Children's perceptions and adaptive behaviours in response to seasonal change and extreme weather in Broome, Western Australia

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ABSTRACT

To exclude children and young people from disaster planning processes undermines their safety when a disaster strikes. Moreover, this exclusion ignores the potential communication opportunities for risk reduction between emergency and disaster management agencies and families. This research applied a child-centred approach to the collection of data regarding children's perceptions of how the wet and dry season affects the young people in Broome, particularly where they play, how they get to school and where they live. The research, which was conducted with assistance from the Principal, staff and students of St Mary's Catholic College in Broome Western Australia, also asked students to describe the adaptive and mitigative actions they believed would alleviate the negative impacts of seasonal changes on their lives.

Introduction

Disaster management in Australia, until recently, has been dominated by a technocratic approach with a focus on hazards and top-down policy responses. There is now increasing recognition worldwide of the importance of community-based methods that aim to reduce underlying vulnerabilities (Wisner, Gaillard & Kelman 2012). However, this remains largely adult-centric and, within Australia, the specific role that children and young people can play in making their communities safer has largely been ignored (Towers 2012). Children are seen as passive victims, while risk reduction efforts remain targeted at adults who are assumed to have the capacity and will to ensure the safety of children (Tanner 2010, Mitchell *et al.* 2008).

Alongside women and the elderly, children are often the most vulnerable in disasters (Peek 2008, Mitchell *et al.* 2008, Fordham 1999). A considerable amount of work has and continues to be conducted on the physical and mental health impacts of disasters on children and the recovery process (Norris, Friedman & Watson 2002). Research is now beginning to circulate which demonstrates that if children are provided with appropriate support they have a unique capacity to understand, problem solve, communicate and take action to reduce risks (Tanner 2010, Haynes & Tanner 2014). To date, this research is predominantly from developing countries and has been championed by child-focused humanitarian organisations with a firm awareness of and appreciation for the UN Convention for the Rights of the Child (CRC) (Benson & Bugge 2007, Plan-UK 2007, Mitchell *et al.* 2008). Although the CRC does not specify natural disasters or emergency management, Article 12 notes the importance of the participation of children in decisions which affect their lives (for a full description of this see Mitchell *et al.* 2008). Child-centred Disaster Risk Reduction (CC-DRR) is therefore an approach that invests in young people and encourages them to reclaim their rights, as effective recipients and sources of risk information as well as active agents of change (Mitchell *et al.* 2008, Peek 2008, Tanner *et al.* 2009, Tanner 2010, Haynes & Tanner 2014).

CC-DRR in Australia is a new concept, particularly within Indigenous communities where woefully inadequate top-down policy unsuited to community needs remains the status quo (Bird *et al.* 2013). Within marginalised communities it is especially difficult for children to have their voices heard and valued by decision makers (Bartlett 2008). It is therefore imperative to investigate how CC-DRR can best be supported to enable children and young adults to participate and reduce their risks. The first step is to understand how children and young people

currently understand and contextualise their climatic environment and its extremes.

In light of the above, this paper, which draws on data contained within Bird *et al.* (2013), aims to:

- determine how the seasons affect young people in Broome, particularly where they play, how they get to school and where they live, and
- identify the range of adaptation and mitigation strategies the young people would undertake if they were able to control the decision making.

Case study location

Broome is located in the tropics on the Dampier Peninsula on the northern coast of Western Australia (Figure 1). Being within the tropics typically means that the community experience two distinct seasons, namely the 'wet' (November to April) and the 'dry' (April to November).The Traditional Owners of the Broome area are the Yawuru people. Today, however, a diverse range of Aboriginal groups and a large non-Indigenous population occupy Broome. The urban centre of Broome, where this research was conducted, had a 2011 population of 12 766 of which, 2 873 or 22.5 per cent of the population identified themselves as Aboriginal or Torres Strait Islander people (ABS 2013).

Figure 1: Location map

Broome's mean monthly maximum and minimum temperatures are 34.3°C (April) and 13.7°C (July), respectively. 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 2012). Storm surges and flooding are common in the Broome area between December and April each year. The region is also vulnerable to bushfires, extreme heat, lightning, severe storms and intense cyclones (categories 4 and 5) with the most recent event, *Cyclone Rosita,* a Category 5 storm making landfall 40km south of Broome, in 2000.

Methods

The research was conducted in November 2012, with the assistance of the Principal, staff and students of St Mary's Catholic College in Broome. Data was collected on the premises of the college during discussions in nine class room sessions with approximately 180 students from grades 4 to 7 (aged 10 to 14 years). In line with the demographic profile of Broome, each class contained children of Indigenous and non-Indigenous heritage. All children were treated identically in the data collection methods, as per James Cook University's Human Research Ethics Committee protocol (HREC Approval #H4850).

An informal and relaxed participatory workshop was used to collect data with each child having the right and ability to express their own views on what they perceived as the best and worst aspects of each season. An illustration activity was also used with children in grades 4 to 6. The researchers let the student participants decide at what age they felt this activity was most appropriate and the children in Grade 7 identified themselves as 'too old' to be engaged in drawing exercises. 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.

The data collection workshop commenced with a warm up activity that focused on creating a general discussion about the weather to determine if the students noted any differences from one part of the year to another. The students were asked to discuss the best and worst things about the wet and dry seasons. While it is acknowledged that there are many seasons recognised in Broome and the Kimberley region, researchers simplified these to the two predominant seasons—wet and dry. This was followed by a discussion or illustration, depending on age, about possible adaptive or mitigative measures that could be undertaken to reduce risks and improve quality of life. Further details on the research aims and methods, and in particular the phrasing of the questions asked, are outlined in Table 1.

All the discussion comments were noted on butchers paper and the researchers asked the children to make a note of the content of their illustrations in order to reduce interpretive bias in the analysis. Where possible, the age and gender of the child was also recorded on their illustration to enable further analysis at a later date. The comments and illustrations were analysed using content analysis to identify the main themes. Examples of the illustrations and comments are provided within the results section.

Results

Various themes emerged from the data garnered from each of the research activities. These themes included cyclones, severe storms, health issues, leisure

Table 1: Research Aims, Methods and Analysis

	Workshop 1	Workshop 2
Research Aim	How do the seasons affect children in Broome, particularly where they play, how they get to school and where they live?	Identify the range of adaptation and mitigation strategies that young people would undertake if they were able to control the decision making.
Method	Open classroom workshop. Students were asked: 'What are the best and worst aspects of the wet and dry seasons?'	Workshop and illustration. Students are asked 'If you were the Mayor of Broome what would you do to make things better for you and your community?'
Completion Time	15 minutes each class	30 minutes each class
Analysis Methods	Content analysis by classroom/age	Content analysis by classroom/age

activities, infrastructure, migration, food, animal/insect life, and tourists. The results are presented relating to disaster mitigation and emergency management (full analysis of results see Chapter 11 in Bird *et al.* (2013)). That is, the experiences, behaviours and perceptions of the children in relation to the wet season and, in particular, severe storms and cyclones. In order to fully explore these impacts a comparison is made between the activities children can undertake during the 'wet' and 'dry'. Detail is also provided on the specific impacts the wet season, cyclones and severe storms have on health and infrastructure.

How the seasons affect children in Broome

Wet season, severe storms and cyclones

The children discussed and illustrated both positive and negative experiences and perceptions of the wet season, severe storms and cyclones. They maintained that the worst things about severe storms were related to post-storm garden clean ups, fears of trees falling on houses and having to rake the backyard of leaves and tree branches. Other negatives included shop and road closures, power outages and big winds. Some children also believed that the storms and wind 'can be scary'.

In comparison, however, most children agreed that 'storms, rain and thunder are exciting'. One child commented that the wind during large storms was fun because they would make sails and use the wind to push them along on their skateboards. Another child commented 'the dam next door overflows and then we can get our mud skimming boards to surf the water'. Other activities included mud skipping, having paper boat races in the gutters, boogie boarding on flooded roads and getting splashed by cars as they drive through flooded roads.

Another positive about the storms related to infrastructure. It enabled them to 'drive along flooded roads' and resulted in the closure of schools (although some viewed this as a negative). The children also had positive recollections of the inundation of the central business district (Chinatown) that brought a crocodile to the main street and saw mangoes floating on the flood waters.

Although a cyclone has not made landfall in the Broome area since 2000, some of the students believed they had experienced one. However, the age group of the sample precluded this. Nevertheless, Broome has experienced many severe storms in the years since 2000, so it is likely that students confused these 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 such as the red zone meant that you couldn't see friends but you could fly kites, whereas the yellow alert meant that school would be closed. This would indicate that there is some understanding of emergency warnings but that the association between coloured alerts and zones was confused.

From the children's discussions it was clear that the positive aspects of the wet season, cyclones and severe storms outweighed the negative, which may reflect the fact that they have not experienced the more negative aspects of a cyclone. Students appreciated the temperature change brought by the rain and wind and enjoyed watching lightning. As rain events are rare in Broome and temperatures very high in summer, students welcomed the water within their play environments and enjoyed splashing in the puddles, and swimming in floodways, parks and roads.

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 wet season. The students identified several concerns associated with rain events, such as worms getting into their skin, getting ringworms from 'playing on flooded road', meliodosis, becoming sick from playing in the rain, or contracting meningococcal if they accidentally consumed the water (while playing outside). One child commented that 'parents think you're going to get sick in the wet'. Another child added that flooding brings 'ticks and mosquitoes'.

Infrastructure

Road accessibility is the primary infrastructure issue that affects the lives of the students, followed by power loss in the wet season. The students spoke positively about infrastructure in the dry season, as they are able to access camping spots, which are inaccessible during the wet season when roads are closed. However, one child stated that in the dry time 'tourists come and they are road hogs'.

The negatives associated with infrastructure in the wet included the dangers of driving on flooded roads

with one child stating that 'strong currents can pull the car off the road' and another added that vehicles are vulnerable to 'skidding off the road'. Children were also concerned about flooding in the central business district area. However, as noted, this was thought of as a positive by other children because of the appearance of a crocodile and floating mangoes.

Power failure during cyclones and storms was also a concern. One child commented that the wet season was good as they 'stay in and play video games' but another contested this statement because they experience 'lots of electricity disruption', which prevents them from doing this. Some believed that power cuts occur during the wet season because 'it's so hot'.

Adaptive and mitigating changes children want

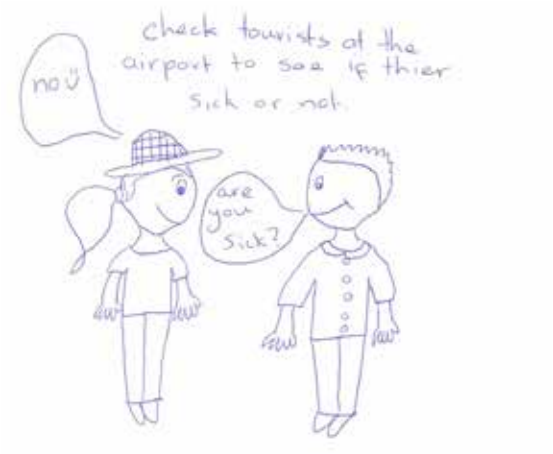
Five themes emerged from this activity and they were broadly described as infrastructure improvements, leisure infrastructure, environmental interventions, emergency management and weather changing interventions. For the purposes of this paper, the mitigative and adaptive responses associated with infrastructure improvements and emergency management are described.

Infrastructure improvements

The discussion comments and the content of the illustrations varied significantly within this theme. Three themes emerged that are of relevance to this article, namely roads, health and electricity.

Roads — Illustrations and discussions included details of road infrastructure upgrades to incorporate storm water drainage to remove the surface water from the roads. One student stated 'cleaning the roads [of water] so that you can go camping'. Another suggested that Broome should 'collect rainwater to drink', in an effort to alleviate flooding. While a third proposed that to stop water from flooding everywhere, more drains were needed on the streets so that 'all the water can get all the way to the ocean'.

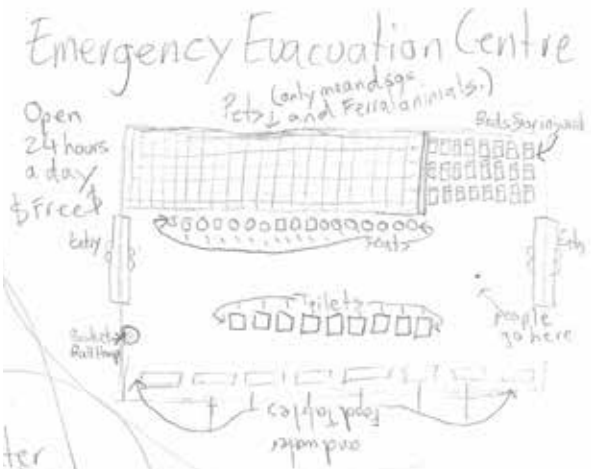
Health — The students believed that the tourists coming to Broome in the dry season brought illnesses that, in turn, infected the local community and created imposts on the hospital. The solution to this concern was to 'undertake a quarantine check on people who enter Broome so that they don't bring bugs and sickness' into the community.



Electricity — Students felt that the loss of power in the wet season should be addressed. Solutions included relocating power lines underground or building 'power stations on a higher slab so there would be less power outages'. Another child believed that making 'Broome a clean energy area' and stopping the reliance on fossil fuels would be a reliable solution to power outages.

Emergency management

Responses summarised under this theme indicate that the students have concerns regarding the design and capacity of the evacuation centre. The children felt that the current centre was not large enough to cope with the population in an emergency situation, more specifically that there needed to be more beds. In addition, students identified a range of activities and services to be provided at the evacuation centre. Some of these included a place for pets, a play area, a safe place for 'lost kids', a medical centre, and a telephone room.



Discussion and conclusion

This research sought to investigate how the seasons affect the lives of young people of Broome and to identify the range of solutions they would implement if they had the opportunity to be involved in the decision-making process.

The research identified that the students engaged in distinctly different behaviours during the dry and wet season. These behaviours are a response to extreme seasonal variations and weather events. The children identified a number of unique activities that can only be undertaken in the dry (e.g. camping) or the wet season (e.g. skim boarding). They described the positive and negative impacts of extreme weather events (heavy rain, cyclones and storms) including a number of health risks during the wet season. These results came from a variety of age groups and would need to be further explored to determine the validity and prevalence of these illnesses, particularly the notion that you could get worms from playing in floodwater.

There were many comments indicating that the students play in flooded drains. Playing in flood waters is the dominant cause of recent child and youth flood mortality in Australia (Haynes *et al.* 2009, Coates 1999). It is therefore very important that a storm water safety education strategy is developed in partnership with children to inform and educate young people about safe play in rain and flooded areas. The dangers of playing in flood waters was the focus of the 2013 Victorian SES FloodSafe campaign, where the flood waters were compared to a floating sewage and garbage dump (Victorian SES 2013).

There are no free swimming facilities in Broome so playing in water in the wet season is a rare treat for young people and will be a hard habit to break. It would be far safer and more equitable for the local government to investigate free and safe swimming options during the wet season.

Of particular concern to emergency management is the confusion regarding the expected behaviour response to the different coloured alerts associated with the community cyclone alert system in Western Australia. One comment regarding flying kites during the red alert, which should be when people are seeking immediate shelter, indicates that there may be confusion about what is life threatening compared to windy conditions. Further research is needed to determine if the children's parents also share the same misunderstandings. It would be interesting to explore the communications between adults and children and identify what risk reduction information, if any, is discussed and how aware parents are of their children's activities in floodwaters.

The information garnered from the illustrations and discussions around civil infrastructure (roads, drains, electricity) and emergency management facilities, suggests that the students have a comprehensive understanding of some of the necessary activities to address their concerns. Most if not all of these activities are within the jurisdiction of the local government. In Broome, the roads are currently the drainage system and the Shire of Broome is seeking funds to construct a storm water system to drain the water from the roads and to harden (concrete) the dirt drainage system that is currently in place.

A CC-DRR approach requires an understanding of how young people conceptualise their environment, including weather patterns, to enable targeted messages to be delivered. Furthermore, a CC-DRR approach must reinforce appropriate and safe behaviours which should be adopted prior to, during and after a disaster.

The results from this research indicate that the young people of Broome are very aware of how the changing seasons and extreme weather events impact their lives and have developed adaptive behaviours in response. The results also indicate that the young people have a sophisticated understanding of some of the necessary actions and policy changes needed to mitigate these impacts. However, the greatest contribution that the results provide is an understanding of children's unique knowledge, perceptions and experiences. Based on this, education programs must involve young people in order to tailor the information to their needs. In particular, urgent work is needed to improve the communication of the Broome cyclone alert warning system, safe behaviour in flood waters, and public health risks associated with rain events.

However, the involvement of the young people of Broome, and indeed all young people in Australia, should go further than simply identifying their vulnerabilities and information needs. Research has demonstrated that children who are informed and involved in risk reduction activities can play an important role in reducing risks to their whole communities through communication, advocacy and direct action (Mitchell *et al.* 2008, Tanner *et al.* 2009, Tanner 2010, Haynes & Tanner 2014). It is also important to note that children are not gender neutral and, in many contexts, girls will differ to boys and demonstrate a heightened vulnerability and resilience to disaster risk. Thus, programs need to be gender sensitive (Haynes, Lassa & Towers 2010).

Although this research is an important first step, further work is required to determine the best ways for young people, and particularly Indigenous children, to be supported to claim their right to safety and be fully involved in CC-DRR programs.

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