rangers in Broome are in the early stages of establishing and fully operating their Ranger programs. The majority are funded through a mixture of government funding and private enterprise.

"One of the big things for Jabalbina and Bana Yarralji to talk with over the next few months is how the existing Kuku Nyungkal Ranger Service can be, or how we can secure funding beyond the middle of next year, 'cause that's when its funding runs out, and so Jabalbina and Bana Yarralji and other partners between us basically have to put a case to the Commonwealth to keep funding that program, so hopefully we can cover Nyungkal country with that (W9)."

Other government grant applications were also discussed. However, it was also noted that time and investment are needed in order to write grant applications, *"just as long as you've got a coordinator and someone in the office who can grind out the applications (W9)."*

A barrier to rangers being able to operate properly on country is a lack of resources. While the federal government was initially reluctant to support the management of the Indigenous estate, regarding it as a form of private land and of low priority, in recent years it has included several IPAs as part of the National Reserve System and created the Working on Country program, which supports 680 properly paid Indigenous rangers working at over 90 sites across Australia, with an estimated cost of \$240 million for the period 2007 to 2013. From 1 July 2013, the Working on Country program has been allocated a further \$244.249 million over four years to 30 June 2017. It is expected that around 730 rangers will be trained and employed through Working on Country by June 2016 (Australian Government, 2012).

Respondents in all locations discussed the need for further financial resources so that ranger programs could be extended to cover more areas. One Djelk ranger mentioned that he hoped one day that the program could open a subsidiary centre to protect his ancestral land in north-west Arnhem Land. Similarly, in Ji-Mardi, an outstation of Maningrida, the feral pig problem was noted as particularly damaging and beyond the resources of the Djelk ranger program. It is hoped that one day a subsidiary ranger station will be opened up there too. *"We're trying to employ more rangers, but ... it's [difficult] funding wise (M13)."*

"We don't have the resources to be able to do all this stuff. No funding to support our ranger. So that's the problem as well. We're hoping that in the near future, probably ten, twenty years down the track, we will ... Not break away from Bawanninga but have our own ranger unit here, whether if it's sea rangers, or land rangers (M9)."

Rangers noted the need for further funding for vehicles, boats and other items required to undertake their work effectively. *"A lot of rangers also don't have a lot of vehicles to*

go to Homelands (N2)." This is a major limitation, considering the vast areas of country that must be looked after. One further expense for rangers in Ngukurr was the increased use of helicopters during the wet season, due to problems with access to certain areas. Indigenous respondents also said that because they didn't have a car or boat they couldn't access country as much as they would like.

Two Djelk Rangers spoke of how more support was needed to encourage both Indigenous and non-Indigenous youth rangers to stand up across Australia. *"I want to see more young feet to come up and protect land and sea ... black and white (M12)."*

Enterprise strategies implemented by the rangers interviewed, in order to expand their coverage, included: carbon abatement, crocodile egg collection, and crocodile hunting.

Lack of authority was also a central issue discussed. Rangers have little power to prevent people carrying out illegal activities on Aboriginal land. One ranger in Maningrida was concerned about commercial fishing intruding on Traditional fishing and too much fish being taken. While many Traditional Owners interviewed raised this issue, there was a sense of frustration that even the rangers don't have authority to stop the fishermen. *"Once they've got enough power ... to go and check the fishermen ... See what they've caught? And then record, get to decide which area they've been ... But they don't have that kind power (M9)."*

Although, on occasion the successful prosecution of illegal fishing has occurred: *"Like that crabber that just last week, because the rangers, he was inside sacred site lines, and he knew it. And he do it a lot. And the rangers had all the photographs; they had the GPS locations, all that sort of stuff. So it was the evidence from the rangers being out there, that led to prosecution in court (M15)."*

However, in order to carry out the monitoring of illegal fishing, more funding is needed for extra patrols. *"We will keep pushing, pushing and then the government's sick and tired of us mob, they're alright, we'll throw ... [some] extra funding (M12)."*

Other rangers talked about the need to observe Traditional boundaries and how this can complicate natural resource management activities. A ranger from Ngukurr stated, *"All the rangers have their own land, I talk to them and they talk to family, 'cause you can't tell people what to do on their own land (N2)."* A Bana Yarralji ranger also raised this issue, stating that rangers can't speak for another's country. For natural resource management activities, like Traditional burning, this impacts the way the burning is carried out. As explained by a ranger from Maningrida: *"It is because they have to come and talk to the TOs, which area they burn, or not burn. So we give them instructions to do it. And, we get one of our family members to actually jump on the plane, like I did (M6)."*

"We ... the sea rangers only got a certain areas to actually cover and look after. They can't cover the whole coast. Because it's ... they've got only responsibilities to their certain areas, and their certain point they must come back. Beyond that, it's another area. They're not allowed to interfere. They have to do it in a culturally appropriate manner. Speak to their countrymen. Permission to go to do it (M9)."

Other issues with access to country arise when rangers are restricted from carrying out natural resource management activities on other tenures such as leasehold land. This makes it difficult to address problems such as feral animals and weeds that spread to Indigenous lands. Gaining the authority to prevent trespass on Indigenous lands is also difficult for some groups. Tenure thus impacts on environmental management but this does not seem to be adequately recognised in policy.

There are strong aspirations to achieve the freedom to look after the country in ways appropriate for Indigenous people. *"That's our land, look after the country ourself, we want the government to one day say to us, 'You can look after it yourself,' 'cause our people look after it ourself for a long time before white settlers come, our country best land because our people look after it (W5)."* Living on country, deriving a sustainable living from country and caring for country are all part of an holistic strategy to ensure the country is managed successfully and climate change can be addressed. Policy initiatives must be designed to empower these Indigenous aspirations.

Altman (2012b) notes that approximately 23%, or about 1.7 million square kilometres, of Australia is now under Aboriginal or Torres Strait Islander ownership or management as a direct result of many different statutory processes granting, allocating or recognising Aboriginal or Torres Strait Islander connections to and Traditional responsibility for that country under a variety of group or community titles. Much of this 'Indigenous estate' includes some of Australia's most environmentally precious natural assets and, for Aboriginal or Torres Strait Islander people, it is rich in cultural and spiritual meaning. The Indigenous estate also comprises a significant proportion of the National Reserve System and is managed through a range of federal and state government initiatives, including Indigenous Protected Areas, the Working on Country program and state-based ranger programs (Altman, 2012b). Rangering has become a thoroughly intercultural practice combining Traditional cultural practices with the adoption of Western science and technology, a pragmatic recognition that a 'two-way' or 'two toolbox' intercultural approach is now essential for dealing with 21st century postcolonial natural resource management problems, "including depopulation, the orphaning of country that needs human presence for management, and broad scale and pervasive environmental threats (Altman, 2012a; p. 221)".

10.2.8.6 Strategies

10.2.8.6.1 Ranger/caring for country

The research has demonstrated that there is a strong need to provide sustainable livelihoods for people so that they can stay on country. This is particularly relevant for large-scale remote areas, where resources are needed to deal with a significant number of environmental threats. *"We need dollars to make this possible, and in every sense, every dollar counts ... the more resources you have, the better you'll try and protect the environment as well, as a whole (M9)."* An employee of the Kimberley Land Council sees Caring for Country programs as really important for *"making country healthy and ... keeping country sustained but also the people that are on the country it's sustaining them as well (B2)."*

However, apart from ranger programs, there is a lack of sustainable livelihood opportunities in remote communities. A Bana Yarralji ranger talked about his aspirations to develop an independent business aside from the working on country program run through their ranger base. He suggested that government policy should support the development of sustainable businesses growing out of ranger programs.

"[I] ... want to look at second stage of planning and, and just value-add to this ... working on country. But I also want to start looking at planning for business now too: campground and putting those artificial ponds and things like that, you know? (W8)"

Other rangers have ideas to spin opportunities off ranger businesses. A Djelk ranger wants to set up a smaller ranger base connected to the larger main base where he can bring *"all the different landowner from here, I want them to come up and see a clear picture from here, and then take them, visit their country (M12)."* Another ranger group is in the process of developing a social enterprise on country, which has grown out of their work as rangers. The social enterprise will be based around climate change

monitoring and hosting research visitors on country. They want to “value-add” to their ranger activities and create jobs for younger family members so they are “*focused a bit more on this block* (W8).” One of the business owners said, “*We have our own protocols that drive us ... Our rules apply in a buddy-buddy system. Those people out there don't understand this. We look after each other then. We branch out ... It's for that reason, we want to do social enterprise* (W6).”

In this way, ranger groups would be able to be less reliant on short-term government funding and more certain of future incomes. This would also enable long-term management approaches to be undertaken. Other ranger groups are finding alternate income streams from strategies exploring carbon exchange opportunities that also act to mitigate climate change. One approach is the Savannah Burning Methodology, where rangers are using Traditional fire management techniques to prevent late-season hot fires that are very destructive to landscapes and cultural sites. They earn carbon credits through the reduction of greenhouse gas emissions. The benefits are economic, cultural and assist biodiversity. An employee of the Kimberley Land Council sees the incorporation of Traditional fire management through the Savannah Burning Methodology into environmental management policy as a good example of a policy approach that uses combined Traditional and Western knowledge. This kind of approach aligns with the aspirations of Traditional Owners around Broome for “*this kind of holistic approach that protects their cultural sites, environment and also provides jobs* (B2).”

The Savannah Burning Methodology has been occurring for four years within the Kimberley region. However, local authorities recognise that it will take time before the enterprise produces a reliable income. One barrier was the funding needed for helicopter use: “*To realise carbon opportunities a far greater investment needs to be made into those strategic burns ... it takes heaps of chopper time ... So at the moment ... we're only making small inroads* (B2).” It is hoped that the Kimberley Land Council will be able to build on their relationships with mining companies to exchange more credits and share resources. It is anticipated that the carbon credit scheme will bolster the income to support Kimberly ranger groups. This is seen as an important diversification of income stream for communities that currently only have ranger jobs funded through Working on Country funding.

“*Because we have all these Kimberley ranger groups, so across the Kimberley we have ten Traditional Owner ranger groups at the moment and they are currently funded through the SEWPaC Working on the Country program and they're very reliant on government funding, so we're seeing the carbon credits through the Savannah Burning Methodology as providing another income stream to support those ranger groups ... at the moment, you know, we're pretty much solely reliant on government funding ... there's a little bit of fee for service contract income that comes in but it's minimal compared to what's actually required to run the programs* (B2).”

Other approaches focus on community-based planning models. Officials in Cooktown describe the Weary Bay Dune Management Plan, where the Traditional Owners, local people, and Council representation have come together to address and manage beach erosion. In Roebuck Bay, the need to involve cultural heritage values in environmental planning has led to the development of community-level management plans for the Bay.

“*The cultural plan embraces a whole-of-country approach and that will underpin all planning from here on. The plan has been guided by Yawuru knowledge of country gathered over countless generations and the need to manage all country together, land, sea, animals, plants, culture and spirits, the marine park* (B11).”

This has resulted in joint management of coastal conservation estates being set aside and managed by Traditional Owners (Yawuru) and the government in joint partnership. This was seen as unique at the time *"because ... the Yawuru people ... and the Goolarabooloo people ... were running it. So they called it the southern and northern tradition (B11)."*

Another planning initiative is the Lyngbya Contingency Plan, which arose in response to increasing Lyngbya blooms in Roebuck Bay. A respondent described how they co-hosted forums *"to try and understand what may be causing them and to get agencies, local government and everyone working toward similar goals (B11)."* At the forums, Yawuru Traditional Owners talked *"about their observations over time about what the bay was like in the past, [and] whether they'd seen lyngbya."* From this, a Lyngbya Contingency Plan was funded by different agencies *"to guide agencies and stakeholders about what to do if a big bloom occurred and what research needed to be undertaken (B11)."*

Both of these approaches are based on community empowerment. This reflects the aspirations of Traditional Owners in northern Australia to take control of land management of their country. A ranger coordinator said, *"I think that's probably the most important thing really ... is that kind of support for people to be taking on that lead role (B2)."*

Methods used on Eastern Yalanji lands to *"try to bring country back together, to look at it all together [so] Traditional Owners [can] think about country in a cultural way, not with all the different tenures and boundaries all over it (W9),"* have focused on the establishment of Indigenous Protected Areas (IPAs). This arose out of frustration with the Indigenous Land Use Agreements arising out of Native Title negotiations. *"There's a sense that country was divided up (W9)"* so development of the IPAs *"is to put the Traditional Owners back in charge (W9)"* of *"their own plan for country rather than being consulted about what other people want to do on country (W9)."* This is seen as a way to empower the Eastern Yalanji in dealing with the myriad of *"different agencies currently dealing with planning and management of country (W9)."* Yawuru are also looking at what Queensland has been doing with the Great Barrier Reef and Traditional Owners for monitoring and use of sea country through TUMRAs (Traditional Use of Marine Resources Agreements). So there is scope for cooperation and knowledge sharing with different communities. There are, however, limited funds available for IPA management.

Another local strategy for environmental management is community education. Ranger groups stress the importance of working from the ground up, especially with children. Rangers undertake outreach work in schools, resulting in children becoming more connected to various natural resource management projects. Junior ranger programs are very popular in several schools, and elders play an important role in helping to develop the children's *"knowledge and understanding of bush life (M13)."*

Community members in Broome also talked about the importance of carrying out advocacy work to target industry and other stakeholders to encourage them to buy into initiatives. For example, dealing with stormwater drain problems in Broome requires the cooperation of the local council, the state, water corporations, and so on. A Broome respondent stated, *"This bottom up approach and top down approach with Yawuru results in a respectful relationship (B11)."* They use a whole range of initiatives to include the community in their work, including making a film with the Yawuru Rangers.

Another successful project involved the stencilling of a 'Keep Our Bay Clean' logo on Broome footpaths and stormwater drains, by rangers, school children and their parents.

"Each school has their own suburb, so they are the like drain custodians, helping communicate to people in their school suburb, to reduce land-based pollution and sediments from entering the drains. And they get to work with our community group and Yawuru TOs, which is a great partnership (B11)." The focus is on wide community participation and rangers play a vital role in encouraging that participation.

Local Yawuru have worked with residents of the new estates within Broome to share ecological knowledge of living on country and how best to utilise resources.

"So what we did was plan to go and talk to these people, to ask them if they can take their coconut trees out and put a cabbage tree in. Less water, five years looking after, they just walk away. Trees ... the birds will come in, build their nest, and things like that. And no water. Now what we're noticing, out of the 100 or the 200 that we see, maybe 70 of them has taken out coconut trees. And they're trying to influence their neighbours (B24)."

Revegetation is another method. In Weary Bay, a wide variety of community members, from elders to young children, participated in foreshore revegetation in an effort to address dune erosion. In partnership with local natural resource management employees, they collected seeds from the foreshore and along dunes, which they later propagated and used to revegetate the foreshore. The community used this exercise to mitigate the effects of climate change through integrating Western and Traditional knowledge of dune management. It also allowed the children who participated to pick up knowledge from being there and involved in the activity. However, these kinds of activities can be difficult for communities to undertake with limited funding.

Local initiatives can be very effective. In the Kimberley, a respondent described the use of bunds, or obstructions, by marron growers to retard water run-off on slopes. This results in greater soakage and rejuvenation of vegetation from naturally occurring seeds. A ranger group uses Traditional methods of dealing with lantana infestations so they don't need to use chemicals. When the ground is moist, they *"dig the fork in and pull [the lantana] out by the roots (W15)."*

Monitoring is undertaken by different groups on country. A Yawuru ranger described *"checking quadrants ... and like how much% seagrass and ... little animals (B21)."* There is concern about the changes that are occurring and there are calls for more research. *"We should have to go and do studies on the area (B8)."* This is in response to the recognised lack of investment in science in northern Australia. A Bana Yarralji ranger spoke of his aspiration to get involved in research and combine Traditional and Western approaches. A possible model to be pursued is the Kimberley Marine Research Station. This is a research facility located on the tip of Dampier Peninsula, with facilities to support scientists studying Roebuck Bay. While this has resulted in more scientific projects being developed in the area, it is not clear how Traditional Owners are involved in the research process.

"See a lot of birds come in about August month ... I want to capture that sort of data so that I can plant more of those trees and ... I want to check the turkey's nest. I want to start checking the water, you know? Start seeing what temperature's in the water, especially around sacred sites and things (W8)."

We agree with Altman's (2012a) analysis that there are three systemic components to Indigenous approaches to caring for country. They are the people on country who live on the land and engage in management through active resource use or the many community based ranger groups; the condition of the landscape is vital, Aboriginal and Torres Strait Islander people draw their livelihood from the country they care for; and

that conservation work needs to be viewed as a different form of development on the Indigenous estate because it not only maintains environmental and cultural values, but also delivers ecological services as public goods with benefits to adjoining properties and communities, and to the Australian public (Altman, 2012a).

10.2.8.6.2 Land use planning and building codes

Land use planning needs to take into account sea level rise for future planning. Particularly in Broome, moderate sea level rise will result in some parts of the town centre being submerged. Storm surges and cyclones also need to be factored into land use planning and decision-making. An official in Cairns said that she was *“really quite concerned about all this ongoing development stuff in these places that we’re saying to people are going to be [inundated] ... Why the hell are we building places and, you know, letting places be built in these areas? (W10)”*

In Broome, residents are concerned about development along the foreshore and housing on the edge of the Bay. However, the creation of an Aboriginal park has prevented a lot of development on the coast and now *“we’re all able to walk through the dunes and see this incredible vine thicket and coastal vegetation which is still intact. And there’s very little housing you can see from the coast and that’s because ... Yawuru people were really keen to look after their ... country and didn’t want to see it developed at the time (B11).”* Community action and education has also been used as a strategy to influence development in Broome. Respondents described how Traditional Owners became actively involved in the design of new real estate developments. Initial Shire plans for 800 houses were ultimately reduced by half, and Traditional Owners campaigned for inclusion of an environmental cultural corridor *“to provide life for the native trees, and the animals to have access, and to provide life for the people too (B24).”* They sought to educate the residents about water use and planting drought-resistant vegetation. And also, native trees were planted *“along the verges, along the roads, they were planting all the native trees instead of fences (B24).”* Residents were encouraged to do this with offers of discounted native trees.

Yawuru PBC is undertaking another strategy for planning – geospatial mapping of Aboriginal housing. They want to map where people go (their special places), what they do on country, what they hunt, and the ceremonies they want to perform. The mapping survey is based on an Indigenous Canadian methodology, but it is intensive, and there are only about 100 Indigenous people who are physically capable of filling in the survey in Broome. A pilot study with just two people listed 1,000 special places. Other community projects such as ‘Knowing our Community’ seek collect information about the reasons that people come into Broome. This will be valuable for future land use planning and decision-making.

New buildings are *“cyclone proof ... all the new houses up to standard, but the old houses, well, we didn’t really have that back in the days when they were built, yeah (B9).”* The new cyclone-proof housing in Maningrida is *“technically pierce-proof (M7),”* although an official stated: *“It still might, depending on the type of the cyclone, how heavy it is (M7).”* The newer houses in Maningrida are core-filled, *“It like comes in big slabs of something, and then they pour concrete down the slab (M7).”* Older homes are better block or mud-brick.

“All the ones at the new suburb, and the ones that are spotted around the community, they are built by Territory Alliance. They’re apparently ... all okay, with that sign on. But that sign doesn’t mean that it’s safe from a cyclone, if a cyclone comes. It just means it’s built to cope; that’s it (M7).”

House construction is still inappropriate for Aboriginal needs, as evidenced by recent house construction in Ngukurr: *"You go around now ... We don't like to live like this. And you look. No good (N4)."* The new houses that have been built don't allow for any privacy. No curtain rail or curtain holders were put in, so if people want to get changed they have to close the louvres. Windows and louvres need to be open to allow cooler air in at night.

A respondent in Wujal Wujal has designed her own house on her land. Her partner *"replaced all the tiles [on an old shack] and put new ones up. Cut all the poles round the block there up on the hill ... Got a chainsaw, cut them on the top. And then the kids started barking all the trees, so [he] just laid it all up, borrow a ladder from my uncle (W2)."*

Although she has access to a house in Wujal Wujal, it is more important for her to live on country. Therefore, she must construct some kind of dwelling which is not up to building code. This increases her vulnerability to extreme weather events. Another respondent from outside Wujal Wujal has designed her own house. *"You've got to work with, you know, what the nature provides, you know. Why you want to have an air-conditioner running when you've got wind blowing all the time ... we're on our own and we've got a big area. So you know, nothing is blocking our air circulation, you know. It's just flowing, you know (W3)."*

10.2.9 Perceptions of climate change

While the sections above provide insight into the underlying vulnerabilities and current adaptive capacities within our case study locations (e.g. why they may be vulnerable or resilient, how they have coped with and adapted to past environmental changes, etc.), this final section on Indigenous views of change and risk specifically deals with people's comments related to climate change.

Firstly, respondents' views about the immediacy of climate change impacts threatening their regions were mixed. There were some that did not believe it would affect them: *"Probably not in my time (B9)."* Others were unsure of timeframes: *"It'll have an effect. Maybe 5 years, maybe 5,000 years, but it'll have an effect (B24)."* And others were more philosophical: *"Adversities, just handled the best you can, just get on with it ... it's your life (B28)."*

A Goolarabooloo Traditional Owner says that people adapt to change *"same as animal ... that's natural as a human being ... in the country, you know? (B23)"* Reading changes in the country by being on country comes naturally: *"We growing up we see the changes ... experience the changes (B23)."* This enables people to *"see it, we sense it, we feel it (W6)."* In essence, connection to country is the key to dealing with changes on country.

To others, climate change is an unknown quantity. *"[You] can't control nature ... government ... talk about climate change ... [but] you can't change the nature itself ... not make policy with nature (M9)."* *"Mother nature you can't stop 'em (M12)."* People don't know how they will cope: *"We really don't know about environment today ... how ... we'll cope with global warming and whatever (B14)."*

Nevertheless, there is an overall feeling that Aboriginal people always adapt, naturally. *"[Aboriginal people] adapt their behaviour to whatever environment they're presented with, and they're very good at it. They just live with it (M3)."*

"This is the thing about nature; nature can heal itself if we leave it. But if you interfere with it, it will change. Like I said, chaos is a beautiful thing. If you interfere with

something it is bound to change, but then again it will heal itself in the course of time and will be protective and come back to the same way, if you're lucky enough. Sometimes it will change, change forever (M9)."

Also see Table B.3 in the Appendix, which lists Broome workshop participants' statements on what climate change means to them.

From an official perspective, it appears that many are not thinking about climate change in terms of natural hazard events. For example, there is little consideration of rising sea levels exacerbating storm surge impacts. Conflict within council departments was cited as a possible barrier as officials are reluctant to *"redo all the maps and will get more people worried, you know, that they're going to be in a red zone rather than a yellow zone (W10)."* While there is information about council's climate change mitigation strategies online, there is no or little information publicly available on council websites about household impacts and actions.

"My perception would be as someone who's had a long interest in environmental stuff and work in environment management in the past that climate change isn't really on people's agenda here anyway (W10)".

11. CHILDREN'S UNDERSTANDING OF WEATHER AND SEASONS IN BROOME

11.1 Purpose

The purpose of this section is to describe the results of an investigation into the perceptions of the young people of Broome regarding seasons and how their everyday lives are affected by seasonal change. Collecting children's opinions is in line with the United Nations Convention on the rights of children. This focus also acknowledges a growing body of research that demonstrates the unique risk perceptions and risk communication processes of children, and their capacity to be involved in climate change adaptation. However, children often struggle to have their voices on environmental issues heard and valued.

In light of the above, the research asks the school children of St Mary's Catholic College about their perceptions of environmental issues in order to:

1. Determine how the seasons affect children in Broome, particularly where they play, how they get to school and where they live.
2. Identify some of the adaptation and mitigation priorities that the children in Broome believe would alleviate the negative impacts of environmental change upon their lives.

The results of this research project can be used within the broader context of the NCCARF project to discuss the implications for science and climate education in schools, for NRM bodies and Traditional Owners, and to suggest possible ways of assisting communities through seasonal changes. This project acknowledges that there are numerous cultures in the town of Broome in addition to multiple Traditional Owners from a variety of places.

11.2 Method

The research was conducted with the assistance of the Principal, staff and students of St Mary's Catholic College in Broome and data was collected on the premises of the college during discussions with students from Grades 4 to 7. St Mary's College allowed the researcher to visit the classroom and undertake a range of activities with the children.

The researcher did not seek the input of Aboriginal and Torres Strait Islander children alone, as both Indigenous and non-Indigenous students participated in the project. So as to ensure that all children were treated identically in the data collection methods, the researcher did not single out or identify children who may have been Traditional Owners of the Broome area. The methods allowed each child the right and ability to express their own views on what they perceive as the best and worst aspects of each season. While it is acknowledged that there are many seasons recognised in Broome and the Kimberley region, we simplified them to two – rainy and dry.

Research Aim 1: How does the season affect children in Broome, particularly where they play, how they get to school and where they live?

Method: Open classroom workshop, students are asked: "What are the best and worst aspects of the dry and wet seasons?"

Completion time: 15 minutes each class.

Justification: To determine how the wet and dry seasons currently affect their lives and use this data to create a baseline.

Analysis Methods: Content analysis by classroom/age.

Role of Investigator: Facilitator that asks the questions and oversees the voting procedures.

Research Aim 2: Identifying the current impacts of seasonal change and the potential future impacts of climate change on children's lives in Broome.

Illustration to answer the question, "If you were the Mayor of Broome what would you do to make things better for you and your community?"

Method: Workshop and illustration.

Completion time: 30 minutes each class.

Justification: How does the season impact on the everyday lives of children, what do they feel and see that adults may be less attuned to or affected by? What can be done to address these concerns and what are the priority locations to address?

Analysis Methods: Content analysis by classroom/age.

Role of Investigator: Facilitator that asks the questions and encourages students to draw their own interpretations of their perceptions and concerns.

Children participated in the workshop as part of their class activities. They were invited to participate and their teachers were present to support those who chose not to contribute. The children were not required to identify themselves and results were aggregated in summary format. Where possible, the age and gender of the child on the illustrations were recorded to enable further analysis at a later date. In order to minimise the occurrence of interpretive bias, the researcher asked the children to make a note of the content of the illustration.

11.3 Results

Thirteen themes emerged from workshop data in relation to research aim 1. These included rain, health, severe storms, cyclones, leisure activities, infrastructure, temperature, marine, migration, food, animal/insect life and tourists.

11.3.1 Rain

Comments made by the students were typically negative when associated with the dry season (refer to Table 11.1) and positive when associated with the rainy season (Table 11.2). Children enjoy the benefits that come with the rain, such as not having to water the garden, swimming and playing in the rain. However, they also acknowledged that rain could also have negative effects, such as flooding, closed markets and increased humidity. There were no positive effects of having no rain in the dry season.

Table 11.1: Responses from children in regards to rain and the dry season.

Element	Worst	Best
Rain	• Have to water the garden <i>"it's too much effort"</i> • No rain • Plants and crops wither and die • No gardening • Might have to pay for water	

Table 11.2: Responses from children in regards to rain and the rainy season.

Element	Worst	Best
Rain	• Can't go outside for sports activities • Humidity before and after the rain • Big rains flood the school • Markets don't open until "<i>after the rain stops</i>" • BRAC can close if too rainy or windy	• Save lots of money on water • Don't have to water the plants • After big rain, get crab for bait and "<i>you don't need money</i>" (to buy bait from the shops) • Swimming – in the ditches, at the Banana Farm (pond), in the pool • Getting wet • Running and playing in the rain in the ditches • Puddles, mud, tadpoles • Flooded roads • Gets cloudy and humid but doesn't rain "<i>teases you</i>" • When it rains there are rainbows • It's nice and cool • After it rains can make boats with bottles (take the cap off and let it float)

11.3.2 Tourists and migration

These two categories are discussed together as they describe the movement of people. There were few positives that the children associated with tourists, with the exception of economic benefits to others (adults and business owners). As far as the students were concerned, the good part about tourists in the wet was that they left town and they could see their own people, they had access to food at the supermarket and that their beaches were returned to locals.

With respect to Aboriginal migration, the students did not identify specific movements of Aboriginal people in or out of their town. There were no comments about the wet bringing more or less Aboriginals into town. One class in particular was more interested in discussing tourists and their negative behaviour than in talking about environmental change. To this end, the class was asked to draw a typical tourist, as they were adamant that they looked different to locals. In these illustrations (see Section 11.3.12) there were no Aboriginal people included, rather there were drawings of non-Indigenous young 'hippies' (student term) or wealthy and, sometimes, overweight men and women.

In sum, while the broader NCCARF student data may suggest that there are higher proportions of Aboriginal people moving into Broome at the onset of the rainy season, this was not raised by the students and had little direct impact upon their lives. Having said this, there was one comment made regarding a negative of the dry season visitors "*visitors from Perth, Canberra and Port Hedland good having family but bad and uncomfortable because some don't leave.*"

Overall, negative comments regarding migration in the rainy season were mostly in regards to negative impacts of people that they know leaving town, people leaving

during the holidays (rainy season) and also in relation to shops closing due to low tourist numbers.

Positives regarding migration in the rainy season included tourists leaving, town becoming quiet and peaceful, and family coming to visit (meaning more presents for some).

11.3.3 Dry season

Table 11.3: Responses from children in regards to tourists and migration in the dry season.

Element	Worst	Best
Tourists	• Crowd up everywhere (restaurants and beaches) • Their behaviour might be different, such as throwing rubbish out the car window • They drive dangerously – drive too slowly or hog the road • More traffic and no parking • Too many scooters • Bad for locals • Gets too crowded in tourist season • People get sick because tourists “carry bugs” • Annoying • Make too much noise • They get lost • Everything gets more expensive • Steal our food (go to the shops and they are all empty) • All are old people • More tourists = more house • Cut down more trees • Bidyadanga – they touch stuff and take things back with them • Don’t respect Lore (Aboriginal Lore) • Don’t listen	• Spend more money and more people see our beautiful beaches • When prices go up, give Broome money • When they leave, more food is available • Good for your business • More shops for locals • Markets start up • Tourists go to Beagle Bay to look at the church • Good for money • More buildings for tourists Other comments made: <i>“Dry time tourists come and kids don’t like them because they are road hogs, more tourists also equals more development and more destruction of the environment.”</i>
Migration	Visitors from Perth, Canberra, Port Hedland – good having family but <i>“bad and uncomfortable cause some don’t leave”</i>	

11.3.4 Rainy season

Table 11.4: Responses from children in regards to tourists and migration in the rainy season.

Element	Worst	Best
Tourists	• No tourists to “make us sick”	• Leave town • Bad drivers • Think they own the beach • Like to see our own people
Migration	• Family and friends leave and go south • Friends leave – bit boring • Shop owners don’t get enough money • Shops close • Sometimes tourists are your family and you don’t want them to leave • People leave over the holidays	• Flight tickets are cheaper • Family visit – more presents • All the tourists leave • New kids in school • Quiet and peaceful • Less crowded • Family comes • You get to travel

11.3.5 Festivals and leisure

There were no festivals described in the rainy season (see Table 11.6), so all comments regarding the dry season and attending festivals were positive (see Table 11.5).

With respect to leisure, the location and range of activities that took place varied between seasons. The variation was associated with the changes in the season and the broader environmental change that is associated with the different times of year. For instance, swimming was undertaken throughout the year, but restricted to pools in the rainy season due to the presence of jellyfish in the ocean. Other activities such as camping and fishing (undertaken together) occurred in the dry, however fishing was still possible in the rainy season but was either reef or shore based due to reduced road accessibility (flooding).

Table 11.5: Responses from children in regards to festivals and leisure in the dry season.

Element	Worst	Best
Festivals		• North West Expo • Sand Fly Circus in May • Shinju • Mango Festival • Rodeo @ Derby • Kimberley Basketball Festival
Leisure		• Can go swimming at the beach/ocean/BRAC • Get to go out with friends • Do sports • Outside activities • When you run around not so hot • Don't need to swim • Camping • Crabbing • Sand fly circus • Get to travel • Sport • Swimming and surfing • Basketball

Table 11.6: Responses from children in regards to leisure activities in the rainy season.

Element	Worst	Best
Leisure activities	• Can't go camping • Can't surf – stingers • Hot can't go outside to do sports activities – sports lessons are <i>“really hot”</i> • Can't go swimming in the ocean (jelly fish) – don't have stinger nets here • Pool gets dirty • Go surfing – <i>“seen a shark”</i> • Crocs go in the creek and kids swim in the creek and they can bite/hurt/kill you	• Boogie boarding in the drains/park when it gets flooded • Slide on wet grass • The dam next door overflows and then we can get our mud skimming boards to surf the water • Muddy puddles • Ride scooter in Chinatown area • Go to the reef • Go diving <i>“on my block – we don't worry about the stingers”</i>

11.3.6 Food

Students identified different foods (bush tucker and others) in each season (refer to Tables 11.7 and 11.8). They enjoyed mangoes and bananas in the rainy season, a variety of different fish and bush foods (e.g. gubinge berries, goanna and witchety grubs). The students also maintained that there was more food available in the shops in the rainy season as compared to the dry when the tourists were present.

Table 11.7: Responses from children in regards to food in the dry season.

Element	Worst	Best
Food	• No mangoes • No salmon	• Crabs – water levels in the creeks are low • Whiskas Salmon are in season • Mangoes start to bloom

Table 11.8: Responses from children in regards to food in the rainy season.

Element	Worst	Best
Food		• Mangoes and Bananas • Witchety grubs • Grasshoppers (can eat them and use them for bait) • Gubinge berries • Barney (Goanna) • Salmon (Threadfin and Bluenose) come out

11.3.7 Health

There were no health issues reported by the students that related specifically to the dry season. However, there was a range of health conditions related to the rainy season (see Table 11.9). The students identified several concerns, such as worms getting into their skin, meliodosis, becoming sick from playing in the rain, or contracting meningococcal if they accidentally consumed the water (while playing outside).

Further research into the prevalence of these health conditions is required.

Table 11.9: Responses from children in regards to health in the rainy season.

Element	Worst	Best
Health	• Worms that can get into your skin • At the end of the wet <i>“people get sick”</i> • If you have cuts and go in flooded water can get sick/infected • Meliodosis • Can get sick from playing in the rain • Get ringworm if you go in the dirty water • Get meningococcal if water goes in your mouth	

11.3.8 Animal and insect life

The students identified definite patterns of seasonal change through the presence of animals and insects. In the dry they noted no stingers and more kangaroos around waterholes (Table 11.10). However, they noted that the rainy season brought out great numbers of diverse species, such as insects, fish, goanna, crocodiles and frogs. Mosquitoes and sandflies were thought of as the worst aspect of the rainy season and there were mixed feelings about frogs and cicadas.

Table 11.10: Responses from children in regards to animal and insect life in the dry season.

Element	Worst	Best
Animals/Insect life		• Dragonflies are cute • No stingers • Kangaroo – mostly around waterholes looking for a drink

Table 11.11: Responses from children in regards to animal and insect life in the rainy season.

Element	Worst	Best
Animals/Insect life	• Mosquitoes • Sandflies • Frogs, cicadas and maggots • Snakes and spiders • Flying fox eat the mangoes • Snakes come out • Flying ants	• Frogs come out (calling) • Beetles after the rain • When high tide comes in you can see the crocs. It doesn't worry people that a croc lives at Town Beach. • Frogs, beetles, cicadas and dragonflies • Cicadas – <i>"noise is peaceful"</i> • Collect tadpoles • Worms out of the soil (for fishing) • Barney – Goanna • Bush Turkey • Barra

11.3.9 Severe storms and cyclones

These were obviously only related to the rainy season and the students saw both negatives and positives from storms and cyclones.

The positives were related to after rain activities; mud skipping, playing boats in the gutters and boogie boarding the roads. When asked why they thought the storms were positive experiences most children referred to the adrenaline associated with thunderstorms and lightning. Even though Broome has not experienced a cyclone since 2000, some of the students believed that they had experienced one. However the age group of the sample precluded this.

Broome has experienced many severe storms in the years since 2000, so it is likely that students confused the severe storms with cyclones. In addition, several students made reference to yellow alerts and red zones – but these were not explained, rather they described the implications for their activities (see comments in Table 11.12). The red zone meant that you couldn't see friends but you could fly kites, whereas the yellow alert meant that you get to go home from school.

This would indicate that there is some understanding of emergency preparedness but it was not discussed in great depth and the association between coloured alerts and zones may be blurred or confused.

Table 11.12: Responses from children in regards to severe storms and cyclones in the rainy season.

Element	Worst	Best
Severe storms	• Big storm pack trampoline • Trees might fall down • Red zone can't see friends, windy, power turns off • Clean up after storms and cyclones • Storms/wind can be scary • Trees snap • Shops close • Messy – leaves and tree branches on the roads • Roads close • Trees fall down, cause damage and can fall on houses. Crushed our above ground pool • Windy • Have to <i>"rake your backyard"</i>	• Red zone (referring to warning system) – fly kites, wind lightening. • Get out of school • Like the wind, noise, lightning and thunder • Yachts go faster • Get to drive through flooded water • Boogie board the roads • Paper boat races • In 2011 Chinatown flooded <i>"was awesome, a crocodile was there and mangoes were floating"</i> • Storms, rain and thunder are exciting • Thunderstorms, the rain, the sound the adrenaline
Cyclones	• If wanna go somewhere can get flooded in • Roebuck – gets flooded • No electricity • They can ruin your house • Trees get knocked down • Shops close • Cars can't get past • Cyclones come <i>"but don't hit us"</i>	• Rains • Like the lightning • Yellow Alert – get to go home) • Turns skies really dark • Can watch cyclones come across • Cool (as in weather temperature) when you go to the beach • Can feel the wind • Can go puddle splashing after cyclones • Swim in the floodways • Skim on the road and parks when roads are flooded • Can have boat races on the road • Tourists leave – not busy anymore • Chinatown floods – shops get flooded and cars go past and "splash you" • Cyclone – we play games

11.3.10 Temperature

The students had mixed feelings about the cooler temperatures in the dry (refer to Table 11.13) and negative feelings about the heat in the rainy season (refer to Table 11.14).

Table 11.13: Responses from children in regards to temperature in the dry season.

Element	Worst	Best
Temperature	• Too cold • Gets really cold in the morning • People light fires in July	• Nice and cool

Table 11.14: Responses from children in regards to temperature in the rainy season.

Element	Worst	Best
Temperature		• Pool temperature goes up • Air-conditioner

11.3.11 Infrastructure

Road accessibility is the primary infrastructure issue that affects the lives of the students, followed by power loss in the rainy season. The students spoke positively about infrastructure in the dry times, as they are able to access camping spots because the roads are not closed (refer Table 11.15). Whereas in the rainy season, road closures impair access to camping, but on a more positive note, the students make their own fun in the floodwaters that collect upon the roads (refer to Table 11.16).

It should be noted that the roads are the drainage system in Broome and that the Shire of Broome is in the process of seeking funds to construct a stormwater system to drain the water from the roads in addition to hardening (concrete) the dirt drainage system that is currently in place.

Table 11.15: Responses from children in regards to infrastructure in the dry season.

Element	Worst	Best
Infrastructure		• Get to go camping with family because the roads are open • Don't have to use air-conditioners

Table 11.16: Responses from children in regards to infrastructure in the rainy season.

Element	Worst	Best
Infrastructure	• Water on the road – bad around McDonalds, affects drivers – skid off the road or if strong current can pull the car off the road • Last year China town flooded • Roads can close • Blackouts and power cuts <i>“because it's so hot”</i>	• Roads get flooded – mini boats and splash around • Don't have to come to school if the roads flood • Skim board • Cars drive by and splash you • Run in the gutters • Swim in the ditches

11.3.12 Illustrations

The illustrations were analysed using content analysis methods, whereby the content of the illustration is described according to a theme. The students answered the question

"If you were the Mayor of Broome what would you do to make things better for you and your community?" The researcher asked the children to make a note of the content of the illustration to reduce interpretive bias in the analysis.

Not all students participated in this exercise. The students in grade 7 were not interested in drawing their responses to this question in their own time and in the three sessions that were held with these grades there was not enough time to permit this exercise. In addition, there was one class that was most disturbed by the behaviour of tourists and was adamant that it could identify a tourist from a local by their appearance. In this instance the researcher asked them to illustrate what they thought to be a typical tourist.

Five themes emerged from this activity and they were broadly described as infrastructure improvements, leisure infrastructure, environmental interventions, emergency management and weather changing interventions.

The content of the illustrations varied significantly within this theme. Some of these included:

11.3.12.1 Infrastructure improvements

Roads:

- Cleaning the roads (of water) so that you can go camping.
- Stop water from flooding everywhere, more drains on the streets, drains so that all the water can get all the way to the ocean.



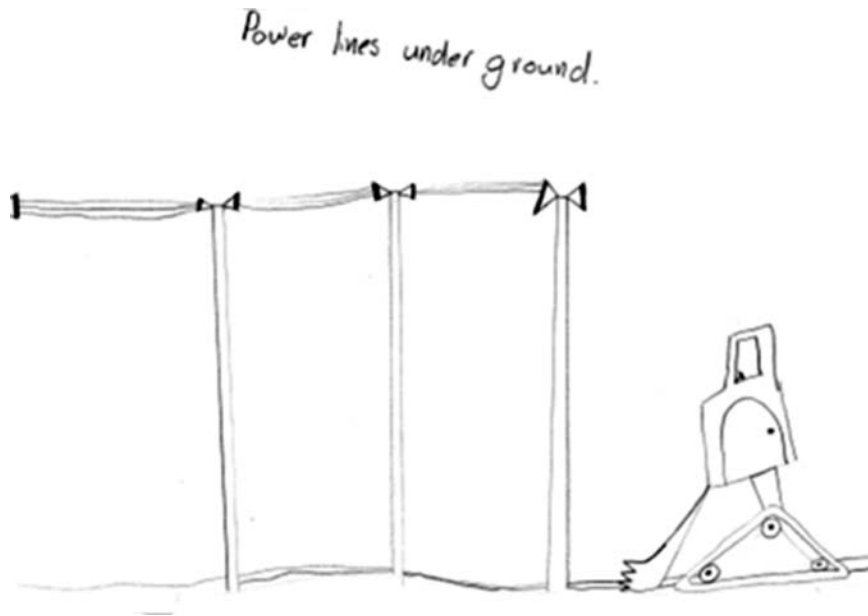
Health:

- Undertaking a quarantine check on people who enter Broome so that they don't bring in bugs and sickness/disease.



Underground power lines:

- To have electricity through the storms;
- Put the power station on a higher slab so there would be less power outages; and
- Make Broome a clean energy area (no fossil fuels).



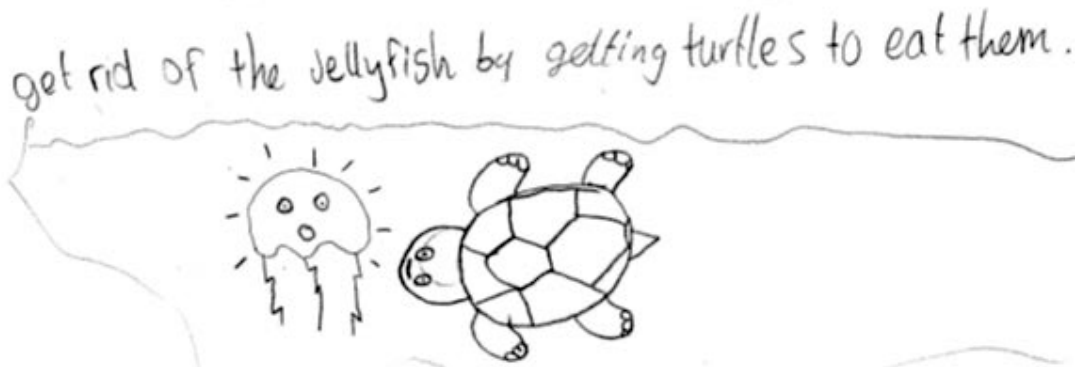
11.3.12.2 Leisure infrastructure

Most of the comments made by students referred to the installation of a water park or public pool. This was to ensure that they could swim all year round as an alternative to only being able to swim in the ocean in the dry. The below illustration suggests that the tourists should pay and that the locals are free.



11.3.12.3 *Environmental interventions*

The comments regarding environmental interventions varied but were typically associated with reducing the jellyfish populations so that the students could swim in the ocean year round.

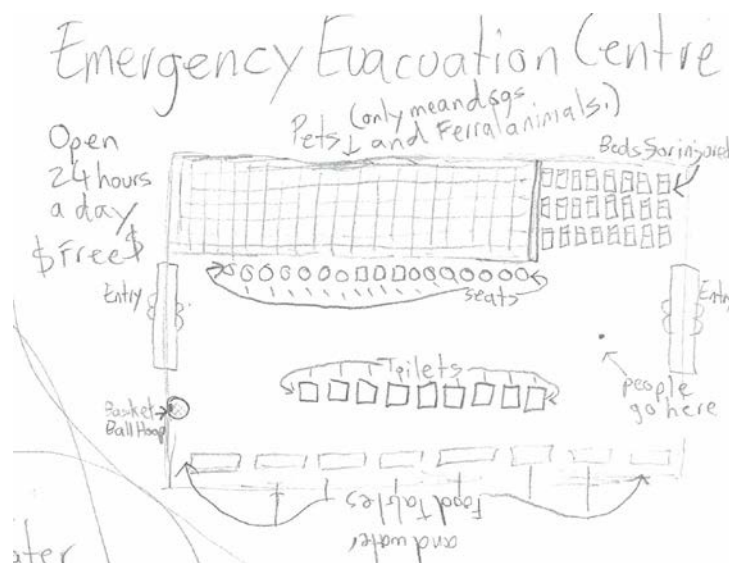


Other illustrations show that the students would like to be able to swim all year round in the ocean. The illustration below shows a structure that separates the jellyfish from the humans.



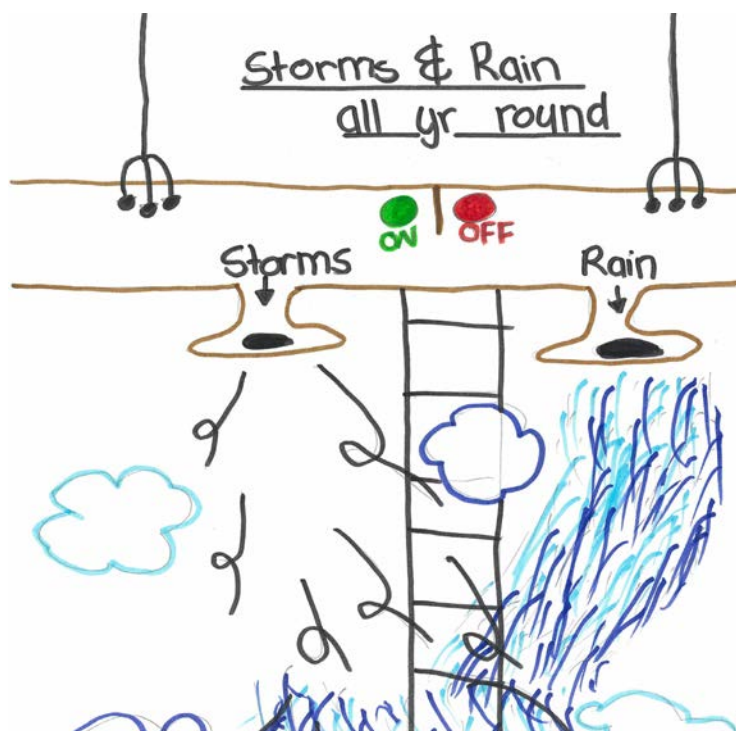
11.3.12.4 *Emergency management*

Responses summarised under this theme included making larger emergency shelters (that have a range of facilities within them) and shelters that are safe.



11.3.12.5 Weather changing interventions

This theme was the most surprising, as the illustrations show the mechanical and technical interventions that students would construct to control the weather.



11.4 Discussion

This research sought to investigate how the seasons affect the lives of Broome children and to find out what their mitigation strategies are to address the impacts of seasonal change. Results from the workshops suggest that the changes that young people experience between seasons is both distinct and extreme. The changes are described as distinct as the students identified patterns of their own behaviour (leisure), changes in population characteristics of their town (presence of tourists), prevalence of particular animal species and food types, climatic temperatures and weather events. The distinctions are extreme (i.e. polarised) in respect to experiencing or not experiencing rain events, cyclones, severe storms, weather related health impacts, flooding, tourists and marine stingers.

Weather related events in the rainy season (flooding, rain, cyclone and storms) were viewed as being both positive and negative. However, the children cited only negative impacts on health in the rainy season and in relation to marine stingers (i.e. there were no positive aspects). The presence of tourists was seen as mostly negative in the dry and the only positive aspect of tourists in the wet is that they are not present and that the town functions with its locals only (albeit on reduced economic terms).

The range of actions that the students would undertake to address their priority concerns varied significantly with five themes emerging from the content analysis. Most of the interventions that the students would undertake related to improving their leisure time throughout the year, such as installing a water park or pool. This indicates that while they possess strong adaptive skills they would prefer to have the extremes in seasons narrowed so that there was less variation.

Other interventions that the students would undertake included breeding up turtles to prey on the jellyfish and reduce their numbers. Other suggestions included hard infrastructure to separate the jellyfish from humans. Either way, the students felt the impact in the change in seasons through an inability to safely swim in the ocean due to the presence of jellyfish.

The remaining three interventions, i.e. emergency management facilities, civil infrastructure (roads, drains) and weather changing interventions, were not considered as important as removing impediments to access to leisure activities year round.

12. DISCUSSION

Each case study location is vulnerable to extreme weather events, which in turn may be exacerbated by climate change. In terms of noticing changes, some respondents commented that the change between seasons seems to be less distinct now than it used to be, but there was no perception that cyclone frequency or severity was increasing. However, some respondents felt that the number of hot days had increased along with the temperature. There was concern about the implications of this as people, especially the young, were considered to be less adapted to high temperatures as they spend an increasing amount of time indoors, relying on air-conditioning and using sedentary technological devices to communicate, socialise and occupy their time.

The connection between hazards and Indigenous spirituality/culture was discussed. Hazards such as cyclones are often interpreted through their connection to country and the damage from a natural disaster is considered a reaction to socio-cultural or environmental transgressions. The major impact discussed in relation to hazards was biodiversity loss. In particular, there is great concern within some communities, notably Ngukurr, in relation to the impact that bushfires have on bush tucker. Although some hazards may adversely impact biodiversity, events such as fire and flood may serve significant ecological functions and can regenerate the landscape, leading to an increase in food supply. However, biodiversity is further threatened by hunting, fishing, tourism and mining impacts, which damage the environment and deplete resources. Feral species consume bush tucker and drive out native species, although people acknowledge that they derive some benefit from the food resource of these animals.

Respondents noted an increase in floods, which, alongside an increase in population, has raised risk levels. In these remote communities, there is also a very real risk from crocodiles during periods of flood. In some locations, respondents believe that severe wet seasons are less frequent. Nevertheless, communities are frequently isolated due to flood, causing overcrowding issues and consequent health problems.

Community members are aware of sea level rise and noted the associated negative impacts of erosion, salt water intrusion, flooding and a reduction in bush tucker. There are also cultural impacts, as graves and sacred sites are becoming inundated. Some communities are looking at relocating inland and have called for more detailed mapping to be carried out. For the most part though, extreme events and slow onset changes are endured.

All four communities are extremely remote, which impedes their ability to recover from disasters when relying on outside assistance. People acknowledged that current cyclone warnings are a great improvement on the lack of forewarning in the past, despite some Traditional indications of the onset of severe weather. Timely warnings are crucial for preparation and communities are accustomed to following advice. However, there have been recent cases of late or non-existent warnings during hazard events such as cyclones Monica and Rona. The remoteness of Indigenous communities often impedes the communication of hazards and risks, and limited resources make it difficult to ensure that proper warnings are disseminated in time.

Isolation often results in communities running out of food, fuel and medicines during extreme weather events. However, many residents take responsibility to negate these effects by stocking up prior to an event – especially with respect to water, food and fuel – and ensure that there are vehicles available for evacuations. The governance issues arising from the amalgamation of local administration into larger shires provoked suggestions that remote communities are now overlooked and neglected. Respondents considered that there is now a lack of resources for preparation, mitigation, response

and recovery, and there are problems with evacuation, such as poor logistics, unknown numbers of people and the insufficient timing of warnings. Refuge centres within communities are often poorly maintained, they may have been damaged by past events such as cyclones, and they all suffer from a lack of space.

In the event of a local emergency, remote communities and their outstations cannot rely on the same kinds of evacuation processes that other more connected communities can. This is particularly evident for Wujal Wujal. To make matters worse, land use planning strategies are uncoordinated with emergency and disaster management and climate change adaptation strategies, and there is no policy to link the substantive knowledge gained from one system to that of another. The national government policy to create resilient communities that are capable of adapting to extreme weather events and slow onset changes is not supported by action on the ground, since the very government institutions and associated systems that currently govern these communities are not structured or adequately resourced to achieve these goals.

Although the remoteness of the case study communities impedes their ability to recover from emergency events through external help, it has increased their resilience and ability to adapt in some ways. Locals know that they need to be self-reliant, they have learned to cope with extreme weather events in the past, and they have endured and adapted to devastating social changes. They are knowledgeable and socially grounded and have learned from their ancestors. Through all of the changes that they have experienced, many Indigenous people have maintained their connection with country. Living on country, when it has been possible, has ensured that those people have a close connection to the land and to their extended family network, while providing a vital healing function to country. There is a strong link between the health of country and the health of people. At the physical level, issues include species loss, increasing numbers of mosquitoes, loss of local food resources, and pollution of waterways and the environment. At the social level, living on country promotes the maintenance and sharing of ecological knowledge and culture, sustaining the spiritual strength of people, and giving them a deep understanding of the seasons and changing environment around them. In effect, it has allowed the people to adopt holistic approaches to deal with complex environmental changes.

Community resilience can be enhanced when partnerships are built between diverse stakeholders in an effort to achieve positive environmental outcomes, as was demonstrated in the case of the Roebuck Bay Working Group. Similarly, the building of sustainable enterprises such as Yugul Mangi Development Corporation in Ngukurr provides employment opportunities to many local residents. Resilience is also promoted through programs that, for instance, support community champions, encourage community participation in environmental initiatives, record stories and culture in a knowledge database, or advance rangers' activities in building environmental sustainability. For example, the setting up of climate change walks helps educate the wider community and visitors of the issues involved in building sustainability, resilience and adaptive capacity.

Government and religious policies, past and present, have often been detrimental to the success of many of the abovementioned initiatives, preventing people from maintaining their culture and spirituality. This loss of culture, or cultural change, is particularly acute among younger generations who lack Traditional knowledge of country and language. However, the research presented in Chapter 11 demonstrated that children in the tropics respond very positively to seasonal changes in their lives. Although some youth may have lost touch with their culture they were, in general, considered more adaptable than older generations, as they can access new

technologies and methods. Moreover, they are more likely to appreciate the issues involved in climate change when they are exposed to relevant and appropriate education. Thus, changing the attitudes of youth is likely to be easier than that of adults and is another area where resilience can be enhanced.

Cultural change is observed and commented upon by the respondents both in terms of the ongoing importance of Aboriginal cultures and the decline and transformation of many of their fundamental characteristics. There are generational issues that relate to the passing on and acceptance of traditions, which are sometimes lost with the passing of older members of the group. However, there may be a possible strengthening of emergent traditions through cross-cultural contact between Aboriginal societies. The loss of language is widespread, but is transformed by the development of *Kriol*. Art and music, on the other hand, remain powerful means of expression, grounded in culture and values but transforming through cross-cultural and inter-generational dynamics. Spirituality is expressed by respondents, but some elements of Traditional spirituality have been incorporated into Christian beliefs. Respondents also expressed concerns at some of the new ideas and approaches, again across generations, where negative uses of spiritual knowledge are evident.

Leadership is both emergent and grounded in Traditional relationships. In all of these communities, relationships with country and understanding of the environment and all of its components, including climate and its changes, are core to culture. The outstation movement enhances that relationship, providing connection, care of country, a richer diet based on bush tucker, and awareness of seasonal and cyclical shifts in the weather and the landscape. Adaptation to changing culture and country seems to be deeply embedded in these Aboriginal communities.

However, centralisation of services makes it difficult for Indigenous people to adapt *in situ* and limited funding for homelands and infrastructure exacerbates this. Further difficulties result from destruction of the environment through mining and other developments, pollution, over fishing and introduced fauna and flora. The ability of relevant bodies to tackle environmental threats is often inadequate due to poorly resourced land trusts and Indigenous ranger services that are dependent on government funding. The lack of access to country by Traditional Owners means that it is more difficult to monitor environmental threats, which exacerbates the problems. Access is further limited due to the lack of suitable vehicles and a change of lifestyle to more sedentary behaviours. These difficulties, in turn, engender a lack of respect for Traditional ecological knowledge and values in the younger generations.

Mobility is a major factor of living in remote communities, as people move for reasons of health, work, education, funerals and seasonal change. Part of that seasonal change is the influx into larger centres during the wet season, where the issue of overcrowding becomes critical. There is longer-term out-migration linked to work and education. Respondents stressed the importance of employment schemes, such as the ranger groups, within the community, and spoke of their powerful impact upon environmental management. On the other hand, while some viewed employment opportunities arising from mining as a positive, there was an overwhelming response towards the negative impacts of the industry. Without doubt, mining is an enormous environmental, political and social issue because in all of these areas it has powerful impacts. It threatens the sustainability of country, culture and social systems and thereby constrains adaptive capacity.

The quantitative and qualitative data presented in this report demonstrate that there is a significant amount of short and long-term population movement between communities, which may occur for a number of socioeconomic and political reasons.

However, there is no particular indication that there will be a substantial increase of movement in the future as a direct result of climate change. Factors that are likely to increase the movement of Indigenous people include the centralisation of services, differing ambitions and behaviours of young people, and employment associated with new mining ventures. Future projections based on demographic data suggest that out-migration may occur from Maningrida and Wujal Wujal, with an emphasis on migration to Darwin and Cairns, respectively. Out-migration from Wujal Wujal is likely to be long-term. Ngukurr is harder to assess although it may experience in-migration from nearby communities due to the mining boom and tourism discussions occurring in lands surrounding Ngukurr. Similarly, Broome will experience significant growth if the proposed gas hub and port are built. However, even if this does not occur, both short and long-term in-migration are likely to continue within Broome.

It is clear from the qualitative data that older generations are keen to remain on their land. Moving away is not viewed as a viable option and, as such, they will have to adapt *in situ*. Movement was seen by some as more of an adaptive response for younger generations who may not be as strongly connected to the land and/or aim for broader employment and social opportunities in larger towns. The younger people are not so concerned about the movement *per se*, but they do desire to maintain control over their movement. While climate change does not surface as a factor that influences the decision to migrate, it may influence where people decide to go as it can affect what services and infrastructure are available at the destinations. Further, extreme weather events and slow onset changes might influence the timing of migration, and when or whether people decide to return.

Short-term migration due to weather patterns is currently occurring with more people moving to the towns and regional centres during the wet season to avoid being cut-off by floods. The peak in numbers of people using the Broome charity kitchens in the wet suggests that climate is a contributing factor to their movement. These movements tend to come when the coping infrastructure is most stressed (transport and accommodation in particular). A changing climate may impact on the duration, timing and severity of the wet and dry seasons, making it harder to plan and provide services and accommodation for the temporary populations. Travel between towns and communities may also become more uncertain and difficult.

Movement of Indigenous people as a response to severe events has occurred numerous times in history. An example from the communities studied includes the movement of the Roper River Mission in Ngukurr, which was permanently relocated in 1940 and temporarily relocated in the early 1950s. The permanent relocation came about due to severe flooding, which forced the mission to move from the floodplain to its current location on a topographic high. The temporary relocation occurred in response to drought, when the mission moved to 'Mission Gorge' for a couple of years to access drinking water when the Roper River became too salty for consumption. In both instances, Aboriginal people initiated the evacuations based on their knowledge and perceptions of country.

The positioning of the mission on the floodplain of the Roper River highlights a lack of planning and foresight, which surprisingly, still occurs in many regions today. This failure leads to *ad-hoc* development and infrastructure that cannot keep pace with community growth and stifles business development in remote communities. Government policy decisions are made without transparency, inclusivity, or due consultation or consideration of the views of Traditional Owners or Indigenous people in general. This leaves Indigenous people feeling voiceless and powerless to influence iniquitous outcomes. An example of such outcomes is the construction of new homes

to fulfil politically motivated policy decisions, but using designs that are both culturally and environmentally unsuitable.

Similarly, initiatives to build capacity and empowerment within communities are not followed through by government agencies. For example, talks of developing small business opportunities within Maningrida instilled the hope of independence in residents. However, discussions have now fallen by the wayside and local residents remain reliant on welfare payments. Such reliance on 'sit down' money is a common feature of many remote settlements, where there is a lack of job opportunities. The result is low motivation, which together with factors such as overcrowding, poor education, poor nutrition, unsanitary conditions, poor health care provision, and use of alcohol and drugs, contributes to a loss of cultural practices, degeneration of the environment, increased stress and poor health outcomes for Indigenous people.

Social problems in Indigenous communities undermine social cohesion and community resilience, but at the same time there is clearly a great deal of social capital. Alcohol, drug and substance abuse are particular problems that plague many communities and are exhibited in generational issues. Many respondents, in relation to the loss of culture, discussed the issue of youth engagement, but at the same time it was acknowledged that young people have a strong understanding and sensitivity towards the environment. Youth issues relate to the role of language and culture, the lack of inclusivity in decision-making, and finding the appropriate balance between Indigenous and mainstream education. Many people justifiably argue that the national curriculum-based education system disadvantages the children of Indigenous communities, who speak English as their second, third or more language, in comparison to the majority of Australians with English as a first language. The centralisation of schools has led to the closure of many bush schools, to the further disadvantage of many Indigenous children.

13. RECOMMENDATIONS AND CONCLUSION

If the goal of federal and state governments is to create climate change resilient communities, then a fundamental change to the way in which land use planning and decision-making is conceptualised and practiced is urgently required. This change is not specific to just the planning fraternity. Rather, all public institutions that relate to disaster resilience and climate change, including planners, climate scientists, decision-makers, regulators and emergency managers, must find structural and policy mechanisms to integrate their knowledge and efforts towards risk reduction and adaptation. Actions to develop climate safe communities through land use planning frameworks in tropical Australia must include the creation of consistent methodologies and data frameworks to enable information-sharing between and across government agencies at all levels. This is especially the case between emergency management agencies and land use planning agencies at both state/territory and local government levels. Land use planning agencies at all levels of government need to ensure they are using the latest information available to formulate appropriate planning and development controls to minimise risks and improve adaptation. These actions should result in better access to risk information and improved collaboration in developing local community resilience through improvements to their built environments over time.

There is a need to reform the procurement policy in all jurisdictions for the design and construction of housing in Aboriginal communities (irrespective of the underlying tenure) to ensure climate and culturally sensitive design practices. Procurement policy needs to be better informed by the hazards and risks and vulnerability of particular communities to extreme and slow onset climate changes and what these might mean for the design of housing in particular locations. Procurement policies and processes also need to better involve the local population, as they know their communities and can provide insights into the types of adaptation measures that may be required.

There is also a need to undertake a review of planning legislation and statutory planning documents to ensure that climate change impacts are taken into consideration in their formulation and that their implementation is enforceable. COAG could, for instance, develop a set of minimum principles for local planning schemes to accommodate climate change impacts and climate responsive design elements. This could be similar to their previous development of a set of criteria for assessing capital city strategic planning systems.

Further, the case study locations need to develop priorities for further action to be addressed within the community by the community itself, and priorities for action requiring assistance from outside organisations. In particular, they need to develop culturally appropriate emergency response strategies in collaboration with emergency and community services. It may also help if communities list any successful interventions that they have implemented to cope with climate change or extreme weather events and share these with other communities.

On a broader scale, there is a need for the recognition in national disaster resilience policies and strategies of local structures and organisations and devolving power to them, while continuing to provide necessary guidance and support.

As we undertook our research, we compiled a summary of Indigenous policies at Commonwealth and state/territory levels that are currently driving many of the programs and activities in our case study communities (Appendix A). While many of these policies and initiatives have laudable objectives, we see a real disjuncture between public policy objectives and the needs and aspirations of local Indigenous communities. We believe the real challenge for remote Indigenous communities in

Australia is to promote new patterns of economic growth and enterprise development that simultaneously sustain cultural heritage values and deliver social and economic justice to people living in remote areas. This requires participatory approaches that better integrate the aspirations of Indigenous people who are the focus of many economic development or poverty alleviation initiatives.

In the course of the project, strong links have been developed between community members, local government agents, emergency service personnel and researchers. Many Traditional Owners, elders and residents have welcomed further research, as they are keen to discuss the findings of this project and develop ideas on how governments and researchers can continue working together with local communities to increase their adaptive capacity to climate change impacts.

One such venture was a DVD, produced through work instigated by James Cook University and in conjunction with Eastern Kuku Yalangi women in and around Wujal Wujal and Shiptons Flat. The film is entitled 'Indigenous adaptation in northern Australia: Disasters and climate risks in Eastern Kuku Yalangi country'. The idea for the film came about following discussions with some Eastern Kuku Yalangi women and observing their passion to create sustainable communities that can adapt to the adverse effects of climate change and disasters. Inspiration for the film was drawn from the 2012 theme for the International Day for Disaster Reduction, 'Women and Girls: The [in]Visible Force of Resilience'. This DVD was produced by Balkanu Cape York Development Corporation and a community screening of the film is scheduled for early June 2013, after which the film will be freely available online. It is the aim of this DVD to increase awareness of the efforts of local women who are helping their communities become more resilient to extreme weather events and slow onset changes.

This report has demonstrated that each community has its own unique set of circumstances and climate change is just one of many issues confronting them. The report documents a detailed assessment of vulnerability, which places the community in its entire context, not just a 'climate' or 'weather' context. We have been cautious not to overstate any conclusions about individual communities because we do not feel that we have had the time to adequately discuss the findings with them and go to the next iteration of the research, which is to consider the potential implications as they see them. Ideally, the next steps would be to examine these results with each individual community and develop, in partnership with the communities, a roadmap to reduce vulnerability and increase adaptive capacity.

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APPENDIX A – COMMONWEALTH AND STATE/TERRITORY INDIGENOUS POLICY INITIATIVES

A.1 COAG National Indigenous Reform Agreement (*Closing the Gap*) (NIRA) and National Partnership Agreements

In December 2007 the Council of Australian Governments (COAG) agreed to a partnership between all levels of government to work with Indigenous communities in order to 'close the gap' in Indigenous disadvantage. In recognition that this will require a long-term generational commitment, COAG identified a range of strategic platforms or 'Building Blocks' to support the reform process for six specific target areas. The Building Blocks endorsed by COAG are:

- (a) Early Childhood Development;
- (b) Schooling;
- (c) Health;
- (d) Economic participation;
- (e) Healthy Homes;
- (f) Safe Communities; and
- (g) Governance and Leadership.

The six COAG target areas agreed in the *National Indigenous Reform Agreement (Closing the Gap)* (NIRA), signed in November 2008, are:

- (a) Closing the life expectancy gap within a generation;
- (b) Halving the mortality gap for children under five within a decade;
- (c) Ensuring all Indigenous four year olds in remote communities have access to early childhood education within five years;
- (d) Halving the gap in reading, writing and numeracy within a decade;
- (e) Halving the gap for Indigenous students in Year 12 attainment or equivalent attainment rates by 2020; and
- (f) Halving the gap in employment outcomes between Indigenous and non-Indigenous Australians within a decade (COAG 2008a:4, 6-7).

The NIRA provides an overarching summary of the actions to be taken against each of the 'closing the gap' targets, as well as the operation of various agreements and partnerships between the Australian, State and Territory governments. The relationship between the various agreements is shown in Figure A.1.

The NIRA also captures the objectives, outcomes, outputs, performance measures and benchmarks that all governments have committed to through various National Agreements and National Partnerships in order to close the gap on Indigenous disadvantage. These are discussed below. The NIRA was revised in February 2011.

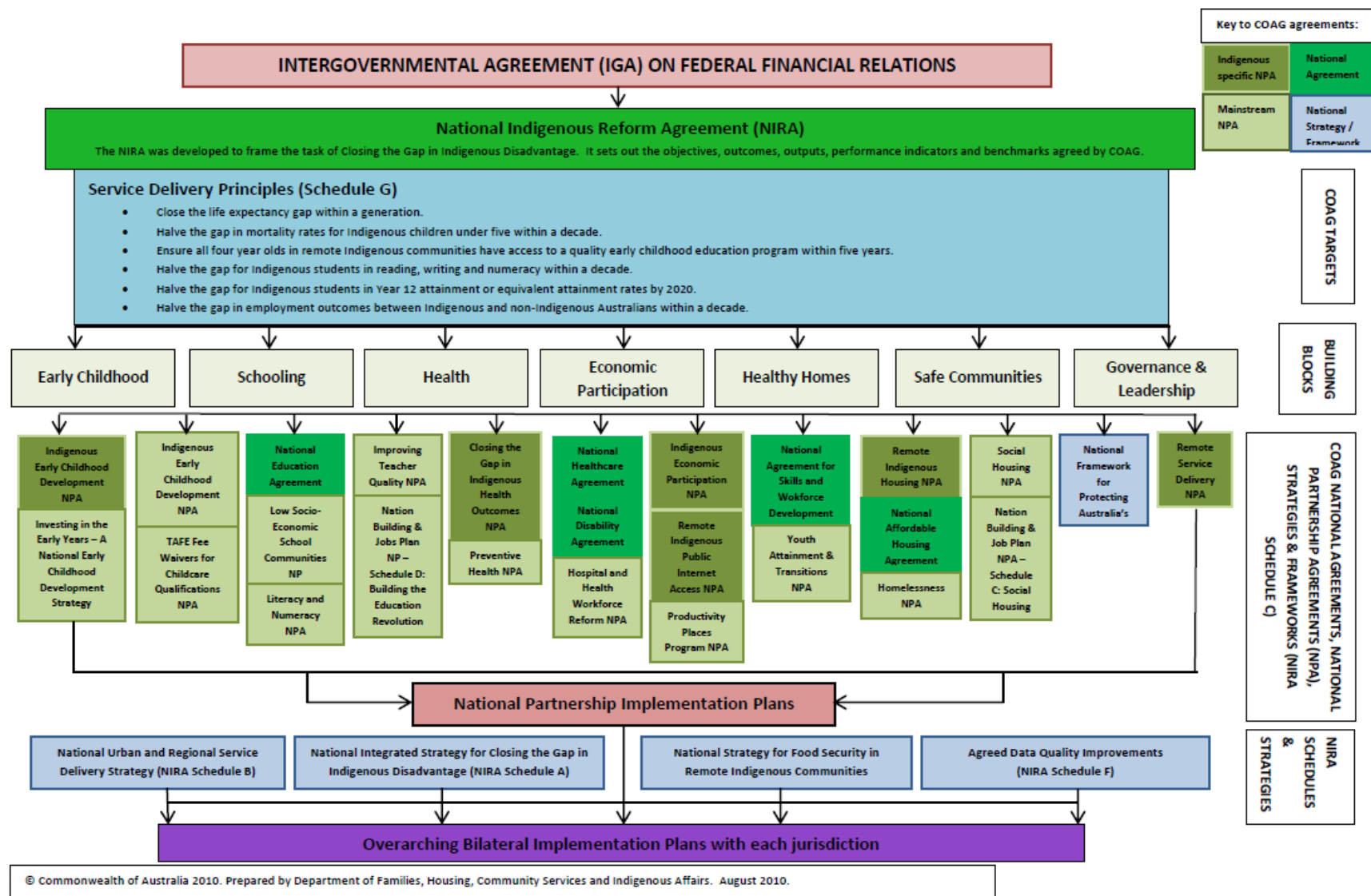


Figure A1: Council of Australian Governments – Closing the Gap in Indigenous Disadvantage.

In the context of the 'Building Blocks' framework, COAG has entered into several National Partnership Agreements, which are designed to ensure that all governments are held accountable for their performance in these key areas. The commitment to a common framework of outcomes, progress measures and policy directions are intended to guide Indigenous reform and build on current initiatives. The Agreements fund specific projects and use payment incentives to reward states/territories that deliver on nationally significant reforms.

Taken together, these agreements aim to address housing needs in remote communities and to implement a more equitable service delivery model to ensure that Indigenous communities receive a standard of housing, service delivery and infrastructure that is comparable to non-Indigenous communities of a similar size and location.

Also worth mentioning here are the *National Partnership Agreement on Indigenous Economic Participation* and the associated draft *Indigenous Economic Development Strategy*. The objective of the Economic Participation Agreement is to create properly waged jobs in government service delivery which previously relied on CDEP; to strengthen government procurement policies to maximise Indigenous employment; to develop Indigenous workforce development strategies for all major COAG reforms; and to foster public sector Indigenous employment and career development.

Each of the National Partnership Agreements includes significant investments aimed at closing the gap in Indigenous disadvantage, including the following:

- Remote Indigenous Housing: \$5.5 billion over ten years from December 2008.
- Remote Service Delivery: \$291.2 million over six years from December 2008.
- Economic Participation: \$228.9 million over five years from December 2008¹⁷.
- Improving Indigenous Health Outcomes: \$1.57 billion over four years from December 2008.
- Early Childhood Development: \$564.4 million over six years from July 2009.
- Remote Internet Access: \$7 million over four years from July 2009.
- An Indigenous Clearinghouse: \$5.204 million over five years from 2009.

Some of these are discussed below.

A.1.1 The National Partnership Agreement on Remote Indigenous Housing (NPA-RIH)

The *National Partnership Agreement on Remote Indigenous Housing* (NPA-RIH) is intended to address the problems of overcrowding, homelessness and poor housing conditions in remote Aboriginal and Torres Strait Islander communities. The agreement recognises the relationship between housing conditions on communities and the potential for improvements in health, education and employment outcomes.

Specific goals identified under the agreement include:

- a) Supply of safe and adequate housing that will contribute to improved living standards;
- b) Robust and standardised tenancy management of all remote Indigenous housing;

¹⁷ These funds were directed to providing properly waged jobs for government services which previously relied upon CDEP.

- c) A program of ongoing maintenance and repairs;
- d) Construction of new houses and ongoing repair and maintenance of houses;
- e) Increased employment opportunities for local residents;
- f) Accommodation such as hostels and subsidised rental housing in regional areas to support people from remote communities to access training, education, employment and support services;
- g) Progressive resolution of land tenure on remote community-titled land in order to secure government and commercial investment, economic development opportunities and home ownership possibilities in economically sustainable communities;
- h) Upgraded housing and housing-related infrastructure in town camps where appropriate; and
- i) Improved data collection through a three-yearly collection similar to the former Community Housing and Infrastructure Needs Survey (CHINS).

The agreement commits the Commonwealth to the provision of funding over approximately 10 years (from February 2009 to June 2018) for additional Indigenous housing and housing-related infrastructure in remote areas, subject to the resolution of land tenure issues and the provision of secure land tenure on community-titled land. The Commonwealth has also committed to providing funding for some municipal and essential services as part of existing arrangements, pending the transfer of agreed funding responsibilities to the States and the Northern Territory.

A.1.2 The National Partnership Agreement on Remote Service Delivery (NPA-RSD)

This agreement aims to establish a new coordination model for remote service delivery, to ensure Indigenous people living in remote communities receive and actively participate in government service provision, to a level broadly comparable with that in non-Indigenous communities elsewhere in Australia of a similar size and location.

The stated objectives of the agreement are to:

- a) Improve the access of Indigenous families to a full range of suitable and culturally inclusive services;
- b) Raise the standard and range of services delivered to Indigenous families;
- c) Improve the level of governance and leadership within Indigenous communities;
- d) Provide simpler access to and better coordinated government; and
- e) Increase economic and social participation wherever possible.

The NPA-RSD is also expected to contribute towards, amongst other things, the standards of services and infrastructure to be comparable with non-Indigenous communities of similar size, location and need elsewhere in Australia.

Each jurisdiction is required to prepare a Bilateral Implementation Plan to achieve the objectives of the agreement and as a precursor to the development of detailed Local Implementation Plans for identified locations. The jurisdictional level Bilateral Implementation Plan is to include timelines for achieving performance benchmarks against the six targets agreed by COAG as essential to closing the gap in Indigenous disadvantage, and is to be reviewed annually by the parties.

The NPA-RSD acknowledges that the performance benchmarks and indicators will differ from location to location, and that these will be developed through the detailed baseline mapping of social and economic indicators, government investments, services and service gaps in each location.

Under the NPA-RSD, the Commonwealth has responsibility for:

- a) Working with States and the Northern Territory to establish a new integrated service planning and delivery mechanism in identified locations;
- b) Providing financial and in-kind contributions to States and the Northern Territory;
- c) Dedicating staff to operate new integrated service delivery mechanisms;
- d) Working with States and the Northern Territory to establish a coordination mechanism to facilitate problem solving and ensuring that the development and implementation of service delivery, including servicing plans, proceeds smoothly;
- e) Baseline mapping, building and maintaining the evidence base, and monitoring and evaluation in identified locations, including current government expenditure/investment in each location, existing community networks and decision-making processes, and an evidence base to facilitate the measuring of performance against clearly defined targets and standards that cut across agencies and levels of government;
- f) A research capacity to provide advice to government on local and systemic issues associated with cultural accessibility, including cross-cultural training materials; and
- g) Introducing a national framework, working with the States and the Northern Territory, for the effective supply and use of Indigenous language interpreters and translators and relevant protocols.

The States and the Northern Territory have responsibility for:

- a) Working with the Commonwealth to establish a new integrated service planning and delivery mechanism in identified locations;
- b) Providing financial contributions (and any in-kind support identified within the respective implementation plan) as set out in the agreement;
- c) Dedicating staff to operate new integrated service delivery mechanisms;
- d) Delivering all of the land tenure component; and
- e) Assisting in the creation of the coordination mechanism.

Under the NPA-RSD, 29 **Priority Communities** were identified using the investment principles set out in the schedules to the Agreement. Communities were selected based on factors including:

- significant concentration of population
- anticipated demographic trends and pressures
- potential for economic development and employment
- pre-existing shortfalls in government investment in infrastructure and services
- potential to build on other significant investment already in progress or on community-based initiatives.

These priority communities, which in many cases are growing as a result of demographic factors, are receiving additional and accelerated investment. The priority locations for initial investment are shown in Table A1.

Table A1: Remote Service Delivery Priority Locations.

State	Locality
Northern Territory	Angurugu, Galiwinku, Gapuwiyak, Gunbalanya, Hermannsburg, Lajamanu, Maningrida, Milingimbi, Nguiu, Ngukurr, Numbulwar, Wadeye, Yirrkala, Yuendumu and Umbakumba.
Queensland	The Gulf communities of Mornington Island and Doomadgee, and the Cape York communities of Aurukun and Hope Vale, together with continuing work in Coen and Mossman Gorge which are part of the Cape York Welfare Reform trial.
Western Australia	Fitzroy Crossing and surrounding communities, Halls Creek and surrounding communities, and the Dampier Peninsula (with a focus on Beagle Bay and Ardyaloon).
South Australia	Amata and Mimili in the Anangu Pitjantjatjara Yankunytjatjara (APY) Lands.
New South Wales	Walgett and Wilcannia in the State's far west.

The Commonwealth Government has indicated that those communities not currently covered by the RSD strategy will continue to receive government support and services at least to existing levels, and that the RSD strategy may be expanded to other remote communities on the basis of the investment principles.

A.1.3 The National Partnership Agreement on Indigenous Economic Participation (NPA-IEP)

The *National Partnership Agreement on Indigenous Economic Participation* (NPA-IEP) complements the NPA-RIH and NPA-RSD, with the objective of increasing economic participation by Indigenous Australians. The goals are to:

- provide properly waged jobs in government service delivery which previously relied on CDEP (completed);
- strengthen government procurement policies to maximise Indigenous employment and business development opportunities;
- embed Indigenous workforce development strategies for all major COAG reforms (completed); and
- increased representation of Indigenous Australians in the public sector.

Under the NPA-IEP, the Australian government made a commitment to strengthen its procurement policy to maximise Indigenous employment opportunities.

As part of this commitment an enhanced Indigenous Opportunities Policy (IOP) was implemented on 1 July 2011. Under the IOP, Commonwealth Agencies subject to the *Financial Management and Accountability Act 1997* (Cth) (FMA Agencies) are required to apply this policy to procurements where there is likely to be a contract or contracts valued over \$5M (\$6M for construction) and the main activity for the contract is in a region with a significant Indigenous population.

Procurement processes to which the IOP applies will require successful contractors to have a DEEWR approved Indigenous Training, Employment and Supplier Plan or IOP Plan in place. The IOP Plan requires organisations to select activities from four groups (Training, Employment, Business and General) which commit to providing:

- training opportunities for Indigenous Australians
- employment opportunities for Indigenous Australians
- opportunities for Indigenous businesses, and
- general activities related to operation of the organisation as a whole.

The IOP is complemented by the recent exemption of small and medium Indigenous enterprises to the Commonwealth Procurement Guidelines (CPG). The exemption has been designed to complement the IOP but operates separately and is administered by the Department of Finance and Deregulation.

- The CPG exemption allows Government agencies and relevant *Commonwealth Authorities and Companies Act 1997* (Cth) bodies to contract directly with Indigenous small to medium enterprises without the need to conduct a full tender process. The exemption can be applied to any procurement over \$80,000.

In October 2011, the Commonwealth released a draft *Indigenous Economic Development Strategy 2011–2018* (IEDS), which links the policy themes of strengthening foundations, education, skills development and employment, business and entrepreneurship and financial security and independence, with the aim of increasing participation of Aboriginal and Torres Strait Islander Australians in the mainstream Australian economy. Areas for action outlined in the strategy are:

- a) Strengthening foundations to create an environment that supports economic development, including access to basic services and infrastructure;
- b) Investing in education;
- c) Encouraging participation and improving access to skills development and jobs;
- d) Supporting the growth of Indigenous business and entrepreneurship; and
- e) Assisting individuals and communities to achieve financial security and economic independence by increasing their ability to identify, build and make the most of economic assets.

The core intention of the IEDS is to support increased personal and economic wellbeing of Aboriginal and Torres Strait Islander Australians through greater participation in the economy. The achievement of this broad policy objective in remote Indigenous communities is focussed on building individual capabilities and ensuring that welfare and tax systems do not discourage economic participation. It is also about identifying new opportunities for employment and maximising Indigenous employment in the existing labour market. The IEDS acknowledges that removing barriers to genuine commercial ventures is crucial for ensuring that private sector opportunities grow in remote locations to complement public-sector services and jobs.

A.1.4 The National Partnership Agreement on Improving Indigenous Health Outcomes

The National Partnership Agreement on Closing the Gap in Indigenous Health Outcomes, agreed by COAG in 2008, commits governments to around \$1.6 billion of expenditure over four years. Key activities during 2010-11 included the rollout of

smoking cessation and reduction programs, and training of workers to support these programs.

A.1.5 The National Partnership Agreement on Early Childhood Development

The National Partnership Agreement on Indigenous Early Childhood Development provides for early learning, support for Indigenous families and improved health for mothers and their children. As part of the Agreement, a network of 38 Children and Family Centres is being established, offering integrated early childhood and parenting services. The first centre opened in April 2011, and all centres are on track to be established by 2014.

A.1.6 National Partnership on an Indigenous Clearinghouse

In 2009, COAG agreed to the establishment of a National Indigenous Clearinghouse for reliable evidence on best practice and success factors for closing the gap on Indigenous disadvantage. The focus of the Clearinghouse will be on building an evidence base which contributes to the achievement of the Closing the Gap targets and objectives set out in the NIRA and the broader COAG Indigenous reform agenda.

A.1.7 Coordinator General on Remote Service Delivery

The Commonwealth has established the Office of the Coordinator General for Remote Indigenous Services to report on the performance of Australian Government agencies in meeting their commitments to implement the NPA-RSD.

The role of the Office of the Coordinator General for Remote Indigenous Services is to:

- Oversee the implementation of the Remote Service Delivery partnership in Indigenous communities;
- Formally report to the Minister for Families, Housing, Community Services and Indigenous Affairs twice a year on progress, and ensure that all government service agencies are held accountable for their implementation responsibilities under the Remote Service Delivery partnership;
- Have the authority to work across agencies to cut through bureaucratic blockages and red tape, and to make sure services are delivered effectively; and
- Have a direct line of sight to the whole of government Regional Operations Centres established to coordinate services in communities and the single government contact points located within the identified priority communities.

In other words, the key role of the Office is to oversee the planning and strategic investment in communities and provide agencies with guidance on good practice. It is also to assess progress and advise governments where there are gaps or slow progress or where improvements need to be made to ensure governments meet their commitments under the Remote Service Delivery Strategy.

To ensure that the delivery of all government services and programs in Remote Service Delivery communities is coordinated between governments, the Office works closely with Commonwealth agencies and the State and Northern Territory Coordinators General, who all play a crucial role in coordinating implementation efforts within their jurisdiction.

A.2 State/Northern Territory Policies and Initiatives

A.2.1 State/Northern Territory Bilateral Implementation Plans

Through COAG, State and Territory governments have committed to the six 'Closing the Gap' targets to address Indigenous disadvantage across urban, rural and remote areas, and agreed to the seven strategic platforms or 'building blocks' as a means of meeting the targets. The commitment to a common framework of outcomes, progress measures and policy directions are intended to guide Indigenous reform and build on current initiatives.

Under the National Indigenous Reform Agreement (NIRA), Overarching Bilateral Indigenous Plans (OBIP) have been agreed between the Commonwealth and each State and Territory (CGRIS 2009 and Ministerial Council for Federal Financial Relations 2011). The Plans underpin a cooperative working relationship between the Commonwealth and each of the jurisdictions to realise the commitments and objectives made under the NIRA by:

- incorporating implementation plans developed under all Indigenous-specific National Partnerships;
- progressing implementation of the National Urban and Regional Service Delivery Strategy for Indigenous Australians;
- clearly articulating activities that the Commonwealth, States and Territories will undertake to improve data required under the National Indigenous Reform Agreement; and
- establishing bilateral governance mechanisms.

The following is a brief overview of Indigenous policy initiatives in the NT, Qld and WA and their respective Bilateral Implementation Plans with the Commonwealth.

A.2.2 Northern Territory

The Northern Territory Government's *A Working Future* provides a longer term vision and framework for remote towns in the Northern Territory. *A Working Future* aims to strengthen services to remote communities, outstations and homelands through a hub and spoke service delivery model, and focuses on six key areas:

- Territory Growth Towns¹⁸ – aimed at making the Northern Territory's biggest remote communities into proper towns, with services, buildings and facilities like any other country town in Australia and to become the economic and service delivery centres for their regions.
- outstations and homelands – aimed at helping homelands and outstations with funding for services they need. Outstations are mostly on private Aboriginal land, so the government will concentrate on helping residents and Traditional Owners to look after their own houses, bores and generators into the future. The government will not be building any new outstations.
- remote service delivery – governments will work together to provide services that local people need with a 'one-stop shop' in remote towns and providing long-term funding so that communities can plan for the future with certainty.

¹⁸ The twenty Territory Growth towns are: Maningrida, Wadeye, Borroloola, Nguiu, Galiwin'ku, Milngimbi, Ngukurr, Angurugu/Umbakumba, Gunbalanya, Yirrkala, Numbulwar, Yuendumu, Hermannsburg, Ramingining, Gapuwiyak, Daguragu/Kalkarindji, Lajamanu, Papunya, Elliott and Ali Curung.

- employment and economic development – helping local people plan for the future of their local economy and putting in place strategies to attract and support new businesses.
- remote transport strategy – working with local people on a Remote Integrated Transport Strategy to help make sure that people can get into the larger towns and get back home again safely to get to jobs, schools, clinics, shops and other services in larger towns.
- targets and evaluation – The Territory Government will report against the closing the gap targets and key town-specific baseline indicators every year, and will also have special evaluation of remote service delivery – to make sure it is really helping remote towns and communities achieve *A Working Future*. (Northern Territory Government 2011a)

The Northern Territory Overarching Bilateral Indigenous Plan between the Commonwealth and Northern Territory Governments commits them to working together and in partnership with Indigenous Territorians to take action to strengthen cultural identity and wellbeing and to address entrenched levels of disadvantage. It consolidates information about the key commitments aimed at closing the gap, recognising that coordination and integration are essential to achieving agreed outcomes for Indigenous Territorians. The term of the Plan is for five years and includes two schedules. Part 1 contains schedules that have particular relevance to the Northern Territory context and which underpin joint work across a range of areas, including:

- Remote Service Delivery NPA
- Closing the Gap in the Northern Territory NPA
- National Urban and Regional Delivery Strategy
- Agreed data quality improvements
- Healthy Country, Healthy People
- Groote Eylandt and Bickerton Island Regional Partnership Agreement
- Indigenous Arts and Culture

Part 2 contains schedules that relate to each of the seven COAG building blocks in a Northern Territory context (NT Government 2011b). The purpose of these Schedules is to consolidate joint activity in each of the Building Block areas, including existing COAG Agreements and Strategies.

In the Plan, the Governments will work in partnership to:

- align existing Northern Territory Government and Australian Government Indigenous initiatives;
- align the reporting requirements associated with these activities;
- engage in joint strategic policy development and planning processes for future activity in the Northern Territory;
- develop and share evidence and undertake joint planning and implementation of evaluations; and
- make results of evaluations publicly available via the Closing the Gap Clearinghouse in order to build a cumulative body of evidence to inform and improve policy and service delivery for Indigenous Australians.

The Remote Service Delivery Bilateral Plan between the Commonwealth and the NT aims to establish a new coordination model for remote service delivery to ensure

Indigenous Australians living in remote communities receive and actively participate in government services at a level broadly comparable with that in non-Indigenous communities of similar size, location and need elsewhere in Australia (CGRIS 2009).

The Agreement is being implemented initially in the priority locations of Hermannsburg, Yuendumu, Lajamanu, Ngukurr, Numbulwar, Angurugu, Umbakumba, Yirrkala, Gapuwiyak, Galiwin'ku, Milingimbi, Maningrida, Gunbalanya, Nguiu and Wadeye. Expanding this approach to additional locations, including those identified as Territory Growth Towns under the Northern Territory Government's *A Working Future* policy framework (specifically Ali Curung, Papunya, Borroloola, Daguragu/Kalkarindji, Ramingining and Elliot) will follow (CGRIS 2009).

A.2.3 Queensland

The Queensland Government's response to COAG's Indigenous Reform Agreement is *Partnerships Queensland*, which aims to improve the way the state government delivers programs to Aboriginal and Torres Strait Islanders living in Queensland. Through Partnerships Queensland, all Queensland Government departments will be guided by:

1. A set of goals and policy objectives:
 - strong families, strong cultures
 - safe places; healthy living
 - skilled and prosperous people and communities.
2. A new way of doing business based on:
 - partnership
 - community engagement
 - improved governance
 - better performing and more accountable service providers
 - shared responsibility. (Queensland Government 2010a)

The Queensland Government has also committed to producing Annual Highlight Reports summarising the progress being made to improve the quality of life for Indigenous Queenslanders living in Aboriginal and mainland Torres Strait Islander communities¹⁹, and Quarterly Bulletins. (Queensland Government 2010 b and c) and form part of the comprehensive arrangements for reporting on key indicators of wellbeing in the discrete communities.

The individual community quarterly bulletins provide statistical information on the key indicators used to summarise the progress being made to improve the quality of life for Indigenous Queenslanders living in the discrete Aboriginal and mainland Torres Strait Islander communities. Each community section contains a community profile, information about some key initiatives and services for the quarter and data in relation to community wellbeing. The information used in the bulletins is collated from several sources, including administrative collections held by state government agencies and ABS. (Queensland Government 2010b and c)²⁰ The Annual Reports and Bulletins also

¹⁹ These include Aurukun, Cherbourg, Coen, Doomadgee, Hope Vale, Kowanyama, Lockhart River, Mapoon, Mornington Island, Mossman Gorge, Napranum, Northern Peninsula (includes Bamaga, Injinoo, New Mapoon, Seisa, and Umagico), Palm Island, Pompuraaw, Woorabinda, Wujal Wujal, and Yarrabah (but not the Torres Strait Island communities).

²⁰ Natural disasters severely impacted the state in late 2010 and early 2011. As a result of the need to focus on community recovery efforts the publication of quarterly data on key indicators was delayed. The latest quarterly data for the period July–September 2010 was published in early April this year. Quarterly data for the period October–December 2010 is anticipated to be available in early August 2011.

summarise the key initiatives and actions the Queensland Government is taking to close the gap.

In early 2007, at an historic Ministerial Indigenous Roundtable in Atherton between the Queensland Premier, six Queensland Ministers and Mayors of the Aboriginal and mainland Torres Strait Islander communities, it was resolved that a new partnership was required to deal with the disadvantages of Aboriginal and Torres Strait islander peoples living in those communities, with a focus on actions that deliver results.

In July 2007, the then Premier and 15 mayors from Queensland's Aboriginal and mainland Torres Strait Islander communities signed a three-year Indigenous Partnership Agreement. The Agreement acknowledges that the gap in the life outcomes and opportunities between Aboriginal and Torres Strait Islander Queenslanders and other Queenslanders was too great, and was at risk of widening as other Queenslanders stand to gain greater benefits from Queensland's strong economy and continued growth in living standards.

The goals of the agreement were for Aboriginal and Torres Strait Islander people to:

- share the same standard of living, economic prospects and general wellbeing as other Queenslanders;
- to have their cultures affirmed and celebrated;
- to live in communities that are sustainable, liveable and prosperous;

The agreement dealt with:

- land tenure and access
- housing
- alcohol and other substance abuse (including related violence)
- child safety and family wellbeing
- chronic disease
- education and training
- employment
- policing, and
- community governance

The agreement also included a commitment that Local Indigenous Partnership Agreements establishing specific goals for each community, would be prepared and reviewed every 6 months, and progress towards each goal would be recorded.

Every Chief Executive Officer of a Queensland Government agency is appointed as a Government Champion for one or more community. Their role is to harness combined agency resources to deliver better targeted and more integrated services. Each champion has the authority and the capacity to cut through 'red tape' to overcome administrative barriers that impede constructive responses to community needs.

The Remote Service Delivery Bilateral Plan between the Commonwealth and the Queensland Governments aims to implement a new remote service delivery model that clearly identifies service standards, roles and responsibilities and service delivery parameters to ensure Indigenous Australians living in remote communities receive and actively participate in a full range of government services.

The Plan is being implemented initially in the priority locations of Mornington Island, Doomadgee, Hope Vale and Aurukun together with continuing work in Mossman Gorge and Coen, which are part of the Cape York welfare reform trial. The roll out of investment under the NIRA and NPAs in additional locations in accordance with the principles outlined in Schedule B of the NIRA (*Principles taken into account in deciding sequencing*).

Under the Plan, the Queensland Government agrees to pursue changes to communally held Indigenous land tenure and administration arrangements to support maximum economic development, improved housing (including private housing) and commercial investment. Land reform will be pursued as a priority in the identified communities.

In the identified communities the Governments have agreed that actions under the Plan, together with other relevant COAG initiatives, will contribute to:

- improving access to a full range of integrated and co-ordinated services (including health, education, employment and other government services);
- improving governance and leadership within the communities and Indigenous community organisations;
- increasing economic and social participation, and promoting personal responsibility, engagement and behaviours consistent with social norms.

A.2.4 Western Australia

In Western Australia, the Department of Indigenous Affairs' (DIA) Operations Directorate, in collaboration with the Commonwealth Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA), leads in the implementation of the COAG Indigenous reform agenda.

The Remote Service Delivery Bilateral Plan between the Commonwealth and the Western Australian Governments includes the following essential elements:

- engagement with communities;
- baseline mapping and service audits;
- establishment of integrated service planning and service delivery mechanisms;
- development of local implementation plans;
- monitoring and evaluation, reporting and sharing best practice; and
- risk management.

The agreement adopts a cluster approach to service delivery enabling the priority locations to be service hubs and enabling the outreach of services to surrounding communities. The Agreement is being implemented in Fitzroy Crossing and surrounding communities, Halls Creek and surrounding communities and on the Dampier Peninsula, with a focus on Ardyaloon and Beagle Bay.

Under the Plan, Western Australia is responsible for developing and implementing appropriate housing and land tenure arrangements to facilitate effective asset management, essential services provision and economic development opportunities in Indigenous communities.

A.3 Indigenous Land Tenure Reforms

A.3.1 Context

In December 2007 the Council of Australian Governments (COAG) agreed to the National Indigenous Reform Agreement (Closing the Gap) (NIRA), a partnership between all levels of government to work with Indigenous communities in order to 'close the gap' in Indigenous disadvantage (SCFFR NIRA, 2008).

In recognition this will require a long-term generational commitment, COAG identified a range of strategic platforms or 'Building Blocks' to guide the reform process. Using this framework, COAG has entered into several National Partnership Agreements (NPAs). These agreements fund specific projects and use payment incentives to reward States that deliver on nationally significant reforms. Each jurisdiction is responsible for developing an Overarching Bilateral Implementation Plan or OBIP to underpin the co-operation between the respective jurisdictions to realise the commitments and objectives made under the NIRA by;

- incorporating implementation plans developed under all Indigenous-specific NPAs;
- progressing implementation of the National Urban and Regional Service Delivery Strategy for Indigenous Australians;
- clearly articulating activities that the Commonwealth, States and Territories will undertake to improve data required under the NIRA; and
- establishing bilateral governance mechanisms (FaHCSIA, 2012 and SCFFR, 2012).

The *National Partnership Agreement on Remote Indigenous Housing* (SCFFR NPA-RIH 2008), the *National Partnership Agreement on Remote Service Delivery* (SCFFR NPA-RSD, 2008) are the two agreements that include provisions relating to land tenure reforms. The parties to the NPA-RSD only include the Commonwealth, New South Wales, Queensland, South Australia, Western Australia, and the Northern Territory. Taken together, the NPA-RIH and the NPA-RSD aim to address unmet housing needs in remote communities and to implement a more equitable model of service delivery to ensure that Indigenous communities receive a standard of housing, service delivery and infrastructure that is comparable to non-Indigenous communities of a similar size and location.

The objectives of the NPA-RIH with respect to land tenure reform are to:

- provide asset security for government investments;
- facilitate home ownership and enable land to be used as security against a debt; and
- facilitate the attraction of private investment.

Since COAG's endorsement of the NIRA, the Commonwealth and the States that are party to the NPA-RSD have taken a number of steps to implement the Commonwealth's Indigenous land tenure reforms contained in those agreements. A brief overview of the Indigenous land tenure reforms in the Northern Territory, Queensland and Western Australia are included below.

A.3.2 The Commonwealth's Indigenous land tenure reforms

A comprehensive policy document discussing the rationale and detailed objectives behind the Commonwealth's current Indigenous land tenure reforms does not exist other than in the NPA-RIH and the NPA-RSD and the Government's *Indigenous home ownership issues paper* (FaHCSIA, 2010). Aspects of the reform agenda may be discerned only through an analysis of these documents and recent reforms to the

relevant land rights legislation in the Northern Territory, for which the Commonwealth is responsible.

The immediate objectives of the land tenure reform agenda are, however, made clear within a January 2009 communiqué written by the Minister for Families, Housing, Community Services and Indigenous Affairs (FaHCSIA) to each of the State ministers responsible for public housing and in a speech delivered to the NSW Aboriginal Land Council in 2009 (Macklin, 2009a and 2009b). The letter to the States advises of three key requirements that determine whether secure land tenure has been settled, and which ought to be resolved prior to the delivery of capital works programs funded by the Commonwealth in remote Indigenous communities:

1. The government must have access to and control of the land on which construction will proceed for a minimum period of 40 years. A longer period has additional advantages.
2. Tenure arrangements must support the implementation of tenancy management reforms including the issue of individual tenancy management agreements between the state housing authority and the tenant without requiring further consent from the underlying land owner. This capacity must also permit replacement of the housing service provider if required.
3. Native title issues must also have been resolved, in that any applicable process required by the *Native Title Act 1993* (Cth) has been conducted.

Enactment of these requirements and the formalisation of secure tenure arrangements are regarded as underpinning the long term goals of raising service delivery standards, facilitating economic development, and promoting home ownership. Moreover, removal of these impediments to public and private investment (on communal-title lands and Aboriginal lands held under other titles) is expected to clarify responsibilities for housing management in Aboriginal communities, by giving Housing Authorities long term access to and control over public housing assets.

These conditions have cleared the way for the negotiation of long term leases on Aboriginal lands in some jurisdictions which have transferred control over land use decision-making from local Aboriginal entities to centralised government agencies. The subsequent creation of subleases designed to promote individualised dealings in land are seen as the principal means of achieving the security of tenure necessary for public and private investments to occur (including by individual home owners), as the basis for overcoming severe problems of poverty, welfare dependency and community breakdown.

As the Commonwealth is not able to undertake land tenure reforms directly (except in the Northern Territory), the land component is the particular responsibility of each of the States given their constitutional responsibility over land within their respective jurisdictions. Instead, the Commonwealth must rely on its role as a funding provider to stimulate the States to undertake land tenure reforms, and the funding of remote Indigenous housing has become the focus of the Commonwealth's land tenure reform program (Terrill, 2010: 5).

Terrill (2010: 6) notes however, that state governments do not necessarily share the Commonwealth's focus on obtaining 'secure tenure', but what is clear is that with billions of dollars of funding at stake, the Commonwealth's new requirements are dominating the State's land tenure reform programs, often to the exclusion of other potential approaches (Robinson, 2009; Terrill, 2009; Crabtree et al, 2012a and 2012b; Wensing and Taylor, 2012).

A.3.3 Northern Territory (NT)

In order to implement its Indigenous land tenure reforms in the Northern Territory, the Commonwealth amended the *Aboriginal Land Rights (Northern Territory) Act 1976* (Cth). The *Aboriginal Land Rights (Northern Territory) Amendment Act 2006* (Cth) covers a number of measures, one of which enables a statutory authority (the Office of Township Leasing) to be granted leases from Traditional Owners for up to 99-years, so that long-term subleases can then be granted without each sublease having to be negotiated with the Land Council.

Section 19A leases apply to Aboriginal town sites in the Northern Territory; that is, all of the land in and immediately surrounding the township in prescribed locations (and not just over new housing areas). The Amendment Act creates the position of the Executive Director of Township Leasing (EDTL) whose role is to hold S.19A leases on behalf of the Commonwealth and to create and manage subleases. In 2008, further changes to the ALRA were made to expand the role of the EDTL beyond township leases, to include leases over Aboriginal community living areas and subleases of town camps.

The intention of these provisions is to expedite the granting of individual leases in order to provide security of tenure for the mainstreaming of service delivery, and to advance the creation of land markets to facilitate home ownership possibilities (Aboriginal and Torres Strait Islander Social Justice Commissioner 2010). Although leases granted by Traditional Owners to the EDTL are voluntary, delivery of new housing and related infrastructure to participating communities has been subject to their signing. To date the majority of sub-leases have gone to government agencies rather than individuals, with the largest leaseholder being the Territory Housing Authority.

While Traditional Owners may make recommendations to the EDTL through a 'consultative forum' (no such channels are open to non-Traditional Owner community members), all subleases are decided upon by the EDTL. This has meant that Traditional Owners and community members have been required to relinquish controls over land use decision-making in the township area for the period of the lease, including decision-making over the amount of rent to be paid under a sublease. Rents in payment for the 99-year head leases are paid from the Aboriginals Benefit Account (ABA).

The issues associated with the implementation of these land tenure reforms in the NT are examined in more detail by Terrill (2009 and 2010).

A.3.4 Queensland (Qld)

In Queensland there is a history of transfer to Aboriginal or Torres Strait Islander councils through Deeds of Grant in Trust (DOGITs), a restricted form of freehold, and through land rights legislation introduced in 1991, which provides for the grant of land as Aboriginal or Torres Strait Islander freehold following a land claim. As elsewhere, the transfer of land has been slow, since government has been reluctant to make transfers of land on which infrastructure has been built; particularly in locations lacking surveys or individual sub-divisions where the process for excluding land from a transfer has been hampered.

In order to satisfy Commonwealth requirements for home ownership on communally owned lands, Amendments to the *Aboriginal Land Act 1991* (Qld) and *Torres Strait Islander Land Act 1991* (Qld) were passed in 2008, principally to make it easier to grant long-term leases to a public housing body and to individual households. The *Aboriginal and Torres Strait Islander Land Amendment Act 2008* (Qld) also makes changes which

allow for: the grant of land to a Prescribed Body Corporate (PBC), the creation of exemptions to transferable land, and to make it easier for government to compulsorily acquire Aboriginal or Torres Strait Islander land.

Whereas previously land transferred as Aboriginal or Torres Strait Islander freehold had to be granted to a land trust to hold for Aboriginal or Torres Strait Islander people particularly concerned with the land, land can now be granted to a PBC to hold for Native Title holders, where there has been a Native Title determination. With respect to the exclusion of particular areas from transfer, the amendment enables the Minister to make a declaration over land on which infrastructure exists, or forms part of a township. The declaration enables the government to exclude areas more readily than was previously the case, since it does not have to survey each individual lot (AHRC 2010).

The Amendment Act eases the requirements for granting leases on Aboriginal and Torres Strait Islander freehold land, DOGIT land and Aboriginal reserve land, and most leases now no longer require the consent of the Minister to issue. The exact requirements vary depending on who the lease is granted to, for what purpose, and for how long it will be granted. Grants of leases to Aboriginal or Torres Strait Islander persons for private residential or commercial purposes may be granted for up to 99 years and 30 years respectively and do not require the consent of the Minister (or up to 99 years for a commercial purpose with Ministerial consent). Similarly for leases granted to a public authority for the provision of housing and related infrastructure. Grants without consent may also be issued to non-Indigenous persons for a commercial purpose for up to 30 years.

The new leasing rules applying to home ownership mean that instead of paying annual rent, a home owner must pay the purchase cost of the property up front, according to a discounted replacement cost valuation, rather than at market rates. Applicants for a lease of more than 30 years for a commercial purpose (requiring Ministerial consent) must provide a business plan and evidence of viability.

The Amendment Act also makes it easier for the Government to compulsorily acquire Aboriginal or Torres Strait Islander land. Whereas previously the government could only acquire Aboriginal or Torres Strait Islander freehold or DOGIT land by an Act of Parliament that expressly provided for the payment of just compensation, the Amendment Act allows for land to be acquired (and a shire lease to be resumed) by a public authority for a relevant public purpose.

In November 2012, the Queensland Government (Department of Natural Resources and Mines, Qld, 2012) released a Discussion Paper outlining its proposed approach to enabling freehold title on land in 34 Aboriginal and Torres Strait Islander communities in Queensland that are in either an Aboriginal shire council or an Indigenous regional council. The existing tenure arrangements do not provide the option for ordinary, individual, freehold title within Aboriginal and Torres Strait Islander communities. Currently these aspirations can only be addressed by leasing.

Pearson (2012) believes that while converting Aboriginal township lands to freehold is a step in the right direction, the Queensland Government's proposals are unlikely to work. The transaction costs associated with sorting out Native Title agreements, getting the lands surveyed and relevant applications processed are "far too onerous, and expecting community members to pay the costs associated with creating the private property system is unworkable and unaffordable (Pearson, 2012)."

A.3.5 Western Australia (WA)

Western Australia (WA) is quite unique in the Australian context because, unlike other states and the Northern Territory, WA does not have a statutory Aboriginal land rights system. What is termed 'Aboriginal land' in Western Australia covers approximately 12% of the state but has generally been granted at the discretion of the Minister for Lands or else is held in trust as a reserve for the 'use and benefit of Aboriginal inhabitants', reflecting 'protection' style legislation from the 19th century (AHRC, 2005).

The Bilateral Implementation Plan for 2009-2014 under the NPA-RSD includes a commitment to undertake a two-stage reform process (Milestone/Output 4.0) (WA, 2009). The first stage included urgent amendments to the *Aboriginal Affairs Planning Authority Act 1972* (WA) (AAPA Act) and the *Housing Act 1980* (WA). The *Aboriginal Housing Legislation Amendment Act 2010* (WA) empowers the Department of Housing (DoH) to become the housing management agent for public housing assets located on Aboriginal Lands Trust (ALT) and Aboriginal Affairs Planning Authority (AAPA) land, as well as on non-ALT or AAPA land in which an Aboriginal corporation holds an interest.

A key feature of the *Aboriginal Housing Legislation Amendment Act 2010* (WA) is the operation of voluntary Housing Management Agreements (HMAs) between the DoH and the relevant land holding body (as the owner of the housing assets). These allow the State to control and manage the letting and leasing of the housing, effectively standing in the shoes of the owner. However, the legislation restricts their application to 'Aboriginal land' which is defined in the Act as Crown land or freehold land that is owned by the AAPA, the ALT or the State, over which an Aboriginal entity has power to grant a lease. An 'Aboriginal entity' is also defined in the Act, to mean the AAPA, the ALT, a corporation registered under the *Corporations (Aboriginal and Torres Strait Islander) Act 2006* (Cth), or an incorporated association under the *Associations Incorporation Act 1987* (WA) the membership of which is wholly or principally composed of persons of Aboriginal descent as defined in s.4 of the AAPA Act 1972 (WA).

The *Aboriginal Housing Legislation Amendment Act 2010* (WA) does not, however, affect current land tenure arrangements, meaning that although the DoH may manage designated housing assets on behalf of a land owner, the HMA's do not create an interest in the land on behalf of the State. Furthermore, since a HMA applies to designated housing lots only, individual lots may be excluded or included as appropriate and according to the changing circumstances on a community.

An 'Agreement to Construct' between DoH and the relevant Aboriginal entity is required to cover the construction of new housing. Effective implementation of the HMAs requires the appropriate secure tenure arrangements to be in place in all locations prior to the commencement of scheduled capital works.

While HMAs are optional, communities that do not enter into an agreement will not receive (or be funded for) tenancy management, general repairs and maintenance, or new housing. The DoH will, however, provide those communities with a basic level of service (AHRC, 2010).

In Western Australia in addition to acquiring long-term leases, the State Housing Authority is able to gain access to and control over public housing assets on ALT land by negotiating HMAs with the relevant community. This has enabled the state to observe its obligations as the landlord of public housing assets without the State Housing Authority having to secure an interest in the land. Currently, the issue for the state is its statutory inability to negotiate HMAs on other tenures, such as freehold (absolute fee simple) land.

Amendments to the *Native Title Act 1993* (Cth) (Section 24JAA) have also been made by the Commonwealth to provide procedural rights for Native Title holders and registered claimants before public housing and certain public facilities can be built by-passing the need to develop an Indigenous Land Use Agreement. During the consultation process for this particular amendment to the *Native Title Act 1993* (Cth), there was little support for the amendments based upon a lack of evidence to support the changes; legal uncertainties; inadequate provisions for consultation; the impact of 'effective' extinguishment; racial discrimination; and the exclusion of any criticism of the bureaucratic processes that contribute to delays in public housing provision (Stacey and Fardin, 2011: 11).

The second stage of the WA Government's land tenure reforms will enable the State Housing Authority to manage housing (with the agreement of communities) on other forms of land held for the benefit of Aboriginal people. This will include an examination of relevant State legislation to work towards allowing maximum transferability of individual titles to facilitate home ownership and commercial use of Aboriginal land (Buswell and Hames, 2009; WA, 2009: 7–8).

In WA, therefore, individuated forms of tenure continue to be preferred over other forms of tenure that also have the potential to address impediments to economic development and home ownership. The implication of this approach is that the risks to individual home owners of individuated tenure (a particular tenure form) may not have been fully considered. Nor has there been piloting of alternative housing ownership and tenure models that have the potential to increase the level of Aboriginal ownership on terms consistent with cultural aspirations in relation to land while also being mindful of the presently limited financial, human and social capacity of households to manage the prevailing risks (Wensing and Taylor, 2012: 15).

A.4 Reforms to Local Government Service Delivery in Indigenous Communities

Existing arrangements for the delivery of municipal and essential services across remote Aboriginal communities in Australia are complex. Since the 1960s the Commonwealth and States have funded housing and related infrastructure for essential services such as water, power, sewerage and local roads, together with municipal services such as waste management and environmental health, on former Aboriginal reserves, missions and Traditional land. The original purpose of this funding was to supplement the efforts of local governments to deliver municipal services to remote Aboriginal communities where mainstream local government services were not available.

Over time, these arrangements have proven ineffective, and the combination of State and Commonwealth funding for these services together with an over reliance on generally low capacity community-based service providers has led to confusion regarding service delivery standards, unnecessarily complex administration, and poor outcomes and accountability. Various reviews have highlighted the need for greater equity in service delivery to Aboriginal communities and for increased effort on the part of all tiers of government to improve service delivery (Morris *et al* 2010).

The 'normalisation' of local government services to RSD locations and other remote Aboriginal communities is fundamental to improving the well being of people living in remote communities.

Both the NT and Queensland have undergone an extensive compulsory local government reform process in recent years. These resulted in a substantial reduction in the number of local governments within each jurisdiction. In addition, both jurisdictions have brought former Indigenous community councils under their 'mainstream' local government legislation. By contrast, in 2009 the WA government embarked upon a voluntary local government reform process that is still underway. Furthermore, WA has no distinctively Indigenous local councils. Rather, it has numerous rural-remote councils with a substantial Indigenous population and significant numbers of remote Indigenous communities located within their boundaries (ACELG 2011:5). In WA, there are a total of 70 small rural-remote local governments. Twenty-two of these have a substantial Indigenous population and significant remote Indigenous communities located within their boundaries. Many of this group of councils currently provide very limited or no municipal services to those remote communities. (ACELG 2011:6)

In Queensland for every Indigenous community (however defined), there is a Local Government, established and accountable under the *Local Government Act 2009* (QLD), which is responsible for planning and delivery of essential and municipal infrastructure and services. Included in this framework are 16 Aboriginal Shire or Indigenous Regional Councils with the same responsibilities as all other Queensland Local Governments, including the requirement to prepare long-term asset management plans, long-term financial forecasts and community plans as well as to adopt planning schemes under State planning legislation.

Responsibility for the ownership and maintenance of municipal infrastructure in remote, discrete Indigenous communities in Queensland rests with the respective local government (usually an Aboriginal Shire or Indigenous Regional Council). Currently, all Indigenous Local Governments are trustees for a Deed in Grant in Trust (DOGIT) – or in the case of Aurukun and Mornington Shire Councils, a Shire Lease – over most if not all land within their local government area. Land tenure in these communities is thus predominantly Deed of Grant in Trust, a form of communal reserve.

Under the 2007-08 statewide reform process in Queensland, 97 'mainstream' and 20 Indigenous councils were amalgamated to create 73. These amalgamations only affected the Indigenous councils in the Torres Strait and Northern Peninsula Area: the remainder were left with unchanged boundaries. Under the reform process, Indigenous councils were also transitioned to Shire Council status and brought under the same legislative framework as other local governments, albeit with some minor variation to reflect the different land tenure and circumstances of Indigenous communities. (ACELG 2011:5) (See Case Study Box)

Local Government Reforms in Queensland

In January 2005 Aboriginal councils that were formerly established under the *Community Services (Aborigines) Act 1984* started the transition to full shire council status under the *Local Government (Community Government Areas) Act 2004*.

The 17 Island councils remained under the *Community Services (Torres Strait) Act 1984* and were not required to comply with the additional legislative and reporting requirements that came with the transition to shire status.

The task of building governance in Aboriginal shire councils and Island councils was addressed through the Community Governance Improvement Strategy, an integrated and targeted strategy to assist councils over a four-year period to transition to the new model, enhance their governance practices and raise community awareness of the role of local government.

In 2007, the Local Government Reform Commission reviewed the governance arrangements for the 15 Aboriginal Shires and 17 Island councils as part of the wider review of Queensland's local government structure. Particular focus was placed on the Torres Strait and northern Cape York Peninsula areas as part of the government's commitment to local government reform.

Representatives of the Island councils and Aboriginal shire councils were consulted in Cairns in September 2007 on the key components of the reforms and the *Local Government and Other Legislation (Indigenous Regional Councils) Amendment Act 2007* (the Act). The Act was passed by the Queensland Government on 22 November 2007.

As a result of the Local Government Reform Commission's recommendations, the three Aboriginal Shires in the northern peninsula area (New Mapoon, Injinoo and Umagico) amalgamated with the two Island councils (Bamaga and Seisia) to form the Northern Peninsula Area Regional Council. The first election for the newly formed council was in March 2008.

The remaining 15 Island councils in the Torres Strait amalgamated to form the Torres Strait Island Regional Council. The first election for the newly formed council was held in March 2008.

As of March 2008, all Indigenous Local Governments (Aboriginal Shire and Indigenous Regional Councils) are fully fledged local governments with the same responsibilities and accountabilities under the *Local Government Act 2009* (Qld) as all other Queensland Local Governments.

Prior to the 2008 local government reform process in the NT, the majority of residents in rural-remote areas lived in communities that came under the jurisdiction of 55 small and highly dispersed Indigenous community government councils that had been established through voluntary incorporation. The reforms saw 51 of the 55 community government councils in rural-remote areas, together with Jabiru Town Council and Tennant Creek Town Council, amalgamated into eight 'Shires' (ACELG 2011:5). While

the changes to local government across the Territory has impacted significantly on the affected communities with regard to service delivery, financial and asset management, and governance and administrative operations, land use planning and planning for infrastructure capacity has remained with the Territory Government (Michel *et al* 2010). More recently, the Northern Territory Government has appointed a 21-member Regional Governance Working Group to provide advice on the future of local government. The Working Group has been tasked with developing options for regional governance that could strengthen local governments in regional and remote communities. Consultations on the options developed by the Working Group commenced in March 2013 (NT Government 2013, Giles 2013).

In Western Australia, a 2008 review of municipal and essential services delivery by the WA Local Government Advisory Board recommended that a Business Plan Framework be developed on behalf of affected local government authorities, to enable local government to articulate detailed costs and standards for the delivery of services to Indigenous communities and to provide a means of assessing potential remote service providers/contractors able to participate in the delivery model (Local Government Advisory Board 2008).

In 2010, the Western Australian Government established the Local Government Services in Indigenous Communities Planning Committee. The Planning Committee comprises the Directors-General of the Department of Local Government and Department of Indigenous Affairs; the State Manager of the Australian Government Department of Families, Housing, Community Services and Indigenous Affairs; a representative from the Office of the Minister for Local Government; the Chief Executive Officer, Western Australian Local Government Association (WALGA) and representatives from key local governments in the regions.

The Committee's key role is to guide the planning, scoping and costing of local government services in Indigenous communities across Western Australia. Scoping and Costing Plans are to be completed by those local governments with Indigenous communities within their boundaries using a template to be piloted by the Pilbara Regional Council. Information collected as part of this process will then be aggregated to provide a whole of state view which will inform funding negotiations between the Commonwealth, State and Local Governments. (DIA 2010)

More recently, the Western Australian Planning Commission has revamped the State Planning Policy relating to the preparation of plans for Aboriginal settlements of more than five dwellings, and the preparation of Aboriginal Settlement Plans must be endorsed by the relevant Aboriginal community, the relevant Traditional Owners, and the relevant local government (WAPC 2011).

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APPENDIX B - CLIMATE CHANGE WORKSHOPS IN BROOME

Two workshops were held in Broome in November 2012, which in part were funded by Rangelands NRM. While data derived from workshops have been included in Chapter 10, the following section provides more detailed information obtained from each of the activities.

B.1 Rangelands NRM workshop

Prior to commencing workshop activities, information about this NCCARF project was first explained to participants. Participants were asked to write down a brief description of what climate change means to them. An official from the Bureau of Meteorology presented Broome specific predictions in relation to climate change. This was followed by further details about hazards and predicted changes in northern Australia. These talks then led into the workshop.

Firstly, the following list of hazards was presented to participants as ones that can potentially impact Broome:

- Bushfires
- Cyclones
- Drought
- Earthquakes
- Floods
- Heatwaves
- Sea level rise
- Severe storms – lightning, wind, rain
- Storm surge
- Tsunami

Participants were asked if they'd like to delete or add anything to the list, to which they added:

- Blue green algal blooms
- Change in biodiversity distribution
- Erosion
- Insect predation
- Loss of biodiversity
- Loss of water quality and quantity
- Salt water intrusion
- 'Tropo season' all year round, i.e. social impacts – wanting to use air-conditioners more, price of power, more depression with people being inside too much
- Vector borne diseases
- Urban infrastructure

All hazards were written down on individual cards that were fixed to walls around the room. Participants were then invited to 'vote' by standing next to the hazard that *currently* worries them the most (i.e. today or this year). This exercise was repeated for their top three hazards after the top hazard was removed each time. Attendees were invited to stay next their top hazard (if it remained up) if they felt it was still the most worrying out of all those listed.

The above exercise was repeated with the exception that participants were asked to stand next to the hazard that worries them the most *for the future*. Table B.1 highlights participants' responses to this exercise.

Table B.1: Hazards that worry participants' the most now and for the future (all hazards listed above were provided as a choice but only those that received at least one vote appear in the table). Please note that some people arrived/left during this exercise and therefore numbers do not add up in each column.

Hazards	Votes for current			Votes for future		
	1st	2nd	3rd	1st	2nd	3rd
Blue green algal blooms	0	0	2	0	0	0
Bushfires	4	8	---	0	2	3
Cyclones / storm surges	6	---	---	5	3	7
Drought	2	1	5	8	---	---
Floods	0	1	3	0	0	0
Heatwaves	1	3	3	1	1	3
Loss of biodiversity	4	4	4	2	9	---
Loss of water quality and quantity	2	0	1	4	4	5
Sea level rise	2	3	1	3	2	4
Severe storms – lightning, rain, wind	0	0	1	0	0	0
Vector borne diseases	1	1	1	0	2	1

The room was then split into four groups and each was assigned one of the top four ranked hazards, i.e. cyclones / storm surges, bushfires, drought and loss of biodiversity. Participants were then asked to discuss:

- Physical impacts of that hazard
- Other factors within the community that exacerbate that hazard
- What can be done?
- Changes that have already been undertaken
- What else can be done
- What conflicts exist between making these changes and culture / livelihood?
- Who's responsible to make changes?
- What barriers prevent these changes from occurring?
- How do we get these people to take action?

Results from this activity follow.

B.1.1 Cyclones / storm surges

Impacts of cyclones / storm surges

- Impact of more intense cyclones upon Biodiversity, particularly:
- Seagrass beds (for dugongs and turtles)
- This also has cultural implications for Traditional Owners
- Impact upon fish stocks
- Trauma
- Loss of life and property
- Inundation of Chinatown and Roebuck Estate
- Electricity supply (continued access throughout)
- Increased run-off through stormwater system

- Nutrients and sediments
- Organic carbon
- Food shortages
- Non linear risk of extreme events
- More at risk than any other community in Australia
- Landscape damage
- Coastal erosion
- Damage to mangroves

Other factors exacerbating the impacts of cyclone / storm surge

- Sudden loss of real estate prices for example if had cyclone and houses wiped out then prices would go down.
- Building set back distances – not developing on edge of bay and low lying areas.
- Disruption to businesses, employment, education and recreation.
- Poor design of houses for the current climate and heavy reliance upon air-conditioners – will only be worse if Broome gets hotter and the cyclones get more intense.
- Inappropriate plantings in gardens such as shallow rooted African Mahogany
- Inappropriate developments – in locations that will be affected
- Reliance upon fossil fuels and future development needs to be reliant on renewable energy.
- Increased cost of housing for increasing the building standards to be resilient to more intense cyclones (structural integrity).
- Increase risk of death and disease including vector borne diseases
- Transport systems – if they get cut-off then Broome is unable to get food and fuel in and a shortage of supplies will result.

Table B.2: What can be done?

What are they doing	What could they do	Who is responsible
Community preparedness	• Drains to be cleared of rubbish • 2 cyclone clean ups per year including green waste • Audit of structural risk of buildings in Broome • If have a firebreak audited each year for compliance then do same for cyclone preparedness	
Landscaping	• Community project to plan cyclone resilient endemics	• Community groups such as SKIPAS • Residents • Shire of Broome
Broome drainage (engineering works) Anne Street Lake Broome	• Create a priority list of drains to be fixed to reduce algal blooms	• Shire of Broome • Community of Broome
Building Codes Bidydanga (standards)		• Building Codes Australia

are working – no houses destroyed last time they experienced a cyclone)		Shire of Broome for compliance
Provision of safe shelters two currently rated: - BRAC - Broome State High School	More community refuges and private shelters to be built	
Increased impervious surface areas	- These areas are intensifying and therefore creating more flooding issues, higher water flows and will in time increase the rate of vector borne diseases - Address the plot ratio on sites	Shire of Broome
	Need to get power underground throughout Broome	Horizon Power
	Decommission and rehabilitate the old sewerage treatment plan (it overflowed in 2000)	Shire of Broome
	- SES to be prepared for more intense cyclones - Need to recruit volunteer ambulance bearers to replace the older members	- SES - Community as volunteers

B.1.2 Bushfires

Impacts of bushfires:

- Property
- Stock
- Wildlife – flora and fauna
- Air quality – when there's fires around you really feel it in your lungs when you go outside
- Water quality - impacted by ash fall and erosion
- Increased emissions
- Loss of ground cover leading to increased runoff and erosion and resulting in less recharge of aquifers
- Access around and into towns – remote communities get cut-off
- Tourists – when it affects areas of significance for tourism
- Weeds – invading species after fire; some weeds burn at very high temperatures exacerbating situation
- POSITIVE – regeneration of plant species

Other factors that exacerbate bushfires:

- Lack of education
- Tourists
- Locals to an extent

- Access to and evacuation of remote locations. It is difficult to know where everyone is. The major towns are known but some of the outstations are not and that proves to be problematic to locate everyone when there is a regional fire.
- Location of communities, mines and outstations
- Lack of mitigation with pastoralists / land managers – these groups are required to maintain fire breaks and prescribed burning on their properties but some don't
- Some people's attitude towards prescribed burning – they don't think it should be done
- Varying levels of preparedness within a community

What can be done?

- Changes that have already been undertaken:
- Building protection zones – Local Government and WA Planning Commission
- "Planning for bushfire" – property is rated a bushfire attack level and different levels require different building materials
- Result from Black Saturday bushfires in 2009
- FESA – community engagement
- Campaigns – developed and distributed literature on bushfires; visits to school to educate kids; visits to at risk populations to provide strategies to reduce their risk; flyers distributed to tourist bureaus, services stations, hotels
- Enforcement for arson – coordinated effort between police, FESA and DEC has resulted in a great reduction of bushfires
- Local government – distribute notices to properties surrounding town, i.e. rural residential, to keep fire breaks clear
- DEC/FESA – Undertake aerial control burn programs with pastoralists and graziers associations
- KEELTY REPORT – WA report based on last year's fires in Margaret River region
- Local Emergency Management Committee – 6 communities; District Emergency Management Committee – Kimberley region; State Emergency Management Committee
- FESA and DEC sit on each committee
- Shire of Broome sit on LEMC and DEMC

What else can be done?

- More education across Australia – Wicked Vans (and all car rental companies) should give out safety messages to clients
- Remove of exotics – some burn at 1000 degrees Celsius creating or exacerbating fire conditions
- More slow / cold burns to reduce fuel loads
- Maintaining communication at the top levels – see Keelty Report

What conflicts exist between making these changes and your culture / livelihood?

- Prescribed burning conflicts with tourist operators – visibility is impaired during scenic flights
- But prescribed burning must be undertaken annually

Who's responsible to make changes?

- Everyone!
- Local government – DEC – FESA – for sure
- Main ones are DEC and FESA and FESA are responsible for outer communication
- Local Government responsible for volunteer bushfire brigade
- PBC and KLC – real responsibilities

- State politicians are also responsible as they are always in the media about fires

Barriers?

- Money

Ignorance / complacency

- How do we get these people to take action?
- Education

B.1.3 Drought

The impacts of drought:

- [Environmental degradation]
- [Wind erosion]
- Species loss and replacement by other species [some species loss and change]
- Food stress for animals and humans [food production negative impact - crops/ - irrigated areas/ - stock]
- Salination of land due to increased pressure on irrigation using bore water, depleting the fresh water reserves, reducing flushing of reserves and land, and possible osmotic processes that may exacerbate the salination problem. [risk of increase salinity. Not replenishing water table]
- Two possible drought scenarios relating to bushfire were considered:
- Scenario 1 - fuel loads are high due to previous wet and consequent growth. Short term dry and high heat could combine to increase risk of uncontrolled high temperature fire.
- Scenario 2 – a long term drought, lasting perhaps several years, will result in lower fuel loads, and a consequent decrease in fire risk. [May reduce intensity or occurrence of fires. Fuel + Drought = Fire]
- An added benefit would be to reduce the livestock numbers, and so reduce methane emissions from bovine bodily functions. [destocking and ↓ methane emissions]

Other factors exacerbating the impacts of drought

- [Economic decline – pastoralism/ - other food production/ - tourism]
- Reduction in tourism
- Less food available locally
- Less pastoralism
- [Unemployment – social disruption – decline in social health (depression)/ - increase in welfare dependency]
- [Population decrease – Regional funding for community services]
- Migration
- Decline in services
- Towns on marginal lands would cease to exist
- [Lack of community – social support and interaction]
- Demographics may change if, for instance, youth leave for better pastures
- Reliance on imports would rise
- [Increase reliance on natural resources – decline in biodiversity] Reliance on bush tucker would go up, at the same time as those resources would be under stress, leading to further biodiversity loss.
- [Increase price of beer]

What can be done?

- [Less reliance on water intensive stock] Change reliance of pastoralists on cows to kangaroos – lower ecological footprint, lower carbon emissions, leaner meat leading to healthier populations and lower cost of healthcare.
- [use of less water reliant produce] – e.g. no more cotton.
- Feral animals which may survive better under the climate conditions (such as pigs and goats) may offer alternative sources of meat.
- [Waterwise strategies – other Govt and community initiatives] Impose government incentives to promote *water wise* practices such as efficient irrigation, no-water toilets, garden sprinkler limitations, washing economies.
- [Community education and awareness] Add water awareness to the education system
- [Less water intensive resource development industries] Ensure water-hungry industries, such as mining, use water in a sustainable way. Alternatives might include using salt water, using less water, developing desalination plants, or simply leaving the stuff in the ground.
- [Domestic water collection – Regional water collection – Govt incentives] Provide incentives for people to husband water that does fall or use bigger water tanks. If temperature of water held above ground is an issue, then incentivise the burying of water tanks.
- [Desalination] Consider building a desalination plant.
- [Close gap between southern and northern understanding of water shortage & consistent strategies implemented] Currently the attitudes to water use in the north are very lax in comparison to drought affected areas in the south, such as Canberra, Goulbourn, and Adelaide.
- Indigenous methods of water husbanding were considered, but the response was that they just used a tap. Before white man came the main problem was the cold.

B.1.4 Loss of biodiversity

Impacts of loss of biodiversity and other factors that exacerbate them

- Less species – fishing
- Loss of food – especially Indigenous communities
- Natural process broken down – pollination
- Less mangoes
- Loss of Traditional medicine/foods
- Less bird migration
- Less tourism opportunities
- Whale nursery moving south?
- Change in pearling / aquaculture industries / cattle / horticulture / agriculture
- Grain growing areas impacted to Broome – imported food
- Loss of aesthetic / sense of place and wellbeing
- Pests may increase – plague?
- Diseases may increase
- More jellyfish
- Loss of Traditional cultural knowledge
- Loss of potential future medicines / drugs
- Broader economic impacts
- Population increase
- Habitat destruction and fragmentation
- Pollution and fertilizer use
- Shifting baseline of what's normal
- Industrial developments
- Economic reliance on tourism / fishing / pearling / agriculture

- Resistance to change – apathy
- Lack of understanding of local impacts of climate change
- Lack of appropriate infrastructure – i.e. bike paths
- Monoculture in agriculture / aquaculture

What can be done? What has been done?

- Seed bank
- Local promotion of local plants in gardens
- DEC, Fisheries, local government – statutory obligations
- Experiments at Birdwood Down Station – remove weeds

What else can be done? By who (all)?

- Individual change in behaviour
- Practical advice and support – local level
- More local spreading of information
- Overcome disconnect between interest groups and broader community
- More incentives for people to change (e.g. ride your bike to work and get extra 20 minutes for lunch break) – increased broader perspectives
- Address transient population (e.g. holiday mode – partying but no incentive to recycle)
- Planning for corridor of vegetation
- Leadership from government – model good behaviour

Conflicts?

- Transient / holiday population (this discussion was about tourists - not about the Indigenous population)
- Hard to locally communicate information in Broome (residents are flat out trying to keep up with 'what is happening in their community' or they find out in the newspaper on the day)
- Taken for granted (the community, lifestyle etc. – apathy to making change – people are educated but still not making the change)

How do we take action?

- Voting decisions
- Increased education / knowledge of issues
- Write/contact Shire
- Media profile
- Make people experience what the future with no biodiversity might look like?
- Make it personal – especially the future of the kids
- Practical options and advice
- Incentives – give a reason to change behaviour (time, rebates, \$)
- Create community network, support
- Remove choice?

At the conclusion of the workshop, Kandy Curran, the Project Coordinator of the Roebuck Bay Working Group (RBWG) provided some insights into the issues that are affecting Roebuck Bay and how these might be exacerbated in the future by climate change. Of note, Kandy highlighted:

- Cultural importance of Roebuck Bay to Yawuru people
- Impacts of stormwater runoff into the bay
- Algal outbreaks including lyngbya
- Pesticides and fertilisers washing into the bay create pollution and can be food for algal blooms of Lyngbya which can form an anoxic blanket over the

seagrass causing a large die off, which in turn impacts marine life living and feeding on the meadows.

- Increased pindan soil erosion from land developments and unsealed roads, run-off entering stormwater drains during storm events, can result in the iron in pindan becoming bio-available to Lyngbya during hot clear weather experienced during the wet season with resultant algal blooms which impact marine life.
- Increased pressures of recreational and commercial fishing, tourism and local usage with boats, vehicles, dogs, people, helicopters – all impacting on migratory birds, turtles, dugongs, dolphins (bottlenose, Australian snubfin and Indo-Pacific humpback). Roebuck Bay hosts the largest collection of shorebirds in the southern hemisphere (120,000 shorebirds in summer; 25,000 non-breeding shorebirds in winter) and supports 1,287 invertebrates per square metre with up to 500 individual species (some new to science!).

Finally, participants were asked again to write down what climate change means to them (Table B.3).

Table B.3: What climate change meant to each participant before the talks/workshop and after. Please note: not all participants' submitted responses.

Before talks	After talks
A hotter world with less biodiversity, less drinking water and all kinds of social unrest	An inundated world where all the coastlines are lost. All very sad.
"Things" will be different than they are now!	e.g. weather events, storm frequency, temperatures, social or community activity, impacts on biodiversity
If climate change means more extreme climatic events it means increased challenges for those who produce our food and fibre (our farmers) and to those involved in NRM	--
More extreme weather, rising sea levels humans needing to change	More awareness of other hazards – drought, heatwaves, loss of biodiversity
More prolific extreme weather events; different economic pressures; lifestyle changes, increasing awareness of our surrounding environment	--
Reliance on the burning of fossil fuels leading to an increase in the pollutants in the atmosphere and subsequent warming of the earth which is directly influencing weather patterns	--
Rising sea levels; increasing severe weather events; devastating impact on tropical coral marine environments (all environments); population displacement; disease; death; social disadvantage; decreasing biodiversity	--

Before talks	After talks
Instability in communities and future impacts on lifestyle and life quality (for grandchildren and great grandchildren!!); challenges to food and water security	THIS PERSON LEFT BEFORE THE END
Increase in pollution into the atmosphere due to humans not living sustainably or less sustainable the last 100 years. Materialism in the world is the biggest drive as well as greed and possibly the cause or biggest threat to us as a species. It's a slow process but generations to come will get affected badly.	--
The climate is either warming or cooling which has been influenced by the activities of humans resulting in extreme events and changing weather patterns.	Changes in biodiversity; social and infrastructure impacts
Non-linear development of extreme weather events in my lifetime; need for understanding of anthropogenic adaptation and mitigation.	--
Change in atmosphere that is changing this balance of the relationship between all living things in the sky, water and land entwined with people.	--
Extreme weather events – insidious change that will have impacts that we may not notice, but will impact every aspect of our lives. Climate change may result, overtime, in a very different world for all living things if the worst case scenario occurs.	Increased severity of cyclones which have huge implications plus what I said previously.
Climate change means the water, landscape, hills and so forth along with animals all are changing due to weather around the globe. Movement in mountains, oceans, beaches, everything.	--
Lack of biodiversity – rapid change in weather patterns; any change in weather patterns.	Same
Deforestation; fire outbreaks; coral bleaching; species extinction – loss of biodiversity; world weather variations and its impact on all plant and animal species in their individual locations; drought and flood and more extreme swings; increasing temperatures in the hot areas and rainfall in the wet areas; polar ice caps reducing; longbya algal blooms!	--

B.2 Ranger workshop

The following day, NCCARF researchers held a similar workshop with some local rangers. The transcript from that workshop has been incorporated within the abovementioned sections in this chapter. However, some of the specific results are shown in Figure B.1 and outlined in Table B.4.

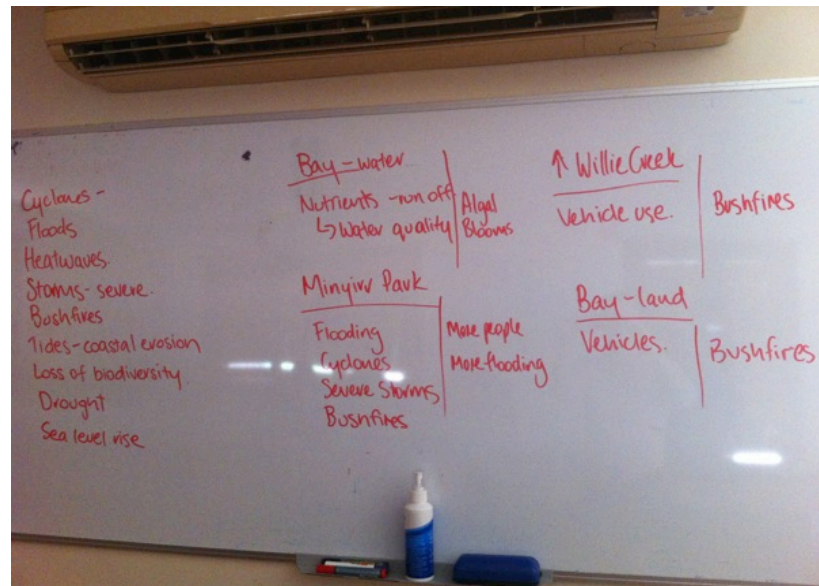


Figure B.1: Notes from the ranger workshop in Broome as explained in Table B.4.

Table B.4: Rangers' views on the current and future hazards that impact on the areas they work.

Location	Current Hazards	Future Hazards
Bay (water)	Nutrient run-off, poor water quality	Algal blooms
Bay (land)	Vehicle use	Bushfires
Minyirr Park	Flooding, cyclones, severe storms, bushfires	More people and more flooding
Willie Creek	Vehicle use	Bushfires

