

COMMUNITY POST IMPACT ASSESSMENT – RAPID APPRAISAL

Tropical Cyclone Debbie, Whitsunday Coast, QLD, Australia 5 - 8 April 2017



Airlie Beach Government Recovery Service Trailer - 7 April 2017

Dr Yetta Gurtner and Dr Astrid Vachette
(Centre for Disaster Studies, James Cook University)

*Corresponding author: +61 747815617/ yetta.gurtner@jcu.edu.au



CONTENTS

BACKGROUND - TROPICAL CYCLONE DEBBIE	3
Wind damage.....	3
Storm surge.....	3
Severe Weather/Flooding.....	3
SYNOPSIS OF BUREAU OF METEOROLOGY WATCH AND WARNINGS	5
WHITSUNDAY COAST COMMUNITY POST IMPACT ASSESSMENT – RAPID APPRAISAL.....	6
OBSERVED IMPACT/DAMAGE.....	7
Bowen	7
Cannonvale and Airlie Beach	9
Shute Harbour.....	12
Dingo Beach and Hideaway Bay	12
Proserpine.....	12
COMMUNITY AWARENESS AND PREPAREDNESS PRE-EVENT	16
Risk and Hazard Awareness	16
Pre-Event Preparedness	16
SHELTERING AND EVACUATION BEHAVIOUR	18
Evacuation	18
Shelter in place	19
INITIAL EVENT IMPACTS.....	19
Loss of power and communication.....	19
Food, water and supplies.....	21
Wind and flood damage	21
RESPONSE AND EARLY COMMUNITY RECOVERY	22
Community capacity and government support.....	23
Recovery hubs.....	24
Transition to recovery.....	25
KEY LESSONS AND RECOMMENDATIONS	27
CONCLUSION	28
ACKNOWLEDGEMENTS.....	29
REFERENCES.....	30

BACKGROUND - TROPICAL CYCLONE DEBBIE

On Tuesday 21 March 2017, a well-defined but weak area of low pressure developed over the North Coral Sea (southeast of New Guinea). Over subsequent days, environmental and weather conditions supported the intensification of a tropical low developing over the Coral Sea Islands. On Saturday 25 March the Australian Bureau of Meteorology (BOM) classified the system as Category 1 Tropical Cyclone Debbie.

As this cyclone tracked slowly west-south-west and south-south-west towards the North Queensland coastline, it continued to intensify until Category 4 Severe Tropical Cyclone Debbie finally made landfall near Airlie Beach around 11:50am on Tuesday 28 March, 2017 (refer to Figure 1). It continued as a slow-moving system generating wind gusts in excess of 160 kilometres per hour (kmph), heavy rainfall and large waves along the coast. Tracking further inland over the townships of Proserpine and Collinsville, more than 24 hours later it was finally downgraded to a Tropical Low where it continued to generate heavy rainfall in its pathway.

The primary hazard risks associated with Tropical Cyclone Debbie (TC Debbie) were the destructive winds, storm surge and the significant rainfall with the potential to lead to localized flooding.

Wind damage

As a Severe Category 4 Tropical Cyclone, Debbie was expected to generate wind speeds up to 158 – 198kmph with gusts to 226 – 280kmph (BOM 2017). Official measurements from BOM on Hamilton Island recorded gusts of 263kmph. With a destructive core estimated to be approximately 100km wide, the Whitsunday Islands were directly exposed to damaging winds for many hours with the jetty at Daydream Island eventually washed away. As the cyclone subsequently crossed the coastline, wind speeds varied in accordance with proximity to the core, local geography and topography. The highest recorded gusts in Bowen were 148kmph and 165kmph in Proserpine (Gourlay, Liddy, Spraggon, & Tilley 2017).

Storm surge

Given the slow and slightly erratic movement of the system as it approached the coast there was significant uncertainty in predicting the exact time and location of landfall. With over 600km of susceptible coastline (refer Figure 2), a crossing with high tide was anticipated to result in a potential storm surge of between 2.5-4m with damaging waves, strong currents and floods that may swamp low lying areas. As a precaution, thousands of residents in exposed coastal “red and orange zones” were asked to evacuate prior to the cyclone impact. With landfall eventually occurring approximately two hours after the morning high tide, on a section of the coast partially shadowed by the Whitsunday Islands, the observed storm surge impacts were limited.

Severe Weather/Flooding

TC Debbie was expected to bring torrential rainfall of between 400-500mm to affected regions, generating a significant risk of flash flooding and flooding in local catchments. As over 320mm fell within 24 hours around Bowen and Proserpine, many homes and businesses were inundated and local road networks were cut.

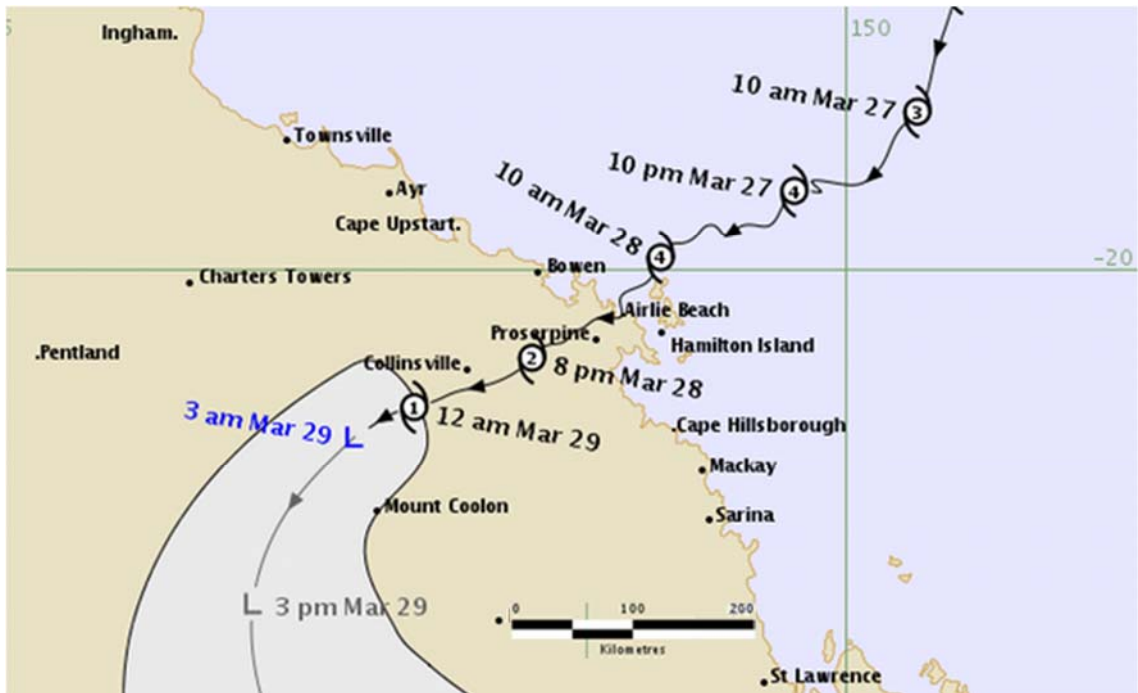


Figure 1. Bureau of Meteorology Tracking Map of Tropical Cyclone Debbie 29 March 2017

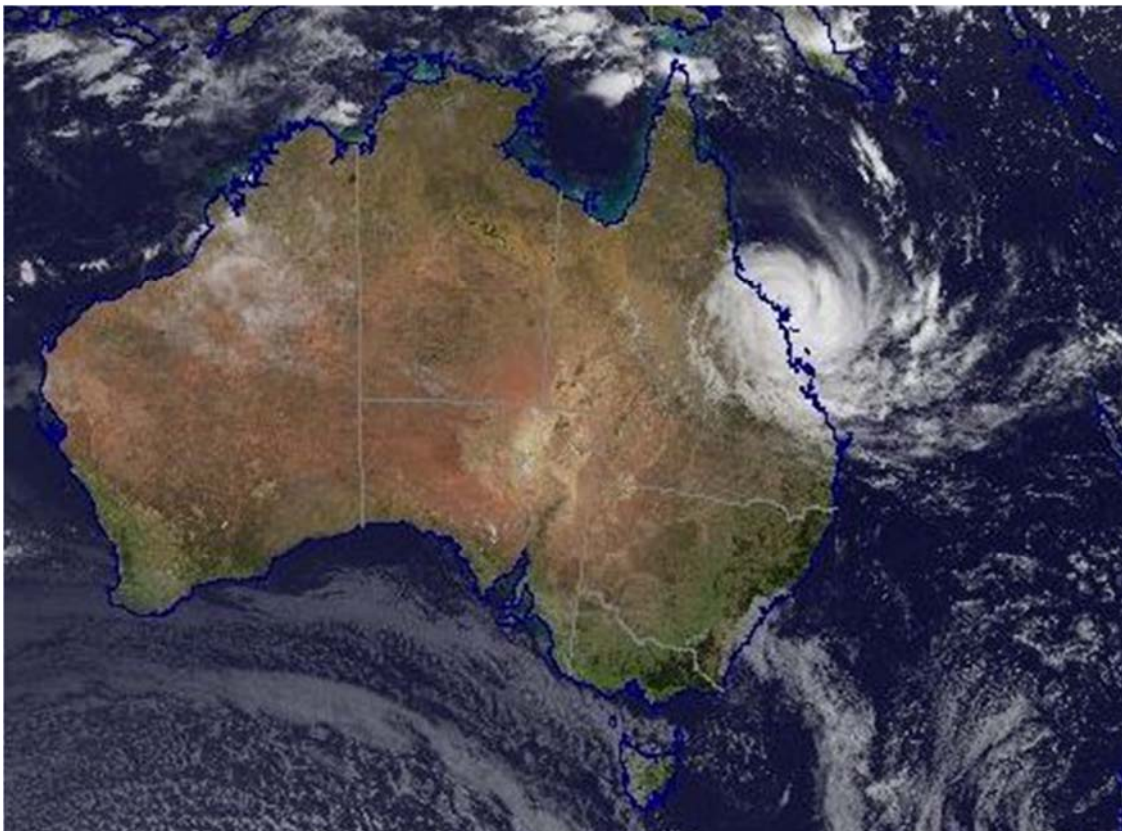


Figure 2. Bureau of Meteorology Satellite Image Tropical Cyclone Debbie 28 March 2017

SYNOPSIS OF BUREAU OF METEOROLOGY WATCH AND WARNINGS

The first Tropical Cyclone Advice for TC Debbie was issued by BOM just after lunch on Friday 24 March, as a Coral Sea tropical low expected to develop and move towards the coast over the weekend. Within 24 hours the system had developed into a Category 1 cyclone with all indications that it would continue to intensify, and a “watch” notification was issued for communities along the east coast of Queensland from Cape Tribulation south to St Lawrence. A tropical cyclone “watch” is issued for coastal communities when the onset of gales is expected within 48 hours, but not within 24 hours (BOM 2017).

Six hours later, (Saturday 25 March 4:54pm) the next advice issued an upgraded “warning” notification for communities between Ayr and St Lawrence, with the watch zone between Cairns and Ayr. A tropical cyclone warning is issued for coastal communities when the onset of gales is expected within 24 hours, or are already occurring. On Sunday, communities in low lying coastal areas (Red and Orange storm surge zones) from Rollingstone to Mackay were advised to finalise cyclone preparations, pack evacuation kits, and evacuate due to storm surge risk. Flights and ferries for the Whitsunday Islands were cancelled and evacuations shelters were being prepared in “at risk” communities, to be open as needed.

As communities made final preparations, the tracking speed of TC Debbie slowed and it adopted a west-southwest track with Tropical Cyclone Advice 14 issued at 4:53pm Sunday 26 March, extending the warning zone north, from Lucinda to St Lawrence. The associated watch zone was between Innisfail to Lucinda, extending west past Charters Towers and Mt Coolon. By Monday morning, TC Debbie had intensified to a large Category 4. The warning zone again expanded, covering Cardwell to St Lawrence, forecast to make landfall between Cape Upstart and Cape Hillsborough (north of Mackay) on Tuesday morning. Flights were cancelled at local airports and schools throughout the region were closed. From 2pm on Monday weather updates were issued hourly.

As TC Debbie continued to meander southwest to south-southwest the warnings and forecast tracking maps altered accordingly. Late Monday night the warning zone had been refined to Lucinda to St Lawrence, and inland from these locations. With the cyclone forecast to make landfall between Ayr and Cape Hillsborough (north of Mackay) on Tuesday morning - potentially coinciding with high tide - 25,000 people from low lying regions from Mackay were ordered to evacuate as a precaution. By Tuesday morning it was evident that the system had continued to slow its tracking speed, with small temporary variations affecting landfall forecasts. The time frame for the expected coastal crossing had also been delayed.

Tropical Cyclone Advice Number 43 issued at 11:58am Tuesday 28 March, indicated that the system had begun to make landfall on the mainland between Bowen and Airlie Beach. It was expected to continue to move gradually west-southwest inland over the subsequent 12-24 hours and weaken. With wind gusts up to 270kmph near the centre, residents in affected areas were advised to remain indoors until emergency authorities advised it was safe to go outside or return home. The official warning zone extended from Townsville to St Lawrence, including Mackay, and the Whitsunday Islands, and inland to Charters Towers, Mount Coolon, Moranbah, and Pentland. Passing over Proserpine several hours later as a Category 3 cyclone, TC Debbie further weakened as it moved inland southwest of Collinsville around 10pm Tuesday night. Almost five days after the first advice was issued by BOM, TC Debbie dissipated to a tropical low on Wednesday 29 March, with significant torrential rain and flooding to follow.

WHITSUNDAY COAST COMMUNITY POST IMPACT ASSESSMENT – RAPID APPRAISAL

Given the proximity of the impacted region, social researchers from the Centre for Disaster Studies, James Cook University visited the communities of Bowen, Cannonvale, Airlie Beach and Proserpine between 5-8 April 2017 to undertake unstructured/informal and semi-structured interviews with residents, community support providers, and a number business operators in order to gain preliminary insights into Tropical Cyclone Debbie impacts. Key themes addressed were; hazard awareness and preparedness; sheltering and evacuation behaviour; and initial recovery progress.

To minimise duress and any imposition on potential informants' time, the majority of interviews were conducted as people were waiting at established local Community Recovery Hubs (with the permission from each recovery centre manager). In addition to numerous government departments offering disaster relief and recovery assistance and advice, the variable range of community support services available for residents at these “hubs” included, Lifeline (counselling), Salvation Army, Red Cross, SES, insurance representatives/assessors, and telephone companies offering mobile phone charge points and credit. Various agencies and community organisations also provided simple respite items such as water, sausage sizzles, and basic first aid and cleaning supplies.

During the rapid appraisal period researchers travelled over 900km from Townsville to Bowen, Cannonvale, Airlie Beach, Shute Harbour, Dingo Beach and Proserpine (refer to Figure 3), interviewing 19 community members, 4 business operators and 18 community support personnel. An integral component of this community recovery assessment was also direct observation of evident damage, impacts, and the extent of visible clean-up/recovery achieved.

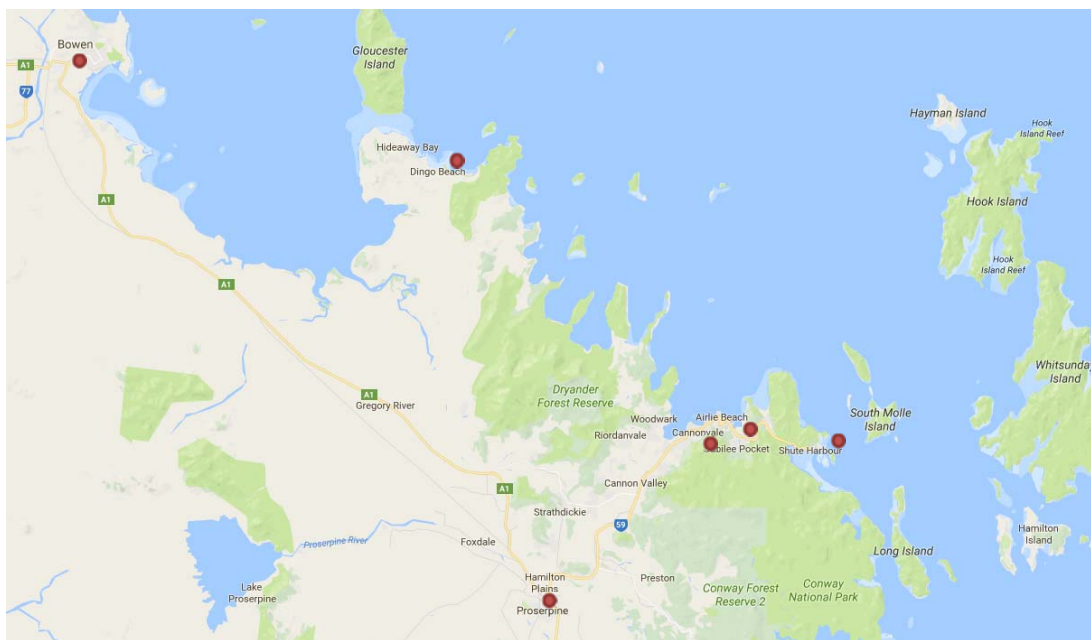


Figure 3. Location of impacted Whitsunday Coast communities visited (Google Maps)

OBSERVED IMPACT/DAMAGE

Given that little more than a week had passed since the impact of TC Debbie, each of the locations visited for this report continued to show clear evidence of damage and debris with variable progress in both individual and community clean-up. While the extent of visible structural damage on buildings and dwellings was more obvious in the higher wind impact regions of Proserpine and Shute Harbour, vegetation devastation was extensive throughout the Whitsunday coastal region. Roads and electricity network infrastructure had also suffered significant obstructions and damage, delaying many response and recovery initiatives.

Highway traffic during this period was predominantly military vehicles, trade and service utilities and the police. Almost all of the local accommodation throughout the region was fully occupied by response and recovery workers. Backpackers in self-contained campervans were still numerous, particularly around Airlie Beach. As the week progressed, more civilian/resident vehicles were observed, especially around the local shopping centres and hardware districts. In each region the extent of visible community activity and clean-up progress mirrored the availability of resources and services such as manual labour, electricity restoration, and debris removal.

Bowen

In the coastal township of Bowen (population 10260, 2011 census - ABS 2017) over 5500 residents were ordered to evacuate prior to the impact of TC Debbie. As the majority of buildings were constructed prior to 1985 and the introduction of cyclone building standards, there were significant concerns about direct exposure to destructive winds and the predicted storm surge (Haynes 2017). While the wind speeds experienced were not as strong as in Airlie Beach and Proserpine (on the southern edge of the cyclone) the torrential rain fall and severe thunderstorm the following night caused the local Don River to break its banks, with resultant localised flooding.

Physical damage observed in Bowen during the fieldwork period was predominantly vegetation, with abundant denuded, fallen and uprooted trees, and as a result, large collections of residential “green waste” amassed for kerbside collection (refer Figure 4). While there appeared to be limited external, structural damage to dwellings, piles of discarded carpets and other water-damaged household items reflected considerable water intrusion. Numerous fences, particularly those constructed from Colourbond panels and wooden palings had been knocked over. Along the beachfront area there was abundant trees, palms and coconut debris yet little indication of significant storm surge damage. Signage however, advised that town storm water had brought sewage overflow out to the ocean (refer Figure 5).

With the restoration of power and household bins out for collection, essential services appeared to have returned for most residents. Businesses and amenities were progressively resuming operations. In addition to the numerous contractor vehicles and utilities on suburban streets there was an obvious police presence both checking houses and talking to residents.



Figure 4. Uprooted trees, vegetation and water damaged household items on footpath in Bowen



Figure 5. Sewage stormwater overflow into the ocean, Bowen

Cannonvale and Airlie Beach

The Cannonvale and Airlie Beach section of the Whitsundays coast (including Woodwark, Jubilee Pocket and Flametree) is widely known for tourism. As the access point to the Whitsunday Islands, and the internationally acclaimed White Haven Beach the majority of the estimated 7868 residents (2011 census - ABS 2017) are employed in accommodation, food services and tourism services. The building and construction, and the coal mining sector are also major employers. In addition to the direct risk to life and property TC Debbie posed for the Whitsunday Islands and this expanse of coastline, it also represented a major threat to the \$2 million a day regional tourism industry (Craw 2017).

With the significant damage sustained to both dwellings and infrastructure on Hamilton, Hayman and Daydream Island these prime tourist destinations were not open for public access during the fieldwork period, although Hamilton began to advertise the availability of reduced tourism services again on April 8, 2017. Repairs to boats, yachts and damaged infrastructure at Abell Point Marina were similarly expedited to facilitate the resumption of cruise and transport operations.

As this part of the tourism industry worked to restore both services and image, the environment and stark hillslopes throughout the region clearly showed the degree of destructive winds experienced. Trees were broken and battered with minimal remanent foliage, shed roofs and roadside advertising signs were bent and had lost panelling, while powerlines dangled loose beside fallen power poles. In the suburbs, the clean-up process had clearly begun, however the majority of visible activity appeared to be contractors lopping trees, clearing green waste in public areas, and working to restore electricity networks. Unlike Bowen, there were few apparent piles of residential debris kerbside, yet many yards still revealed fallen branches, uprooted trees, and other vegetation damage.

The small coastal town of Cannonvale, directly west of Airlie Beach appeared to represent the main commercial centre for the region's residential community recovery efforts, providing supplies and services via the Whitsundays Shopping Centre and Plaza, Bunnings, the temporary green waste dump (refer to Figure 7) and the Community Recovery Hub. Reopened supermarkets and businesses selling fresh produce (ie the butcher and bakery) were particularly popular. Although a number of houses and strata title units demonstrated clear structural damage related to roof battening or airborne debris (refer to figure 8) and several boats were washed up along the shorefront, the overall level of structural damage observed around Cannonvale was limited.

Airlie Beach located 3km away, clearly reflected a tourism oriented resort town assiduously working to clean up and resume operational capacity, relying extensively on generators, manual labour and staff activities (refer to Figure 8). Commercial rubbish skips were full of damp discarded carpets; ceiling insulation and water-damaged fittings, suggesting significant water infiltration had occurred (refer Figure 9). Despite the concerted efforts of Energy Queensland electrical power had not yet been restored to all premises with less than half open for business, predominantly those offering food, beverages, travel services and souvenirs. Lacking electricity or a back-up generator many accommodation service providers were forced to remain closed, as a reasonable number of more independent tourists stayed in self-sufficient campervans in the shorefront parking lots.



Figure 6. Temporary local green waste dump and mulching, Cannonvale



Figure 7. Structural damage and foliage loss, Cannonvale



Figure 8. Generator power to assist clean up and resumption of business operations, Airlie Beach



Figure 9. Business clean up post-cyclone and flooding Airlie Beach

Shute Harbour

Formerly the main departure point to the Whitsunday Islands and the Great Barrier Reef, Shute Harbour including Mount Rooper and Shutehaven, supports a small population, recorded as 95 people in the 2011 census (ABS 2017). With a median monthly mortgage repayment of \$6067 most of the houses in this area represent prestigious higher value luxury dwellings of newer construction, predominantly used as holiday accommodation. The majority of dwellings are located on the hillside overlooking the harbour and were not vulnerable to the storm surge hazard associated with TC Debbie, however were directly exposed to the damaging winds. With the extensive private and commercial boating within the harbour, a mandatory evacuation order was communicated to anyone residing in and around the low-lying areas – either on land or on the ocean.

Despite evidence of initial clean up and salvage efforts, access to the Shute Harbour area showed extensive damage sustained to physical infrastructure, vessels and vegetation. Numerous boats and yachts were washed up, or destroyed, with debris strewn throughout the mangroves and mudflats along the coastline leading to the harbour (refer Figure 10). In the harbour itself, a further two vessels had clearly sunk. Having sustained extensive structural and internal damage the visitor centre had been gutted of all fittings, and cordoned off from public access (refer Figure 11). Jetty infrastructure, moorings and even the shore-side cement footpath had become considerably cracked and broken. Repair and restoration to operational capacity is likely to be significant. Around the Shutehaven community, a number of garage doors appeared to have blown in, with a small quantity of discarded carpets and household furniture evident, however the majority of visible damage was limited to surrounding trees and bushes.

Dingo Beach and Hideaway Bay

Dingo Beach and Hideaway Bay are part of a small remote coastal beach settlement located 50km north of Airlie. In the 2011 census (ABS 2017) the population was recorded at 420, predominantly older residents (median age of 56) with no dependent children. The community of Dingo Beach was ordered to evacuate due to storm surge risk on Sunday 26 March. Although the structural damage and the storm surge experienced in this region was not as significant as feared, debris and flooding from TC Debbie prevented access to the community for several days after the event (the road reopened Friday 31 March). During this time, residents that opted to shelter in place were left isolated with no power and no additional food or fuel supplies once the only local store had diminished available stock. Despite popular perception that the entire community had been completely neglected in any response and recovery efforts, a site visit showed that the clean-up process on the foreshore was well underway (and near completion), the local store had both food and drink stock (but no fuel in the bowsers) and a recovery based NGO had established a formal presence.

Proserpine

Having recorded gusts up to 165kmph the small inland rural town of Proserpine (population 3,390, 2011 census – ABS 2017) experienced substantial wind damage to both the natural environment and older housing stock during TC Debbie (refer Figure 12 and 13). Torrential rainfall and the severe storm the following night also caused the Proserpine River to flood, cutting off roads and exacerbating adverse conditions for residents. As one of the worst affected mainland communities, Proserpine became the central focus of extensive military support and recovery efforts.



Figure 10. Smashed boat and debris in mangroves, Shute Harbour



Figure 11. Extensive cyclone damage evident at Shute Harbour terminal



Figure 12. Extensive business premises damage, Proserpine



Figure 13. Asbestos identified as a further hazard in damaged housing, Proserpine

While significant damage to buildings and dwellings was still apparent on April 7, the majority of yards and streetscapes around the community of Proserpine had already been cleared of debris. Consistently, the military personnel were progressively withdrawing from the town. Both power and structural integrity appeared critical determinants in the restoration of community based businesses and services, with many still not operational. SES crews, trade vehicles, contractors and assessors remained abundant, working with individuals and community to return a degree of normalcy.

As each affected community continued with the clean-up and recovery efforts, any person directly impacted by TC Debbie was recommended to visit the official Community Disaster Recovery Hub set up in their locality to receive support, advice and financial assistance (where eligible). The three primary Recovery Hubs in the Whitsunday coastal region were established at the Bowen TAFE campus, Cannonvale State School and Proserpine State High School. The majority of informants for this research were accessed in these locations.



Figure 14. Cannonvale Community Recovery Hub

COMMUNITY AWARENESS AND PREPAREDNESS PRE-EVENT

Risk and Hazard Awareness

Although informants for this rapid community assessment were asked to retrospectively comment on their preparation before TC Debbie, each person interviewed indicated that they were well aware of potential cyclone hazards prior to the event, having received information and advice from a variety of sources including local council, television, radio, print and social media, friends, and family. As most also had previous cyclone experience they knew that residents in the forecast impact zone should; tidy up loose items in yards and gardens; tie down sheds, boats and trampolines; secure windows, doors and external fittings; sandbag buildings prone to flooding; and, organise sufficient food, water and relevant supplies.

While familiar with the risks of wind damage and storm surge exposure for any resident living along the foreshore, there was less clarity regarding the demarcation of storm surge and flood zones in relation to the position of personal dwellings. A number of informants indicated that they knew they were in the “Red Zone” for storm surge inundation, as they lived in low lying areas close to the coast, however were not able to clearly identify risk exposure to riverine and/or flash flooding. Other residents were unsure of their susceptibility to any type of water inundation threat. Consistent with this degree of uncertainty, none of the informants advised that they had an established, written disaster plan for their household prior to the event.

Demographic characteristics, household composition, dwelling type, home ownership, rental occupancy, and insurance coverage was highly variable between individuals, and had limited apparent influence on early planning or preparation activities.

Pre-Event Preparedness (community response to cyclone watch/warnings)

As TC Debbie was a large, relatively slow moving system that altered track a number of times prior to making landfall, informants reported being initially complacent about their preparation activities. Given the extensive cyclone “watch” and “warning” zones initially identified by BOM, many chose not to undertake recommended actions until it was evident that the winds were starting to pick up in their region. Such activities included cleaning yards, moving household items that would be subject to flooding, securing property, and organising disaster kits. Friends, family and social networks were apparent in this preparation process; however, a number of informants also indicated that they were socially isolated and had to manage alone.

It was a slow system; everyone kept saying it was going to hit Townsville. So Townsville got ready. For days it was Townsville, Townsville, Townsville – then it was all about Ayr...It wasn't until the day before when the winds started to pick up that we knew it was coming our way. We were prepared even if it was last minute, but no one expected a bloody Cat 4 to come!
Resident – Jubilee Pocket

My husband works for the Department of Agriculture and that is how I found out that a cyclone was coming. After that I sought information on the BOM website. We started to cut trees, especially palm trees, to minimise the risks. We knew what to do from previous experience, I knew what to do. The BOM website did not teach me anything new except for the change of track. Resident – Bowen

We knew how to prepare for the cyclone, we had a cyclone kit and we trimmed trees, but there is only so much you can do alone. No one came to help us. My daughter and son-in-law took charge of me... Resident – Airlie Beach

While BOM proved to be the primary source of warning and threat information for TC Debbie, there was significant variability in how the information provided was perceived and understood. There was also a substantial degree of uncertainty about how the warning/potential impact messages translated at the localised level.

We used television and radio, we found out about the cyclone through the news, and listened to reports from BOM, but this was not very informative, or we missed the key information. The website of BOM was too complicated for us...We don't have Facebook but our son from Townsville was texting and calling to give us information he got from Facebook. We got a lot out of that. ...The cyclone caught us off guard, as we did not think it was going to hit us based on the maps. We received very last minute warnings only. Resident – Bowen

BOM got it all wrong...There was so much conflicting information that only focused on the big towns, and this information was inadequate for understanding what it meant for our area. This region has very different geography, different areas and suburbs - there is Cannonvale, Airlie, Jubilee Pocket, Shute Harbour – we all have different risks and needs but the focus was always on the big towns so we didn't know what it meant for us... Resident – Jubilee Pocket

Several informants mentioned that rather than just providing valuable information, some commercial and social media networks heightened emotions such as stress and apprehension in the lead up to TC Debbie. They referred to the sensationalism evidenced in extensive images of previous cyclone damage and destruction, direct comparisons with large scale, severe tropical cyclone events such as Yasi and Larry, labels such as “monster cyclone” and “a one in 100-year event”, and excessive commentary on potential adverse social, environmental and economic impacts. It was difficult for residents to identify clear, direct and meaningful information.

Consistently, there was a lot of media attention given to the preparation and purchasing behaviour of residents in the predicted impact zones – particularly notions of “panic buying” or excessive, unnecessary, stockpiling resulting in empty shelves in local supermarket and hardware stores. Although many retailers have developed restock contingency plans for such last minute or “just in time” purchasing, an instinctive behavioural response to feel prepared combined with supposed shortages created further community anxiety. Informants indicated they also ensured they had sufficient food, water and supplies during this period.

I felt well prepared. I went to the supermarket the day before to buy some last-minute supplies, just some bread and a couple packets of chips. The shelves were almost empty - people were “panic buying”. The community was highly stressed, everyone was tense. A lady at the checkout in front of me was trying to buy 3 slabs of water bottles. She was advised by the checkout operator that due to low stocks customers were limited to one slab each. She proceeded to pick up the extra 2 slabs and threw them to the ground where they smashed, proclaiming, “Well if I can't have them no one else will either” Resident - Bowen

As TC Debbie strengthened towards a Category 4 cyclone on Sunday 26 March, residents were advised to finalise their preparations. With regional commercial flights cancelled and all schools officially closed, several local shops and business also opted not to open on the day prior to the cyclone making landfall.

SHELTERING AND EVACUATION BEHAVIOUR

Both directed (mandatory) and voluntary evacuation orders were communicated in the days prior to TC Debbie, targeting residents in low lying areas consistent with established storm surge and flood zones. These evacuation messages were delivered via the radio, television, print and social media, text message, and/or in person by police and emergency service personnel. Individual responses to this evacuation advice appears to have reflected personal circumstances and risk perceptions more than official warnings, zones or exposure. The role of clear targeted information, social networks (friends and family), transportation, pets, and perceptions of evacuation shelters were prominent in many of the narratives.

Evacuation

Reflecting a high degree of uncertainty and hesitancy, only a small number of informants claimed to have evacuated their dwellings prior to TC Debbie. This included voluntary and mandated evacuations to friends and family and official guidance to seek refuge within established evacuation shelters if no other option was available. A reported 200 backpackers and tourists from the Airlie region were bused to Rockhampton on Monday 27 March (Lyons 2017).

We decided to evacuate voluntarily as we were not sure about our house, even if it is not very old. We have a 10-month-old baby so it changes your perspective, we might even have stayed if it was just my husband and me. Instead we went to our friend's place which we knew was safer, in a higher area. Since the cyclone however, my baby is much clingier and more demanding. Resident – Airlie Beach

The police came around to my place and told me that I had to evacuate as I was in the “red zone” for storm surge. As I only have a bicycle they offered me a lift...but a friend came on Monday before noon and drove me to their place where I stayed safely overnight. Resident – Bowen

I was told by the police to get out of my hut, but I was misdirected and I went south towards Bowen. When I arrived in front of the supermarket I realised that it was the wrong place to evacuate as the threat was moving south, so I decided to go back to my hut. After that I did not know where to go, so I decided to just stay there for the cyclone. Resident – north of Bowen

I was living on my boat in Shute Harbour with my two cats when the police issued a mandatory evacuation order on Sunday – they said there was an imminent threat to life and property. As the winds and rains had already started to pick up I had limited time to grab any personal possessions. I didn't have any cages or anywhere to take the cats so I was forced to leave them behind on the boat... I don't really know anyone here and don't have a car or anything so the police drove me to the Airlie PCYC evacuation shelter. Resident – Shute Harbour (boat)

Shelter in place

The reasons given by residents for not evacuating or opting to shelter in place were numerous. Several people said that they had not been advised to evacuate, or did not understand the warning messages, so simply decided to stay. Others felt that they would be safer and more comfortable in their own homes during the cyclone event. Commitment to personal pets and poor perceptions of evacuation centres were the most frequent explanations provided.

There was an evacuation order for my street the day before Debbie but I don't trust the police so I didn't open the door to receive the message. I chose to stay – I reckon about 70% of my neighbours also stayed. I taped my windows and “bunkered down” - I wasn't worried about looting or anything. ... I have no friends or family, I am a loner and prefer my own company – I had no interest in going to an evacuation centre. I wouldn't be able to cope with my anxiety and dislike of crowds or large amounts of people. I have heard they are crowded, confined and uncomfortable. Resident - Bowen

The police ordered an evacuation but I did not leave because I have a 10-month-old pup and a cat – also I don't like being around a lot of people so I really didn't want to go to a cramped evacuation centre, it was not “appealing”. I would rather take the risk and be comfortable, my house is solid and raised 7ft. Resident - Bowen

I wouldn't have left anyway – evacuation centres don't take dogs and I wasn't leaving my dogs behind – lots of people didn't leave because of their dogs Resident – Airlie Beach

In discussing evacuation behaviour one informant relayed their concern regarding an elderly neighbour with limited mobility and a reliance on medical support that did not appear to receive any medical assistance to relocate to the local hospital prior to TC Debbie, effectively left to shelter in place with his wife. There were also many reports about tourists and residents unable to evacuate in time and subsequently left “stranded” on Whitsunday Islands. The Australian newspaper (2017) reported that on the night of 28 March, 283 Bowen residents sought refuge at Bowen State High School, 26 were at the Bowen Courthouse with 53 in evacuation shelters in Proserpine.

INITIAL EVENT IMPACTS

Loss of power and communication

As TC Debbie approached landfall and progressively increased intensity, most residents kept up-to-date with the weather and local conditions through conventional means such as television, radio, the internet and phone. A large number of informants admitted that they also relied considerably on their mobile phones to access further information and maintain personal communication with friends and family. With the inevitable loss of power from the damaging winds, television, fixed broadband/NBN and digital/VOIP phone services were no longer viable forms of information or communication for impacted residents. Where available, informants were left to rely on mobile phones and/or radios for continued information about the event, yet these options had evident limitations.

I mainly got my information from the Internet until it went down. I only checked the BOM website. The information from BOM was really good, but that is only a source of information while the power is on, once it is down, we don't have any other source of information. ... We only had a small AM radio as TC Debbie destroyed the big FM radio. There was absolutely NO useful information on the radio. I don't understand why the local radio was not more informative. Resident - Bowen

I mainly used the radio on my phone for information and warnings as I did not have a transistor radio. As the event got closer the coverage/reception cut out and then my battery died. I have a radio in my old car, it doesn't have AC, but I didn't think about it until days later – I could have used my car radio to hear what was going on, the whole world could have been destroyed by Cyclone Debbie for all I knew. Resident – Bowen

I listened to the local ABC radio which provided adequate warning information initially, however I lost reception in the event and was unable to receive any signal since the hills interfere with transmission on the transistor radio... I have no phone or internet... They need to SIMPLIFY the communication and messaging, Radio National changed its focus to Airlie, Proserpine and Mackay with no local information on Bowen – Bowen was ignored as if “they will be fine” Resident - Bowen

Used for a variety of purposes such as maintaining direct contact with friends, neighbours and/or relatives; accessing information on the internet and social media; entertainment; and even as a torch; the obvious constraint with mobile phones in this context was the limited battery life and need to recharge. While there are power saving settings, power banks, or even the capacity to recharge via the car, these options are only viable for a short period. Residents on pre-paid mobile plans with call, text and/or data caps had further restrictions. When trying to access information wirelessly on mobile phones informants indicated that they found the majority of official websites poorly suited to this type of use; with excessive data consumption, slow content downloads, and difficulties in locating or navigating to relevant information. Despite issues regarding the accuracy of information and advice available, Facebook and social networks became key resources.

Reflecting the increasing popularity and reliance on developing technology, very few informants owned a battery operated radio as an emergency back-up option. For those that did manage to access radio communications there were a number of reported issues including the loss of local reception, poor transmission quality, and a perceived lack of local content, knowledge and timely information. Without functional mobile phones or radios many individuals and households felt isolated for days after the event, reliant on direct contact with social networks to keep them apprised of local recovery advice and initiatives. Consistently residents that were more solitary or marginalised did not have access to relevant information about water sanitation, food provision or available support services. Given the scale of the event, response agencies had limited resources, personnel and capacity to provide direct outreach.

The Police came to check on me twice – the first time was 2am the night of the storm (the night following Debbie) as apparently a family member expressed concern and wanted to know that I was ok. The following night my house was spotlighted by an official vehicle...Communication was really poor - no one knew what was going on, no one was telling anyone anything – I felt really “isolated” from the world Resident – Bowen

Post event there was a COMPLETE lack of information. I did not know what to avoid and I drank the water - it tasted off Resident - Bowen

Food, water and supplies

With the power loss extending beyond five days for most informants, access to fresh food and clean drinking water had become an apparent issue. Although everyone claimed to have prepared adequate supplies for the recommended 72 hour self-sufficiency period, many admitted to an overreliance on perishables which required refrigeration. Shortages were exacerbated by the slow onset and extended duration of the event. The official warning period for the region had commenced on Sunday, with many shops closed on Monday following advice to keep all roads clear for emergency service personnel. The cyclone did not make landfall until close to noon on Tuesday – however people had already started to consume their emergency provisions. While extensive damage and clean-up prevented most residents from leaving their premises on the day following TC Debbie, torrential rainfall and localised flooding from the severe storm on Wednesday night created further destruction and delays.

As I live alone I had a small fridge with enough food and water for 3 days. Most of my food was perishable and started to go off after 3 days with no power. I still have no power. I don't know what to do about my medication – it is supposed to be refrigerated. Resident - Bowen

I couldn't get out to access the recovery centre or food due to damage and trees down, and the flooding from the storm. Resident – Bowen

As local water processing had been compromised during the event, residents were also advised to sterilise all tap water or rely strictly on bottled water until the issue had been resolved. A number of informants indicated they had run out of bottled water in the first few days and did not have adequate facilities to boil water without electricity. People similarly admitted that their personal cyclone planning did not include items such as fuel, cash, cleaning supplies and medication.

We were safe during the cyclone now the issue is that our car is blocked by trees so we can't do anything, I cannot go to work, I cannot get food, water or equipment to clean. My friend had to pick me up today just so I could come to the recovery centre Resident – Airlie Beach

If I could do anything different or make recommendations it would be to put petrol in car and to have cash - we were stuck in the house for days but once it is over you want to be mobile and be able to buy stuff Resident - Bowen

Wind and flood damage

With the exception of the evacuated informant from Shute Harbour who lost her boat, all of her possessions, and one of her cats, during TC Debbie, most informants only reported limited structural damage to their property. This included varying extents of vegetation loss, shed and fence damage, and water ingress through broken or poorly sealed windows, doors and roofs.

My house is ok but all the fences came down, lots of trees and bushes, some damaged tiles and water inside the house... It's not too bad but I don't have contents insurance – just home insurance so nothing inside is going to be covered Resident – Airlie Beach

I have a wide experience of disasters, I have been living in the area for 20 years, but Debbie was a real monster, it was very slow and just got bigger and bigger. Because it was so slow and information kept changing it was so stressful. I found that it was one of the most frightening disasters. I lost power, I lost internet and there was lots of water infiltration, but that was not really scary as it is not a safety issue. What was scary was the roof of the shed that flew away. Seeing that metallic sheet flying was very frightening Resident – Bowen

While people expected significant wind gusts and impacts associated with TC Debbie there appeared to be less awareness and preparation for the severe storm and rainfall that affected the community the following night. Most informants had not anticipated flooding after the cyclone had made landfall, and in many cases existing damage was compounded.

Everyone knew the cyclone was coming, there was plenty of warning and plenty of information, most of us have prepared before. There was no excuse for not being ready it was so slow in developing... What we weren't prepared for was how much rain came from the storm the next night that's where we suffered the most damage. Business operator - Bowen

The house I live in is about 40 years old – there was extensive water intrusion through the ridge caps and window seals, and the door blew in. I spent 16 hours the night of the cyclone mopping up and 14 hours the night of the storm, I am still exhausted. Neither the real estate, nor owner, have bothered to contact me or check. There is wet carpet, walls and fittings – I am trying to dry it all out yet there are obvious issues of damage and I am worried about health and sanitation issues including mould. I am pretty self-reliant though, I will continue to clean it up by myself. Resident - Bowen

It was a 30 – 40 hour event. The wind kept howling - it came from one way for 4-5 hours, the eye was 2-3 hours big, and then we were hammered the other way. I have experienced nothing like it... With the winds before and then the severe storm the next night – everything got flooded, the ground was saturated and we lost even more trees Resident – Airlie Beach

In addition to the observed impacts on homes, businesses, and the natural environment, preliminary wind and flood damage from TC Debbie included significant agricultural loss to horticulture crops, sugar cane fields, irrigation equipment and cane train infrastructure. Transport, water sanitation, and electricity network recovery was delayed by the extent of rain and debris generated by the event. For Airlie Beach and the Whitsunday Islands the tourism sector was faced with extensive damage to accommodation, hospitality services and cruising infrastructure, with images and perceptions of complete destruction expected to result in further widespread booking cancellations across the region. As contractors and emergency service personnel worked on aspects of physical recovery, communities began to tackle social recovery.

RESPONSE AND EARLY COMMUNITY RECOVERY

While the Australian Army proactively mobilised up to 1000 personnel, to clean up the roads and debris, and/or provide engineering, humanitarian and emergency assistance (as soon as it was considered safe after the event) communities had already commenced their own personal damage assessment and clean-up process.

Community capacity and government support

In reviewing the first few days following TC Debbie, informants described varied response behaviours. The majority of people indicated that friends, families, neighbours and/or other spontaneous volunteers worked together to help clear roads, fix fences, remove yard debris and damage, and share available resources. In some cases such altruism extended to the offer of customised support and accommodation.

I cannot commend the community spirit and support enough - everyone stepped up to help each other. There was free food and water, and cook ups. "Whitsundays food service" provided everyone from Jubilee Pocket free food at their own expense. ... The tourists haven't stopped whinging it's all they do, but some of them are good - there were a whole heap of backpackers that were getting in and working and helping clean stuff off the roads - was good to see them helping in Airlie Resident - Jubilee Pocket

There has been incredible community support. There are 2 girls that are offering help to older people, they are in the local pub and anyone can come and ask them to register them online for recovery assistance. Community support officer - Bowen

I am currently hosting 2 people who were previously strangers that I met at the PCYC evacuation centre. The community was asking for help and I had the room. It's what you do, you help out. Some of these people had lost everything it was the least I can do, but, you know, it cost money to feed and look after them and drive them around. I don't want money or anyone to think I am a hero or anything, it's what anyone would do, but it's hard Resident - Airlie Beach

There was also a large number of emergent individuals and groups from other towns, and across the impacted region, that self-organised and mobilised donations of food, water, clothing, and other relevant supplies to address an expected community need (refer Figure 15). Established charity organisations such as the Salvation Army, Red Cross and Lifeline maintained an active presence and role at the recovery hubs.

In the absence of mains electricity, businesses with access to generator power reopened as soon as feasible to provide residents and emergency support personnel with meals, accommodation and fresh supplies. Short term initiatives at some locations included free parking, free mobile phone charging, free Wi-Fi access and the option to withdraw cash through the provision of a portable self-powered ATMs.

In direct contrast to the prevailing community spirit of generosity and support, there were also many rumours and unsubstantiated stories of looting, opportunism, price gouging and profiteering in the days after the disaster. The police were quick to investigate any formal complaints of illegal activity, and fortunately such cases appeared to be the exception rather than the norm.

There was a woman on Facebook who was collecting donations and asking for money to purchase extra supplies and transport them to the stricken areas - but she wasn't part of any recognised group or organisation - I don't know if she actually delivered anything to anyone Community support provider - Cannonvale

I heard that a guy went into Bunnings just before the cyclone and bought all of the generators they had in stock, and then sold them for a huge profit to community the day after...

Community support provider - Cannonvale

Although it was evident that people were working collectively towards community recovery, some informants revealed limited initiative, with an underlying expectation that the government should be doing more. In the aftermath of the event, informants reported waiting *in situ* for authorities and outreach services to come directly to them to offer information, support and/or assistance.

No one came to help, not the police, not the army, not the neighbours. I don't even know how my neighbours are doing. Everyone is working for themselves Resident - Bowen

I have not spoken to my neighbours and no one has come to check on me to advise what is going on. For two to three days there was no help, no advice and no updates. I had absolutely no communication about any events or activities. I haven't seen any emergency services, police or even volunteers Resident - Bowen

While operating primarily to support genuine community need post disaster, this culture of dependency and entitlement was also recognised at the community recovery hubs.

People expect way too much from government support, they should do more on their own and not wait for aid Community support provider - Cannonvale

Recovery hubs

Managed by the Queensland Department of Communities, Child Safety and Disability Services and staffed by a variety of government personnel and agencies; community organisations; NGOs; volunteers; and; disaster recovery affiliated businesses, “recovery hubs” were established in the major community centres from March 31 to provide face-to-face access to financial assistance and support services for individuals and businesses directly affected by TC Debbie. Described as chaotic in the initial days of operation, staff at each hub were assessing more than 450 claimants each day with waiting periods in excess of 4 hours long (up to 7 hours in Proserpine). In the absence of electricity or generator power most of the early information collected was paper based, needing to be manually entered onto official systems (at an external location) for further processing. Police and security personnel were initially present at the hubs to diffuse any potential frustration or stress induced conflict.

Through experience, necessity, and increasing familiarity with operational requirements, recovery hub support staff progressively introduced a more effective system of management to triage individuals’ needs and processing requirements. While maintaining the set objective of community recovery support, the management approach and atmosphere at each recovery hub was discernibly different. This varied from a relatively relaxed, engaged yet casually efficient environment to a much more strategic “command and control” authority structure and presence, affecting community behaviour and attitudes accordingly. Given the expanding scale of post TC Debbie impacts in other regions, sourcing of experienced, trained staff and fatigue management became additional issues.

In catering to diverse community demographics, a number of observations were made by both staff and community informants regarding the functional capacity of the community hubs. In the Cannonvale hub which assisted numerous visitors and tourists from Airlie Beach and the islands, there was a clear recognised need for a translation service or multi lingual interpreters to facilitate communication and processing. While a phone based system was eventually set up, it proved very slow with limited capacity. Although not considered an operational issue, another informant noted that the traditional “sausage sizzle” and water respite which was offered to those waiting could be expanded to include fruit to better cater to diverse cultural and dietary requirements. For some people it represented the first fresh food that they had received in days.

As almost all community informants expressed both gratitude and appreciation of the recovery staff and services available at these hubs, communication and provision of information remained the biggest issue. Without power, radio, the internet or even telephone contact, most people only found out about the recovery hubs through existing social networks – predominantly word of mouth. While there was registration and application forms, and extensive recovery information available online, most residents were not able to access this content.

People don't know about the recovery hub. There has been very poor information or communication about the location and services provided Community service provider - Proserpine

We found out about the community recovery centre through word of mouth, our daughter works in Bowen and found out about it through her work and she told us where to go. I would have never known about it without her and my friends Resident - Bowen

The recovery team is very nice, and helpful, and organised, but information is hard to get and difficult to understand on official websites like the government or BOM Resident - Cannonvale

With declining numbers of claimants as the week progressed it was apparent that many organisations had begun to withdraw or reassign personnel from the recovery hubs. Committed to provide support for “as long as needed by the community” key staff discussed down-scaling and moving towards a more informal “pop-up stall” or information desk-type arrangement in an easily accessible public location such as a local shopping centre.

Transition to recovery

For the majority of informants the restoration of power was considered the critical element in progressing community recovery. Electricity allowed for; more efficient cleaning capacity; access to news, information, and communication; increased day-to-day living convenience and comfort; and for many; the opportunity to return to employment. After days of enforced isolation and/or deprivation people generally felt tired and exhausted. Despite the recent experience, damage and destruction, people remained relatively stoic and grateful to simply be alive.

I can't believe all the palms, the beautiful palms – they have lost their top fronds/the crown so they all have big orange crosses on them marked to be cut down – I know they can grow back but they were part of why I moved here... first world problems I guess... Resident – Airlie Beach

We still don't have hot water. I am tired of camping, after 2 days it was no longer fun anymore
Resident – Cannonvale

As more businesses and services began to operate in each community there was an increasing sense of returning to “normalcy”. Emergency responders and support personnel were progressively withdrawing or moving to assist in the next looming hazard/community crisis. While making necessary recovery arrangements such as building assessments, insurance claims and repairs, some people were inevitably considering the prospect of future hazards.

I don't know if I want to stay here – I never want to go through that again Resident – Airlie Beach

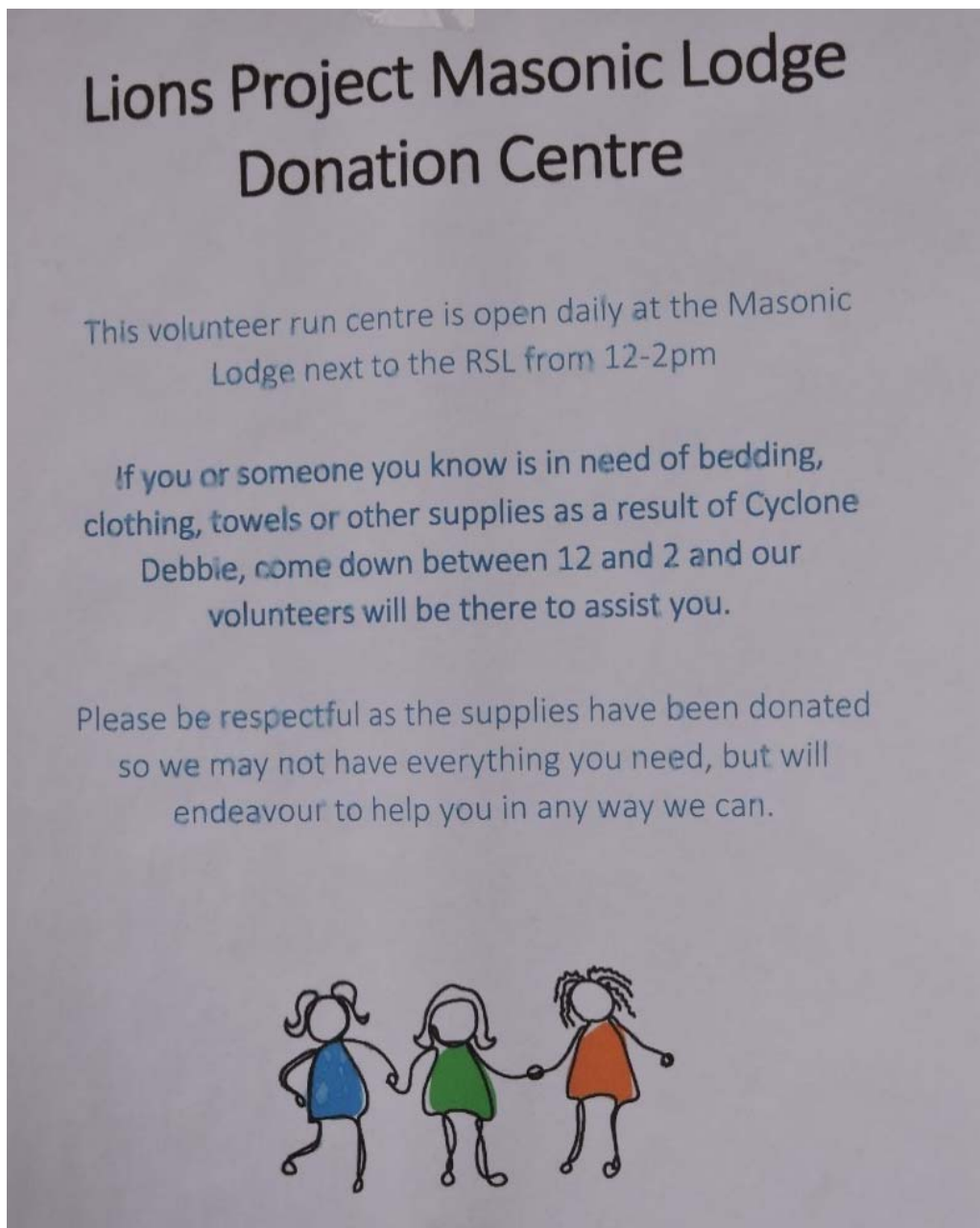


Figure 15: Spontaneous volunteers and donations organised in Proserpine

KEY LESSONS AND RECOMMENDATIONS

Informants showed a clear awareness of cyclone hazards, yet a restricted understanding of personal exposure/risk

- There needs to be a better understanding and awareness of direct physical hazard exposure (zones) and a greater appreciation of how the type and scope of risk may vary for different hazards eg cyclone, storm surge, riverine and flash flooding
- There needs to be a better understanding and recognition of the degree of uncertainty in forecasting the exact impact location of a cyclone and associated hazards – and how the potential variability of impact is communicated through official BOM watch and warning messages

People were familiar with preparation recommendations, yet most were not adequately prepared

- While some degree of final preparation and purchasing of relevant supplies is to be expected prior to a significant hazard event, individuals/households need to progressively build up provisions and proactively undertake necessary garden and property maintenance with the commencement of the wet season
- A 72 hours (3 days) preparation/disaster kit is considered a minimum recommendation for evacuation and self-sufficiency, and does not allow for any contingencies – individuals/households should aim to have one to two weeks food and water supply in advance of a hazard event, including additional fuel, cash, medication and other necessities
- Despite the versatility of the mobile phone and associated technologies, individuals/households should still have a working battery operated AM/FM radio (and spare batteries) tuned to the official ABC radio network to maintain hazard awareness and communication in an event (particularly if power loss is likely)

Evacuation understanding was limited

- To avoid unnecessary confusion and misunderstanding regarding evacuation zones and shelters, there needs to be better education and understanding of local disaster management evacuation plans and advice on hazard zones and shelter locations

Most people preferred to shelter in place irrespective of risk

- In making the decision to shelter-in-place individuals/households need to objectively assess the safety of the proposed dwelling in relation to current Building Codes and Australian Standard compliance, and fully understand the identified hazard/risk exposure
- Individuals/households need to proactively develop evacuation plans which identify alternative shelter options – this may be at an external location, with an accommodation provider, at established community refuges and/or with friends and family. Plans should include specific arrangements for the sheltering of pets and a personal communication plan

Social networks were valuable in all aspects of awareness, preparation, response and recovery

- There is a need to proactively expand and enhance existing individual and community social networks through localised initiatives that identify and include more isolated and marginalised residents (ie “Neighbour Day” campaigns)

Community has an unrealistic expectation of the role and responsibility of authorities, agencies and emergency response personnel in a hazard event

- Individuals/households need to be better educated and prepared to be more independent, self-reliant and resilient before, during and after a disaster

CONCLUSION

As a preliminary rapid assessment of community recovery, the primary aim of this report was to observe and document individual and community experiences of the Tropical Cyclone Debbie event in the Whitsundays region. Informant interviews provided direct insight into risk perceptions, awareness and associated behaviours; before, during and directly after the event. While communities generally felt prepared for the cyclone, the narratives given demonstrate a number lessons and short comings which should be addressed in the advancement of safer, more sustainable communities. Consistent with the Council of Australian Government’s (COAG) National Strategy for Disaster Resilience (NSDR) and the Sendai Framework for Disaster Risk Reduction, disaster management is considered to be a shared responsibility, and the recommendations proposed in this report require commitment and engagement from all relevant stakeholders – particularly community members.

ACKNOWLEDGEMENTS

This report was based on rapid appraisal fieldwork conducted by researchers from the Centre for Disaster Studies (James Cook University), supplemented by relevant available media reports and information. The objective of the Centre is to facilitate sustainable community based disaster management through the effective delivery of research output. The purpose of the study is to provide a preliminary assessment of community awareness, behaviour and responses to Tropical Cyclone Debbie to assist all levels of government, emergency services and relevant agencies to identify and develop strategies to enhance community resilience for future hazard events.

Please visit www.jcu.edu.au/cds for additional information, and for access to previous rapid appraisal and community recovery reports. Questions and comments on any aspects of our work are most welcome. Please direct your enquiries to yetta.gurtner@jcu.edu.au

The authors gratefully acknowledge the Australian Bureau of Meteorology and the Bushfire and Natural Hazards Cooperative Research Centre for financially supporting the conduct of this research. Similarly this extends to Dr. Deanne Bird for her comments and editing skills on the draft report. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of these sponsors.

Special thanks to the community members and informants from Bowen, Cannonvale, Airlie Beach and Proserpine that were willing to share their insights and personal experiences of the TC Debbie event. This gratitude is extended to all of the individuals, community recovery hub staff, agencies, volunteers, non-government organisations and emergency service providers for their support and willingness to assist our research efforts. Our work would not be possible without their contributions.

REFERENCES

- (BOM) Australian Bureau of Meteorology (2017) *Tropical Cyclones* Retrieved from <http://www.bom.gov.au/cyclone/>
- (ABS) Australian Bureau of Statistics (2017) *Quick Stats 2011* Retrieved from <http://www.abs.gov.au/census>
- Craw, V (2017, March 29) Fears for Queensland tourism industry after battering from Cyclone Debbie. *news.com.au* Retrieved from <http://www.news.com.au/technology/environment/fears-for-queensland-tourism-industry-after-battering-from-cyclone-debbie/news-story/92f92f7592b3aac5fd20693c371f36b7>
- Gourlay, C., Liddy, M., Spraggon, B & Tilley, C. (2017, March 29) Cyclone Debbie: BOM shows wind speeds top 260kph as Queensland battered ABC News. Retrieved from <http://www.abc.net.au/news/2017-03-28/cyclone-debbie-wind-speed-tracker/8392288>
- Haynes, J (2017, March 28) Cyclone Debbie: What you need to know at a glance ABC News Retrieved from <http://www.abc.net.au/news/2017-03-27/cyclone-debbie-guide-for-residents/8388866>
- Lyons, C (2017, March 28) '200 people' evacuated to Rockhampton as Cyclone Debbie hits. *The Morning Bulletin*. Retrieved from <https://www.themorningbulletin.com.au/news/200-people-evacuated-to-rockhampton-as-cyclone-deb/3160024/>
- The Australian (2017, March 29) Cyclone Debbie: Queenslanders prepare for clean up. *The Australian* Retrieved from <http://www.theaustralian.com.au/news/cyclone-debbie-thousands-flee-as-winds-intensify/news-story/ab83952c9ac48ba60d66b64d41735255>