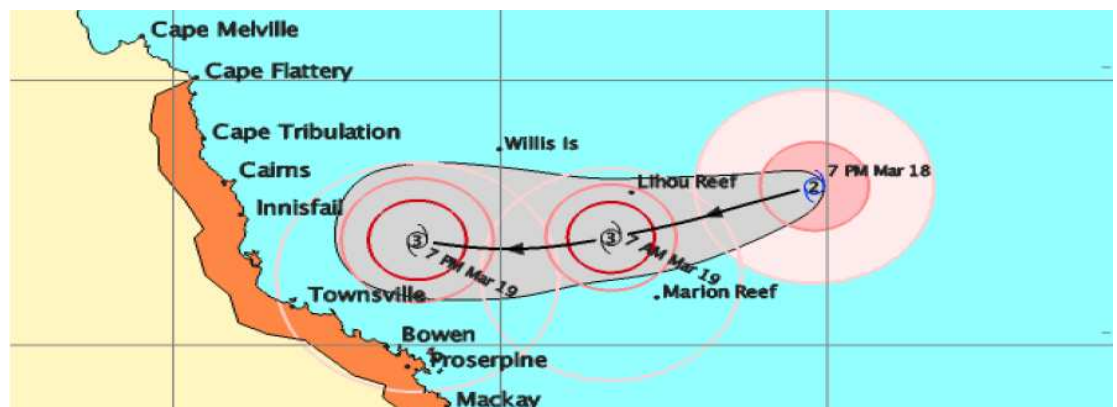


# Mapping for Public Awareness of Imminent Natural Hazards

Experience from Cyclone Larry, March 2006



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# 1 Introduction

Cyclone Larry impacted Innisfail and surrounding areas of the Johnstone Shire on March 20<sup>th</sup> 2006, causing significant material, social and economic damage. In the midst of recovery and reconstruction efforts over the days immediately following the cyclone's passage, activities to assess the nature and extent of damage, along with the actions, feelings and observations of affected residents were undertaken. This survey effort involved several public and private organisations including James Cook University (JCU; Centre for Disaster Studies and Cyclone Testing Station), Bureau of Meteorology (BOM), Geoscience Australia and Systems Engineering Australia (Davidson ed., 2006).

JCU's Centre for Disaster Studies (CDS) undertook a household survey by means of face to face interviews of Innisfail Estate, East Innisfail, Flying Fish Point, Coconuts, Kurrimine Beach (resident encountered in Innisfail), South Johnstone, Mourilyan and Babinda (King & Goudie, 2006; Figure 1). Included in the survey instrument were questions regarding cyclone awareness, preparation, feelings, behaviour, specific situation, property damage and past experiences. The full survey instrument is provided, and results of the survey dealt with in detail, by King & Goudie (2006).

This report will examine specifically the role played by mapping products in the community pre-impact. Based on responses to the CDS survey (King & Goudie, 2006), the ability of residents to access and understand map products provided by the Bureau of Meteorology, the impact of these on feelings prior to the cyclone and how this was manifested with respect to preparedness will be interpreted.

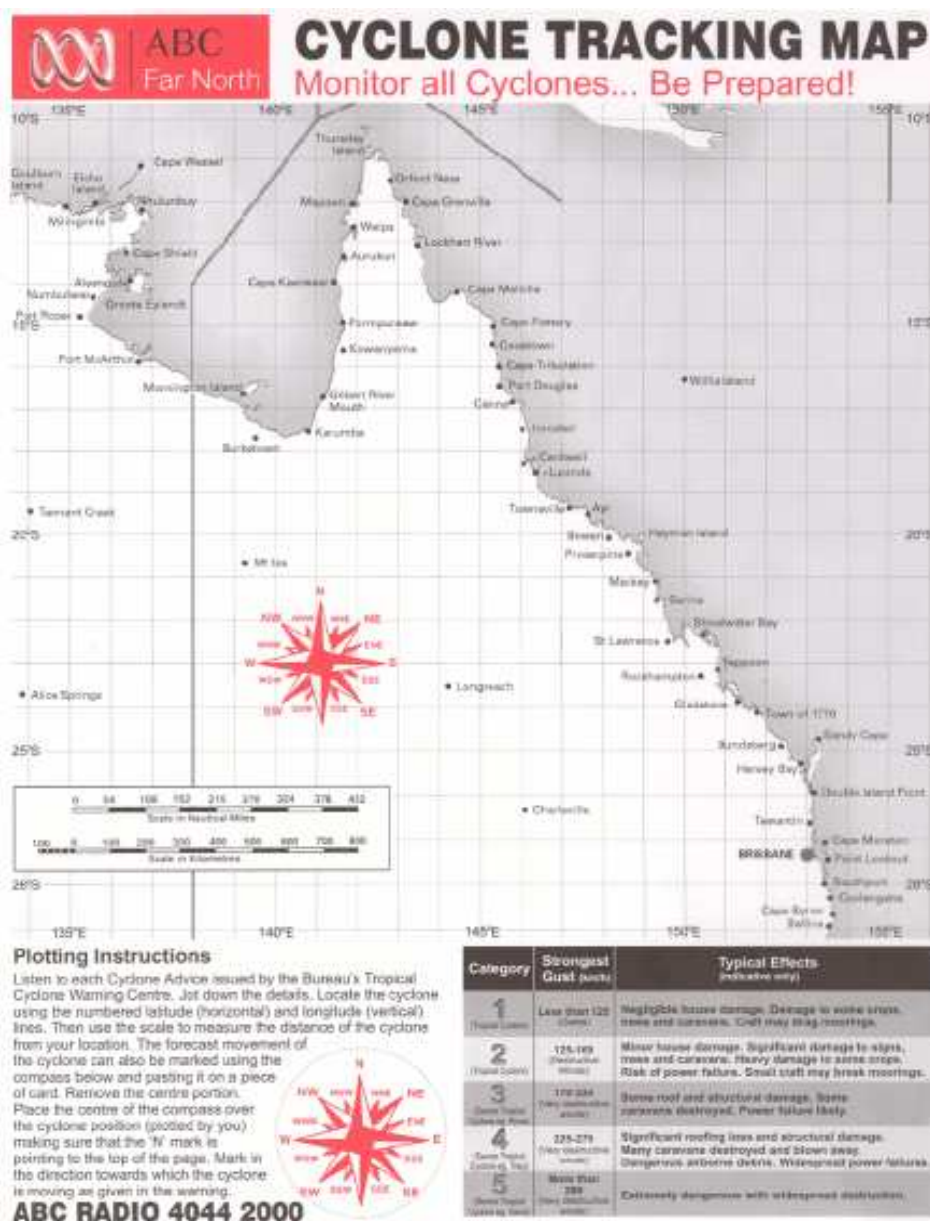
**Figure 1 - Survey Localities** (King & Goudie, 2006)



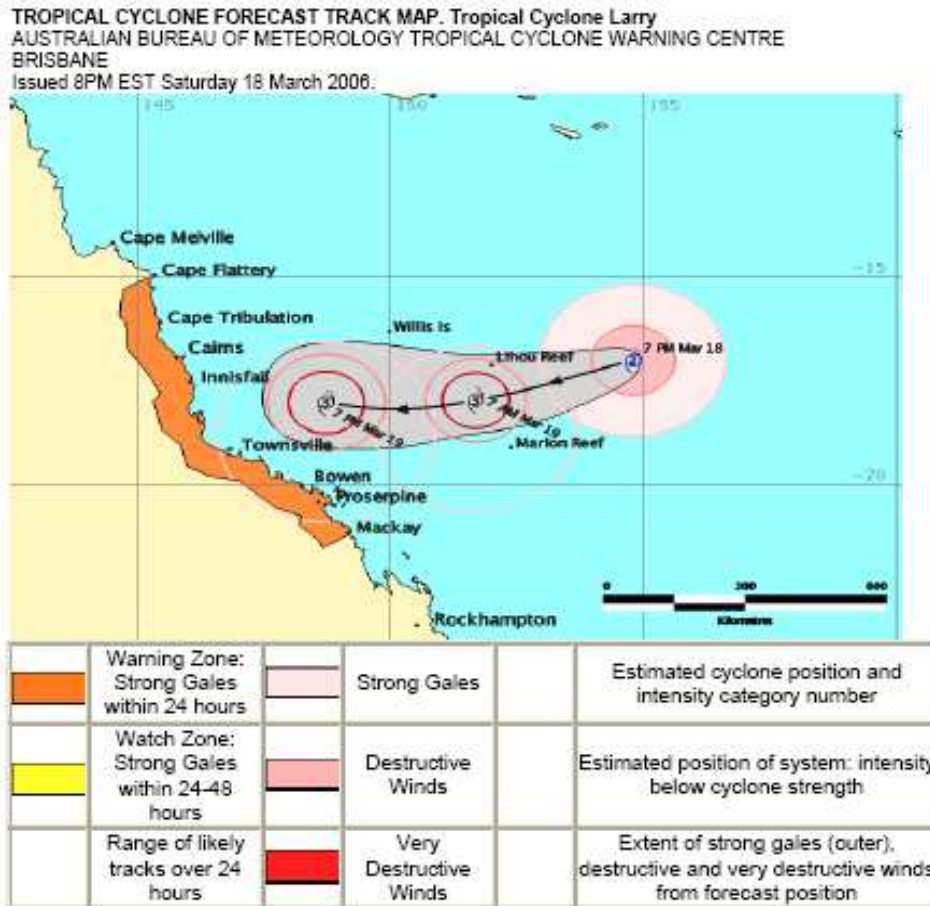
## 2 Methods

Full descriptions of methods used to undertake the surveys and the subsequent entry of data into a database are provided in King & Goudie (2006). Subsequent paragraphs contain the specific questions and reasoning used in examining the usage, access and consequences of Bureau of Meteorology Cyclone Tracking (Figure 2) and Forecast Track (Figure 3) maps. Due to the insignificant number and nature of non-responses in the survey data, these have been omitted from analyses.

Figure 2 - Cyclone Tracking Map (ABC, 2005)



**Figure 3 - Forecast Track Map (BOM, 2006)**



## 2.1 Qualification of Results

### Q39A Have previously experienced a cyclone? (which ones and where)

Responses: No previous experience, Other Cyclone, Cyclone Winifred

Data analysed regarding feelings (Section 2.5) and preparedness (Section 2.6) was also placed in the context of question 39 to determine whether responses are modified by previous cyclone experience.

## 2.2 Usage

### Q14 Did you track Cyclone Larry using a cyclone tracking map?

Responses: Yes, No

### Q15 Where did you get the map from?

Responses: BoM website, Brochure, Council, Did not use, family/friends, newspaper, phone book, phone book & shop.

### Q16 Was the forecast track map useful?

Responses: Did not see it, Not much, Yes, Yes very

Questions 14-16 were the only included in the survey relating specifically to map products. Simple tallies provided utilisation of both maps and the source from which the tracking map was obtained (forecast track maps as in Figure 3 are only available from the BOM website).

## **2.3 Accessibility**

### **Q5 As Cyclone Larry approached on Sunday March 19<sup>th</sup>, where did you mainly get information about the cyclone?**

Responses: BoM website, Friends & Relatives, Local Authorities, Multiple sources, Radio, TV, TV & radio

Responses to Question 5 showed which sources were available to residents, and allowed testing with responses to question 15 (Section 2.2) of whether map products were not used despite being accessible.

## **2.4 Understanding**

### **Q35 Did the messages contain the information that you felt you needed?**

Responses: Yes, No

### **Q35A Were they easy to understand?**

Responses: Yes, No

### **Q36B Were they too technical?**

Responses: Yes, No

All parts of Question 35 relate to cyclone advice messages issued by the Bureau of Meteorology. These included latitude and longitude of the cyclone eye for use with the cyclone tracking map, and most probably were considered by some residents to also cover the forecast track maps issued on the BOM website. Map products must be able to be readily understood by non-technical customers to be of any use to residents.

## **2.5 Feelings**

### **Q7 Can you remember how you felt when you heard the cyclone advice messages for cyclone Larry?**

Responses: Annoyed/angry, calm, concerned, did not take it seriously, excited, prepared, scared, strong, very scared, worried.

### **Q8 Can you recall how you acted on this feeling?**

Responses: Confused, evacuated, increased preparations & activity, listen to warnings, no action, stay calm/don't scare others, upset

Questions 7 and 8 are the only two which relate specifically to feelings of residents prior to the cyclone's arrival. Question 7 was matched with responses to questions 14 and 16 (Section 2.1) to suggest the effect of map information on resident disposition.

## **2.6 Preparedness**

**Q2 *At the beginning of this cyclone season did members of this household discuss the possibility of a cyclone affecting you this year?***

Responses: Yes, No

**Q21 *When did you begin to make preparations for Cyclone Larry?***

Responses: None made, Before Saturday, Saturday, Sunday before 9am, Sunday 9am-1pm, Sunday 1-5pm, Sunday 5-8pm, Sunday after 8pm

**Q23 *How adequate do you think your household's preparations were for Cyclone Larry?***

Responses: Excellent, Good, Pretty Good, Fair, Poor

Questions 2, 21 and 23, represented awareness of the cyclone hazard, an objective measure, and a subjective qualification of preparedness respectively. Responses to these question were placed in terms of questions 14 and 16 (Section 2.2) to determine whether use of map products was associated with modified responses.

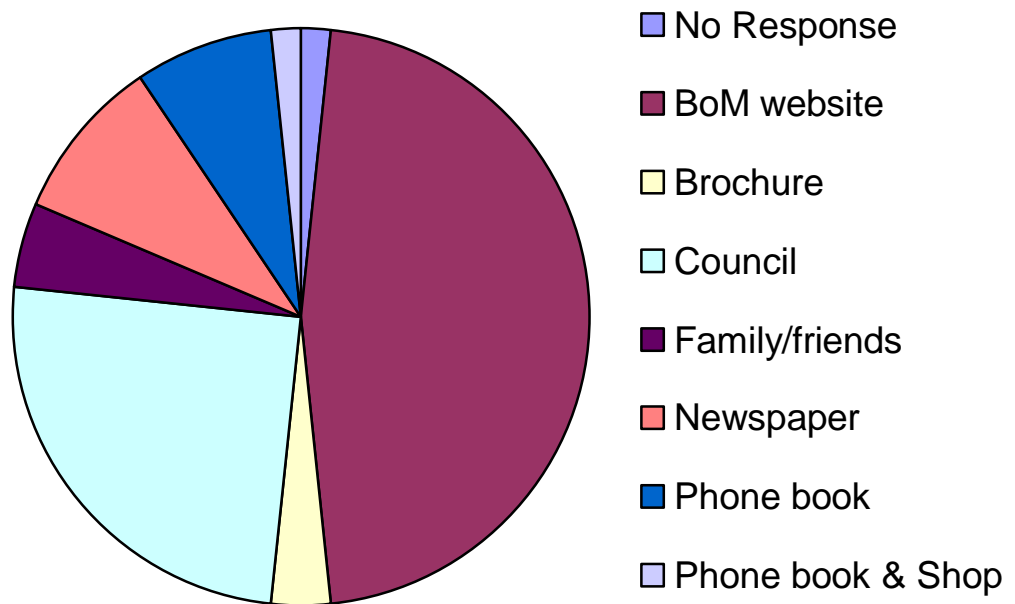
## **3 Results**

### **3.1 Usage**

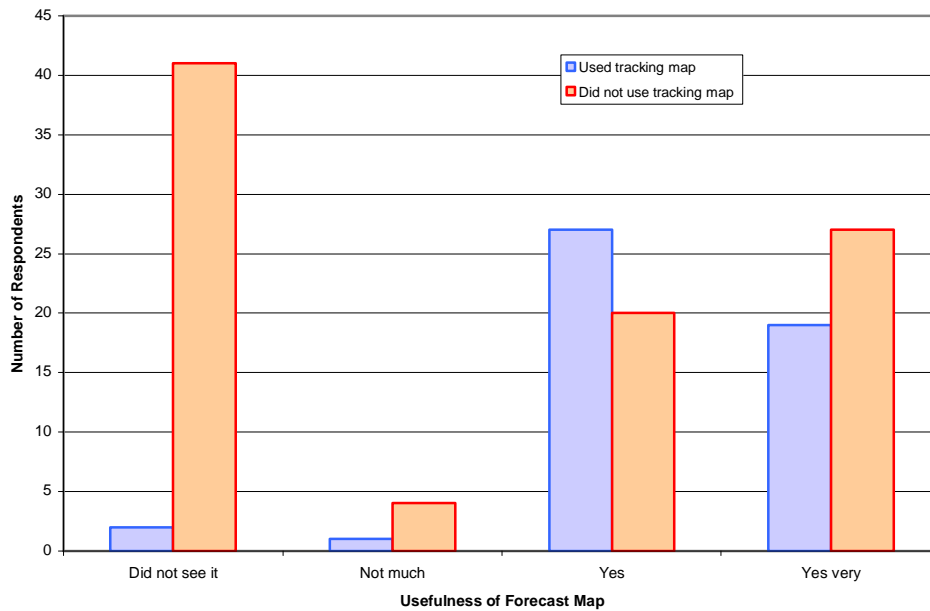
From responses to question 14, 49 of 147 respondents used cyclone tracking maps the majority of which were obtained from the BOM website. Interestingly 25% were provided by Johnstone Shire Council in preference to apparently more accessible sources such as phonebooks (Figure 4). A significant proportion of the residents who did not use tracking maps also did not view a forecast cyclone track map available from the BOM website. The relationship between usage of the two map products is shown in Figure 5.



**Figure 4 - Tracking Map Source**



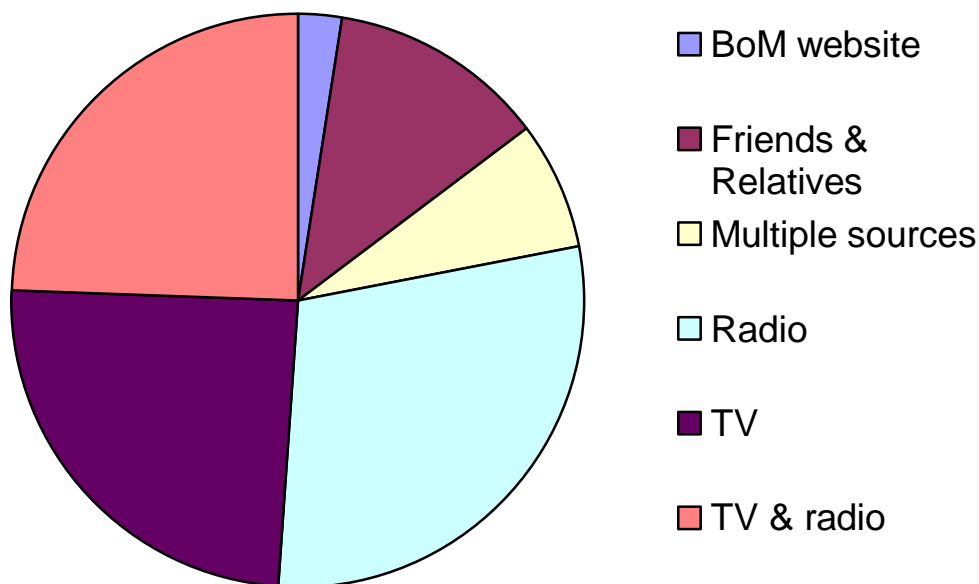
**Figure 5 - Usage of tracking and forecast track maps**



### 3.2 Accessibility

Based on the lack of use of forecast cyclone track maps, sources used for obtaining information as the cyclone approached, by those respondents who did not sight the forecast map are shown in Figure 6. Even if the internet were assumed to be used by respondents listing multiple sources, it rates lower than all other forms of communication. This in turn may explain the large number of residents who did not see the forecast cyclone track map.

Figure 6 - Information Source (Forecast map not sighted)



### 3.3 Understanding

For responses to question 35, both part A and B listed around twelve of the total 143 respondents who found BOM information to be difficult to understand or too technical. These negative responses were not provided by the same dozen residents for both sub-questions.

### 3.4 Feelings

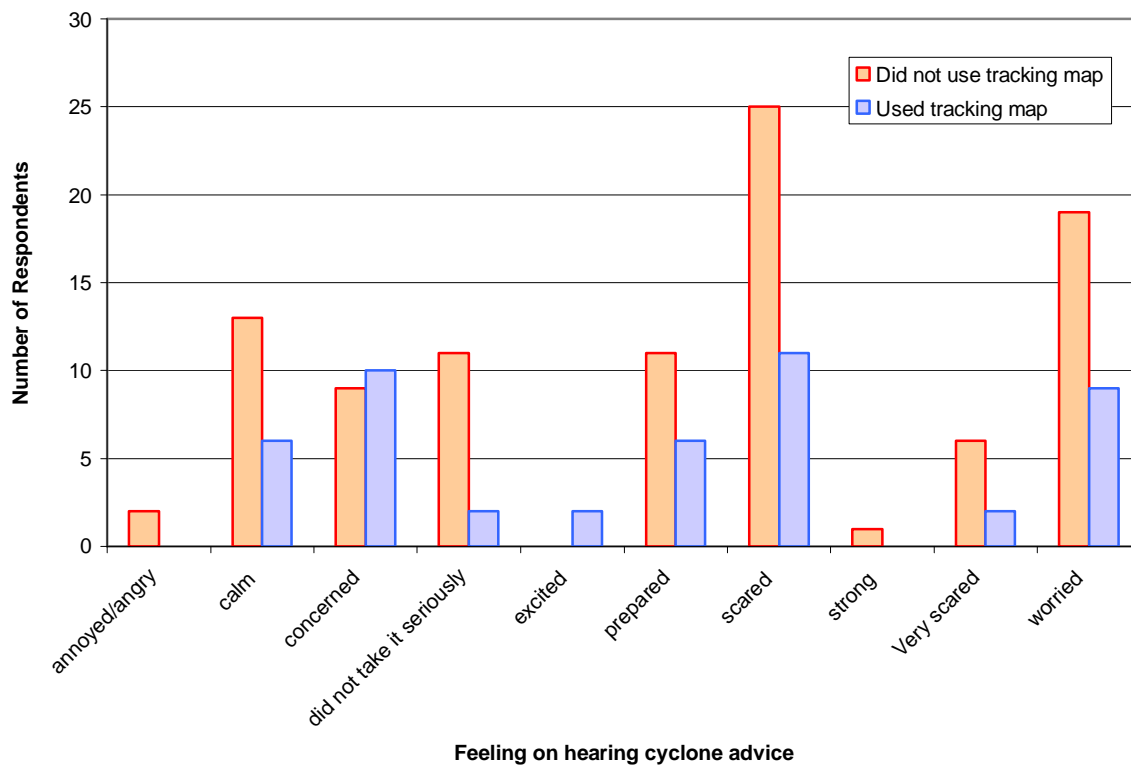
Table 1 demonstrates the type of action which resulted from different respondent states of mind. These feelings are shown with reference to both tracking maps and forecast track

maps in Figure 7 and Figure 8. Overwhelmingly, despite their feeling regarding cyclone Larry, residents increased preparation as a result of advices. Most respondents who did not use a tracking map identified as being either scared or worried, while this was reversed for the forecast track map.

**Table 1 - Manifestation of Feelings**

		Action						
		<i>Confused</i>	<i>Evacuated</i>	<i>Increased Preparations &amp; activity</i>	<i>Listen to warnings</i>	<i>No action</i>	<i>Stay calm/don't scare others</i>	<i>Upset</i>
<b>Feeling</b>	<i>Annoyed/angry</i>			2				
	<i>Calm</i>		1	6		8	3	
	<i>Concerned</i>		1	13		3	2	
	<i>Did not take it seriously</i>	2		4		3	4	
	<i>Excited</i>				1	1		
	<i>Prepared</i>			8	1	1	7	
	<i>Scared</i>		3	17		8	7	1
	<i>Strong</i>			1				
	<i>Very scared</i>	1		5				2
	<i>Worried</i>		1	17		5	5	

**Figure 7 - Feelings related to cyclone tracking map**



**Figure 8 - Feelings related to forecast cyclone track map**

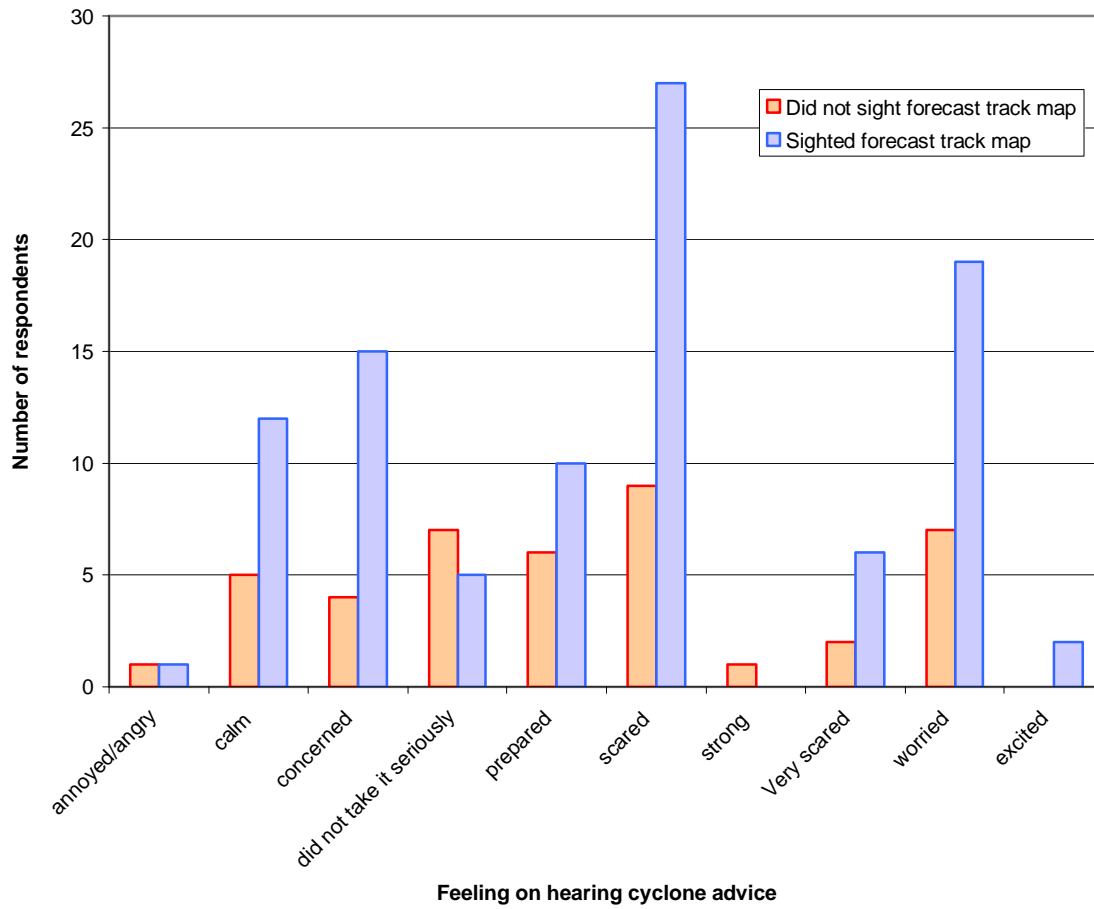
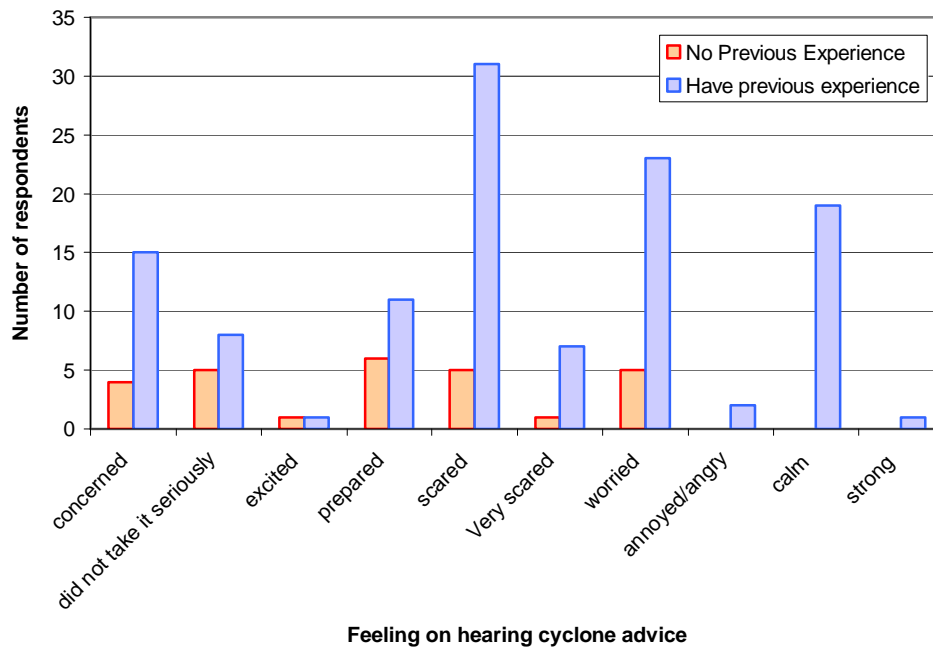
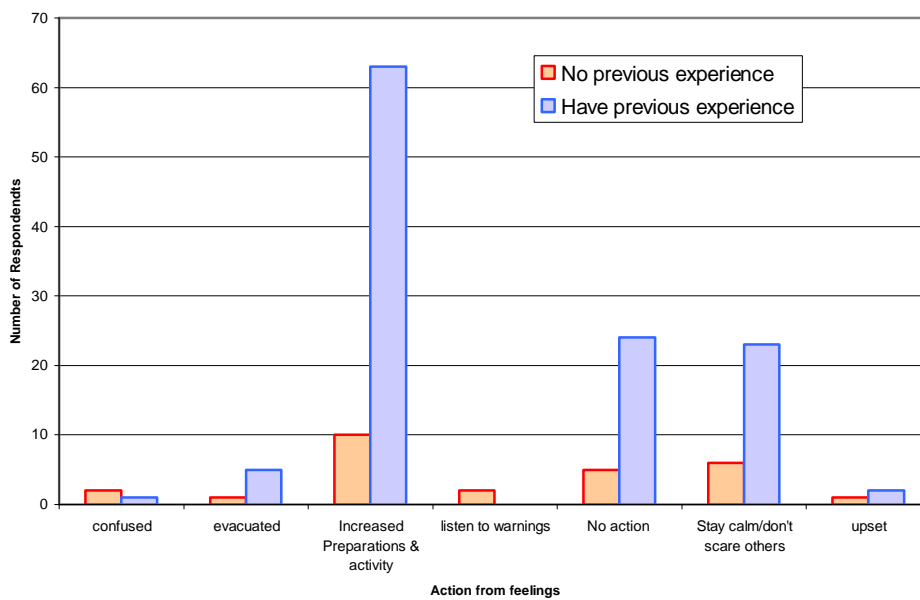


Figure 9 and Figure 10 show the influence of past cyclone experience on feeling and action. It appears that previous cyclone experience caused many people to become scared, worried or concerned, however it also enabled some to remain calm, unlike those with no prior experience. This is also reflected in the subsequent actions taken, with a large increase in preparations and significant numbers taking no action on feelings, or remaining calm

**Figure 9 - Feelings and Previous Cyclone Experience**



**Figure 10 - Action and previous experience**

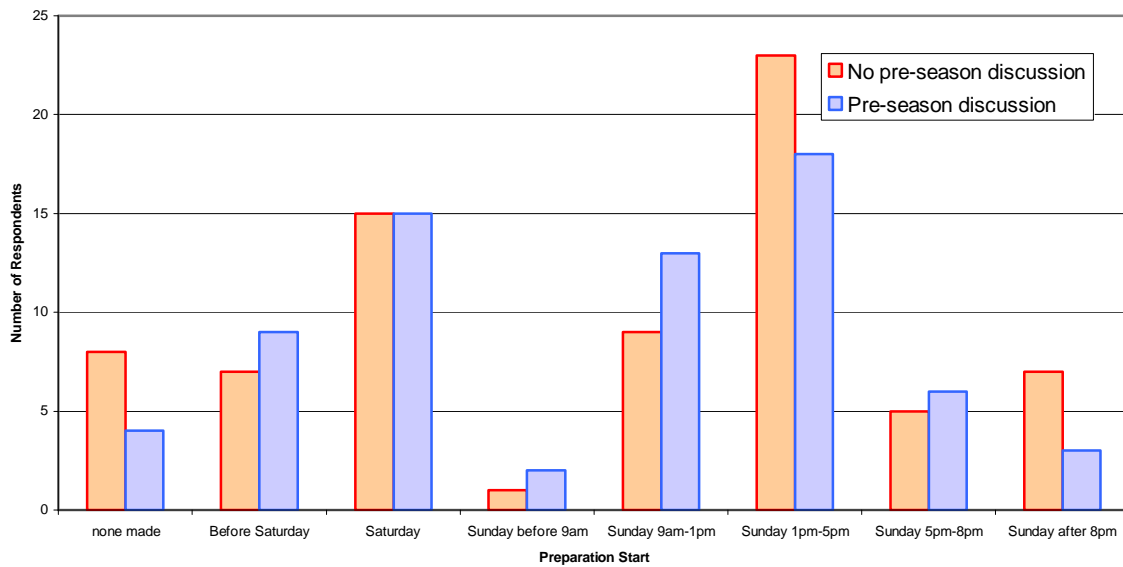


### 3.5 Preparedness

Examination of the responses to questions 21 and 23 showed similar distributions of perceived adequacy of preparations and the time at which those preparations were begun,

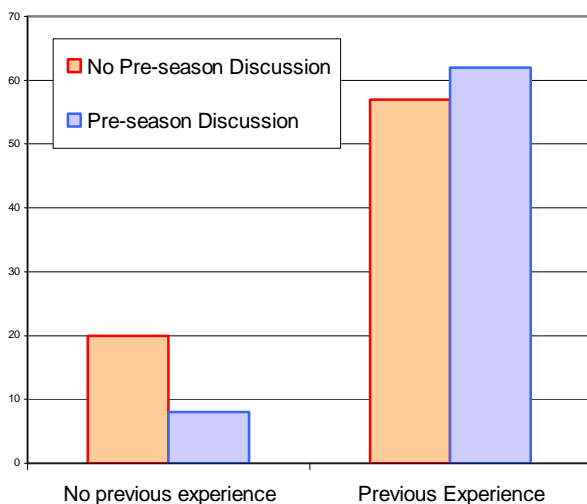
regardless of map product exposure. Also, no clearly defined relationship suggesting that respondents were more satisfied with preparations which were begun earlier, as might be expected. Likewise, prior cyclone experience did not create any particular pattern in start of preparations or satisfaction with their adequacy. However, lack of discussion at the beginning of cyclone season appeared to elevate the number of respondents who made no preparations, or only at the very last minute (Figure 11).

**Figure 11 - Comparison of preparation start time based on pre-season discussion**



Residents without previous experience of cyclones were also more likely not to discuss cyclone hazard pre-season (

**Figure 12 - Pre-season Discussion modified by past cyclone experience**



## 4 Discussion

From the low proportion of residents who utilised map products and the significant number who did not sight a forecast track map, it is evident that problems exist with accessing BOM products available on the internet. This is to be expected in rural shires such as Johnstone. TV presents as the only other visual form of communication widely viewed leading up to Cyclone Larry, accounting for more than 50% of respondents. Possible inclusion of the forecast track map instead of the location details currently broadcast with cyclone warnings should be examined. Conceivably, this will also aid in reducing the number of residents which find BOM information to be difficult to understand; “a picture paints a thousand words”. Additional justification for the wider distribution of forecast track maps can be drawn from the fact that the majority of residents who sighted these maps perceived them to be of use.

No categorical statement can be made regarding the impact of map products on the feelings and consequent actions of residents due to the disparate nature of results for the two types of map under consideration. Similar can be said for preparedness, where no distinct difference in distribution of responses could be seen between those who had and hadn't been exposed to maps. Past experience of cyclones and the act of discussing possible hazards prior to the cyclone commencing, appear to have a much more significant influence on resident feelings, and organisation of preparations.

An interesting additional observation is that no mention was made of storm surge information products being available. While residents at the sea front are more than likely aware of the potential for storm tide inundation, this may not be the case in surrounding low-lying areas adjacent to the coast.

## 5 Conclusions

Preceding results and discussion indicate that no significant conclusions can be drawn as to the utility of maps in terms of resident state of mind and preparedness prior to impact of an extreme weather event. This is partly due to the limited themes and distribution of map products within the affected area, along with the small sample size. Suffice to say however, those that were able to access forecast track maps perceived them to be of use.

The utility of mapping, specifically GIS, for hazard assessment and emergency management tasks is well recognised amongst the research and public service sectors (Granger & Hayne, 2000; Free, 2004; GHD, 2006). This is not the case however, in providing members of the public with enhanced levels of situational awareness pending extreme events. Rohrmann (2003) assesses a number of public websites available for fire hazards, and cyclone location information has been provided online and in televised warnings for number of years, nevertheless this is by no means a comprehensive coverage of disaster information needs. Additional research is required to determine the information which could usefully be disseminated in map form to members of the public for a range of natural hazards, along with means to combine multiple existing bulletin sources into a single access point. The experience in Innisfail has shown that pc-based internet is not an entirely satisfactory means for delivering hazard information outside of metropolitan areas, and further investigations should be made toward the enhancement of existing media services, as well as utilisation of newer location based services and telecommunication technologies.



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