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Are the knowledgeable better prepared in the event of a cyclone?
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Executive Summary

Although a better knowledge disasters and threats they pose to the local environment is assumed to lead to better preparation in the face of disasters, there appears to have been little research examining the relationship between the two. This report attempts to quantify this relationship, if it exists, based on a random sample of 80 households within the two Townsville suburbs of Railway Estate and South Townsville. Analysis of survey data revealed that respondents generally had a limited knowledge and awareness of local cyclone vulnerability and had carried out little preparatory action. A relationship between knowledge and preparation could not be conclusively determined, because whether respondents decided to take these actions or not seemed to depend very much on their own perceptions and understanding of the risk.

This report provides some insight into how increased cyclone knowledge does not necessarily lead to increased preparedness and a reduction in the vulnerability of residents of South Townsville and Railway Estate to tropical cyclone and storm surge hazards, but is influenced by many external factors, including a range of community specific attributes and characteristics that form the basis of an individual's perception of risk. Cyclone awareness education should therefore be aimed largely at defining and explaining the risk in an interactive way if it is to be effective in encouraging risk minimising and preparedness behaviours.

South Townsville, used as the basis for this study, lie within this area vulnerable to storm surge.



Figure 2: Townsville Storm Surge Map
Source: Townsville City Council, 2005

Tropical cyclones, like other natural hazards are not, in themselves, disasters (Hewitt, 1997). In their most general form, natural disasters are the result of the interaction between a natural hazard and a vulnerable human community. Thus a natural hazard becomes a disaster when a vulnerable individual or community is impacted (Hewitt, 1997; Buckle, 1999). At its simplest, vulnerability has been conceptualised as a pre-existing set of attributes that make people or communities more, or less, susceptible to loss (King, 2000).

In the Australian emergency management context, vulnerability is defined as “the degree of susceptibility and resilience of the community and environment to hazards” (Emergency Management Australia, 2000). Blaikie *et al.* (1994) builds on this definition by arguing that vulnerability can be reasonably defined by the characteristics of individuals or communities in terms of their capacity to anticipate, cope with, resist and recover from the impact of a hazard. The hazard event is no longer viewed as the primary cause of loss and instead focus is directed towards the human community and people’s living conditions, social and economic resources, livelihood patterns and social power and includes a consideration of resilience, a more empowering concept (King, 2002). It is, therefore, the vulnerability of the community that determines its residents’ susceptibility to loss and harm in the event of hazard impact.

Community vulnerability does not remain static, but is dynamic and ever-changing, due to the complex relationships and inter-relationships arising from the unique actions and interactions of the social, community and demographic attributes and characteristics of a particular population (Buckle, 1999). An appreciation of vulnerability is therefore central to risk management and to the development of hazard mitigation strategies (Anderson-Berry and King, 2005). In combination, these form the basis of community, family and individual knowledge, understanding and life processes that gives rise to the individual and community perception of risk (Drabek, 1986).

Risk perception is an important component that may complicate the relationship between knowledge and action. Mathematically, risk is the product of all potential hazard events and the vulnerability of the exposed elements at risk (Buckle et al., 2000; King 2000). That, is:

$$\text{Total Risk} = \text{Hazard} \times \text{Elements at Risk} \times \text{Vulnerability}$$

Individuals and communities make decisions on what precautionary measures will be undertaken to ensure that loss resulting from a hazard event is limited to an 'acceptable' level based on the level of risk they perceive to be associated with these events (Smith, 1996; Berry and King, 1998). If perceived risk accurately portrays the actual risk associated with a particular hazard, then mitigation strategies and response preparedness are likely to be appropriate and vulnerability can be minimised. If risk perception is biased, the reverse is true and vulnerability may be increased (Anderson-Berry, 2003). In relation to the question under investigation, where individuals have a can be m

complex process where the media and the general public select, reinterpret, and weigh up meteorological and hazard information, applying a complex set of attitudes, perceptions, experiences, biases and misinformation to the initial message (King,

2. Determine the level of knowledge of cyclone processes and threats displayed by residents of South Townsville and Railway Estate; and
3. Determine what precautionary measures people in South Townsville and Railway Estate have taken to prepare for the upcoming cyclone season.

Hypothesis:

People who have a better knowledge and understanding of cyclone processes and potential threats are more likely to take precautionary action than those who have a limited understanding of such processes and threats.

Methodology

In order to transfer the data used for this report from raw field data into a useful format, where meaningful conclusions and recommendations can be made, three main steps were undertaken:

Data collection in the field

A survey, composed of 96 questions multiple choice and short answer responses (for full copy of survey see Appendix A) was distributed to a random selection of 80 residences in Townsville suburbs of South Townsville and Railway Estate. Although an extensive questionnaire, it was drafted in such a way as to lead thinking naturally from one area to the next. The survey, written by a post-graduate student of James Cook University (JCU), was distributed at the onset of the 2001 cyclone season (early December) in order to determine the vulnerability of South Townsville and Railway Estate communities to cyclones and storm surge. The surveys were left at the premises to be completed at the respondent's convenience over the weekend to be collected on Monday 10th December.

Data entry

In 2005, the raw data was entered into the computer program SPSS by two fourth year Urban Planning students of JCU as part of their minor project. Several variables were recoded.

cyclone awareness among upper primary school students. This is a vital part of increasing community awareness in general as children can effectively be targeted at school and often they pass information learned at school onto their parents. Also, learning from an early age these children should retain some of this knowledge into adulthood, resulting in a cohort of future citizens who have increased cyclone awareness and (hopefully) preparedness.

There are also high levels of misunderstanding of terms such as storm surge and categories of cyclones. Fortunately, at least there is almost universal understanding that Category 5 is the most severe cyclone and Category 1 the least. It is worrying though that only 37.5% of the 80 people surveyed correctly identified which categories indicate a severe tropical cyclone. However, a further 31.3% were partly correct, the most common mistake being the inclusion of category 2 in the 'severe' category, perhaps due to inaccurate media portrayals inadvertently referring to category 2 cyclones as 'severe' or using other synonyms that people would interpret as severe.

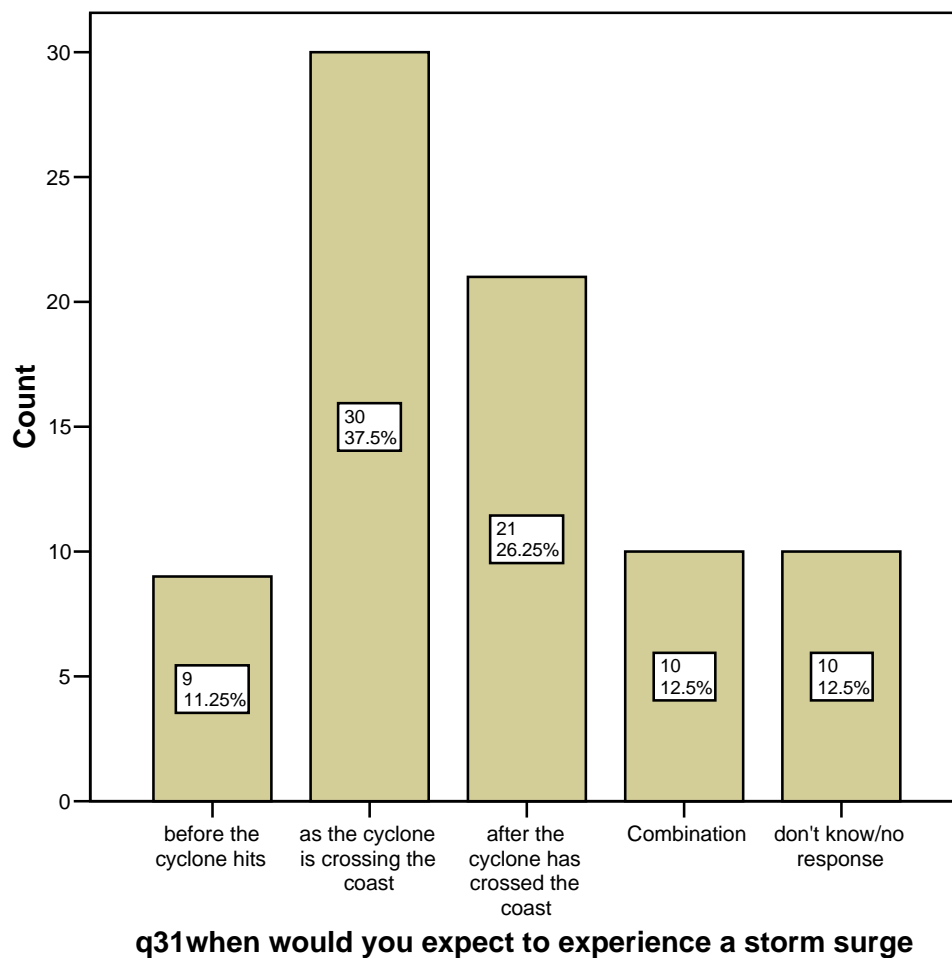


Figure 5: Bar Chart of Response to Question 31 – Storm Surge Occurrence

Potentially, the most destructive phenomenon associated with tropical cyclones that m

Estate is mostly old-style wooden Queenslanders and the structural integrity of these buildings may be substandard such that they do not comply with modern cyclone regulation building standards, and in addition to the threat of flying debris, there is the possibility structural collapse in the event of a severe cyclone.

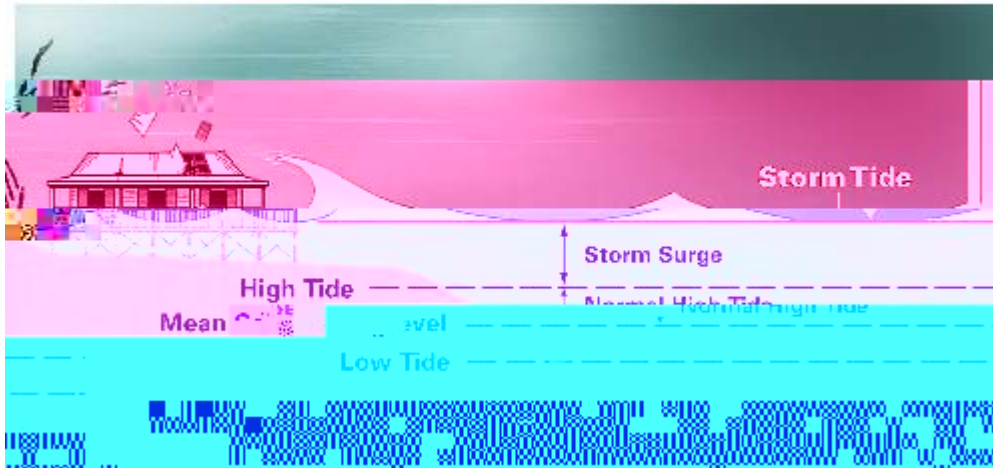


Figure 7: Diagrammatic Representation of Storm Surge and Storm Tide
Source: BOM and EMA, 2005

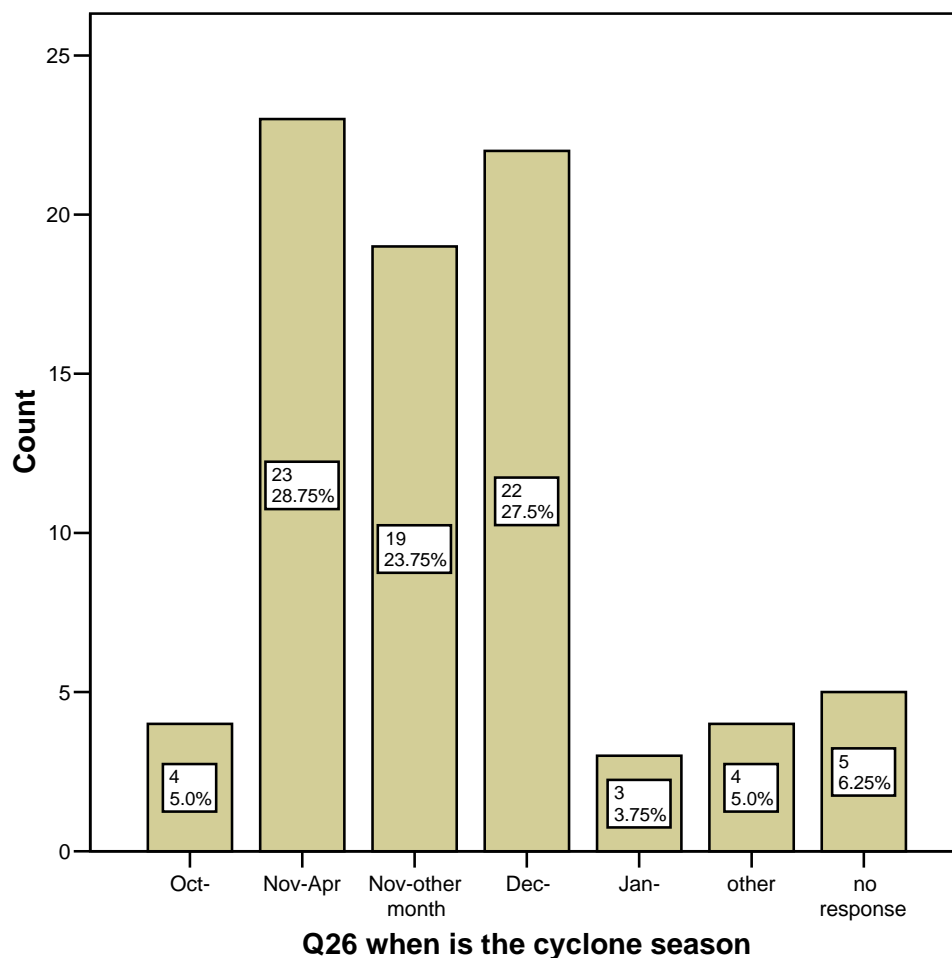


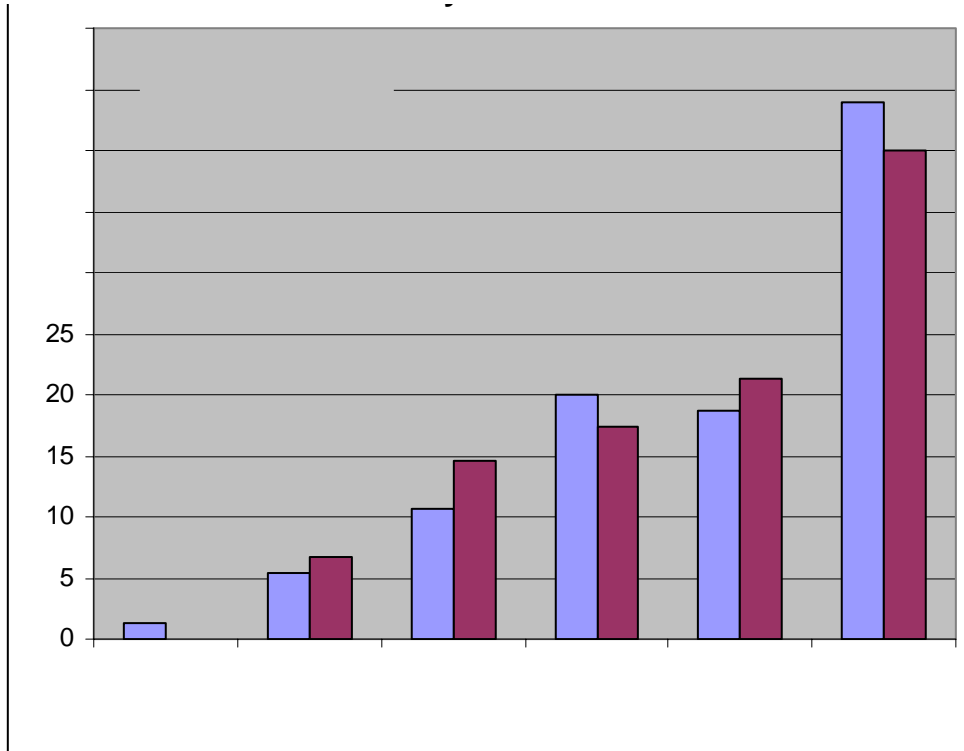
Figure 8: Bar Chart of Response to Question 26 – Cyclone Season

According to the Bureau of Meteorology (2005), severe tropical cyclones affect
Townsville on average once every twenty years, while stormy

9%) correctly identified that the cyclone was 12.29.69992 662.248036 Tm ,

m

10m/s long



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that there would be enough time to prepare when, and if, a cyclone posed an imminent to prepare to prep

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Pearson's Correlation Coefficients were used to determine whether a statistically significant relationship existed between selected indicators of cyclone knowledge and preparedness. As Table 2 shows, however, very few statistically significant relationships were found. Out of a possible 80 relationships that could be observed between either cyclone knowledge or local awareness factors and preparedness variables, only five of these were statistically significant, as shown in bold and italics. This shows that some external factor/s intercept the assumedly direct relationship between knowledge and preparedness. The most influential of these is most likely risk perception as discussed previously, but numerous other community and individual factors may exert influence, making vulnerability analysis through the use of only knowledge and preparedness indicators very limited in its scope. Those indicators of preparedness and knowledge that were statistically correlated are discussed further in the crosstabulations below.

The relationship between variables was equally as weak – only five of the preparedness indicators were correlated with each other and only two general cyclone knowledge and local knowledge indicators showed statistical correlations. Therefore, in general, not only is there a very weak relationship between knowledge and preparedness, thus rejecting the hypothesis being tested, but there is also little consistency among variables. This means, for example, a respondent who correctly answers one general knowledge question, is not, on average, any more likely to answer a

its location and structure. By considering the potential impacts cyclones and storm surge may have prior to purchase, loss of life and damage to property could be minimised should a cyclone hazard threaten the coast.

Counter-disaster plans are immensely important in providing a link between hazard research and on the ground practice, giving guidance on local disaster response and preparation measures (Emergency Management Australia, 1999). The knowledge of whether a counter-disaster plan exists seems to have a positive correlation with whether

general cyclone knowledge) and preparedness. Thus basic background knowledge is less likely to influence the preparation measures that residents are likely to take than an awareness of each individual's and the community's collective risk of cyclone damage and storm surge. The results notwithstanding, the structure of the survey instrument used and relatively small sample size may have detracted from the scientific merit of this study. If a study was conducted purely with the goal of testing this hypothesis, and a more appropriate survey was formulated using a larger more representative sample, a stronger relationship may emerge. However, general cyclone knowledge alone does not necessarily lead to better preparedness, due to the influence of risk perception and the 'generic' nature of much information that fails to address identified and specific community needs (Anderson-Berry, 2003). Thus people cannot relate to this on a local level and knowledge cannot be transferred into action.

Despite the inconclusiveness of the general hypothesis, some other findings were of particular importance. Alarming, survey respondents showed not only a common misunderstanding and lack of general cyclone knowledge, but also demonstrated a lack of knowledge of the threats in their immediate environment. Although respondents displayed a basic level of preparedness, if these results are representative of the wider Townsville and north Queensland regions, then this is a cause for concern for emergency managers, especially if a severe cyclone threatens the region. Unless information is presented in an interactive way, and the very real risk of cyclones and storm surge is acknowledged, the local population is still highly likely to suffer unnecessary and avoidable loss associated with the tropical cyclone and storm surge hazards.

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(9) Do any

(20) What is the approximate combined annual income in this household? 1.

- Less than \$25,000
- 2. \$25,001 -\$50,000
- 3. \$50,001 -\$75,000
- 4. \$75,001 -\$100,000
- 5. More than \$100,001

(21) Is every member of this household, over the age of 5 years, able to communicate effectively in the English language?

Yes

No

If not, who does not, and, what language(s) do they speak and understand.

(22) In which country(s) were the Adult residents in this household born?

Are you or Aboriginal or Torres Strait Islander descent? Yes

No

(23) If not born in Australia how long have they been living in Australia?

(24) What makes a cyclone form over the sea?

(25) Is it possible for cyclones to form over land?

(26) When is the cyclone season?

(27) In which direction does the wind circulate in an Australian cyclone?

(28) How many kilometres from a severe tropical cyclone centre would you expect significant damage to extend?

(29) What is a storm surge?

(30) What causes a storm surge during a cyclone?

(31) When would you expect to experience a storm surge?

1. Before the cyclone hits
2. As the cyclone is crossing the coast
3. After the cyclone has crossed the coast
4. Do not know

(32) Are there any other conditions that may cause a storm surge to be greater?

(33) How would you usually become aware of an incoming cyclone?

1. A change in the weather
2. Word of mouth
3. Radio
4. Television
5. Print media
6. Other, (please specify)

(34) Which is a more destructive cyclone?

1. **Category 1**
2. **Category 5**

(35) Which categories indicate a severe cyclone?

(36) What means of transport do you and members of this household usually have the use of? 1.

- 4 Wheel drive vehicles
2. Motorcycles

(39) Do any members of your household have any special needs? -such as:- 1.

Prescribed medication

2. Crutches I walking frame

3. Wheelchair

4. Oxygen

5. Diet

6. Home Dialysis

7. Regular hospital out-patient treatment

8. Other. (please specify)

(40) Are any members of this household disabled?

Yes

No

If yes, what is/are the disability(ies)?

Does any member of this household require special transport?

Yes No

If yes, what kind of special transport?

Do you have relatives or friends in the area where you and other members of this household could go in the event of an evacuation being necessary?

Yes

No

Would you mind telling us the where they live (street, suburb /township)?

(48) Who would you expect to have the responsibility for issuing and authorising the tropical cyclones public information, warnings, and advice bulletins that are broadcast on television, radio and in the print media?

(49) Who would you expect to issue evacuation advice and/or orders?

(50) If it appeared that a cyclone was heading straight for Townsvillerrhuringowa and your household decided to leave the area by what mode of transport would you choose to leave?

(51) Have you and other members of this household discussed an evacuation plan for this household?

(52) Do you know whether this area has a counter disaster plan in the event of a cyclone or storm surge disaster?

(53) Where would you expect to find copies of such a plan?

(54) Do any members of this household have any previous experience of cyclones (have they ever been through a cyclone?)

If yes, which cyclone(s)? (If you cannot recall exactly, can you estimate approximately how many years ago and where it/they crossed the coast)

How far from the eye (centre) of the cyclone where were you/they physically located?

(55) Do you think cyclones are a threat to the South Townsville / Railway Estate area? Please mark on the scale

not at all 1 2 3 4 5 6 7 very great threat

(66) Have you and/or other members of this household experienced a cyclone warning?
Yes No

If so, can you recall how it made you feel?

1. Frightened
2. Excited
3. Disbelief
4. Anxious
5. No reaction
6. Cannot recall
6. Other, (please specify)

Can you recall how you acted upon this feeling?

(67) Do you already have your cyclone emergency supplies kit packed and prepared for this household?
Yes No Partially

If yes, or partially. what are the contents of this kit?

(68) If you do not already have an emergency supplies kit packed and prepared, or if it is only partially done when (if at all) do you intend to get it ready?

What will the contents of this kit be?

(69) Are this household's valuables, important documents and irreplaceable mementos (photographs etc.) located together where they can be readily found if necessary?
Yes No

(70) Do you have a tide chart in your home?
Yes No

(71) Does at least one member of this househo

(83) How much time do you think this household would need to do all that you feel is necessary to prepare for an incoming cyclone?

1. A couple of hours
2. Several hours
3. A day
4. A few days
5. No idea

(84) If it appeared that a cyclone was heading for Townsville/Thuringowa would you need to attend to any other premises in addition to this residence?

Yes No

If yes. what are the premises?

(85) In the event of a cyclone would any member of this household have to attend to the needs of anyone who is not a member of this household (eg. elderly parents, neighbours etc.)

Yes No

If yes, who?

(86) Upon the arrival of a cyclone where, in this residence, would you and other members of this household shelter?

What sort of damage and disruption to services in the community would you expect if a severe tropical cyclone were to cross the coast near-by?

(88) When do you think Townsville/Thuringowa is likely to be hit by a destructive cyclone?

1. This year
2. Within the next 5 years
3. Within the next 50 years
4. Not in my lifetime
5. Never

Do you think Townsville/Thuringowa is protected to some degree from a direct cyclone hit? Yes No

If yes, what do you believe protects the region?

(90) Are you insured for cyclone damage?

Yes

No

If yes. What does your insurance cover?

(97) Are you concerned that any dangerous substances or fauna may not be adequately contained in the event of a severe cyclone crossing the coast near Townsville/Thuringowa?
Yes No

If yes, what may they be?

(98) What aspects of a cyclone cause you the most concern?

(99) Would you be prepared to participate in a follow up survey in 12-18 months time?

(100) Would you like to add any suggestions as to how you think Local Government Authorities and Emergency Services can make the community more aware of and better prepa