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RESPONSES TO THE LOMBOK EARTHQUAKE, 2018 – RAPID ASSESSMENT STUDY

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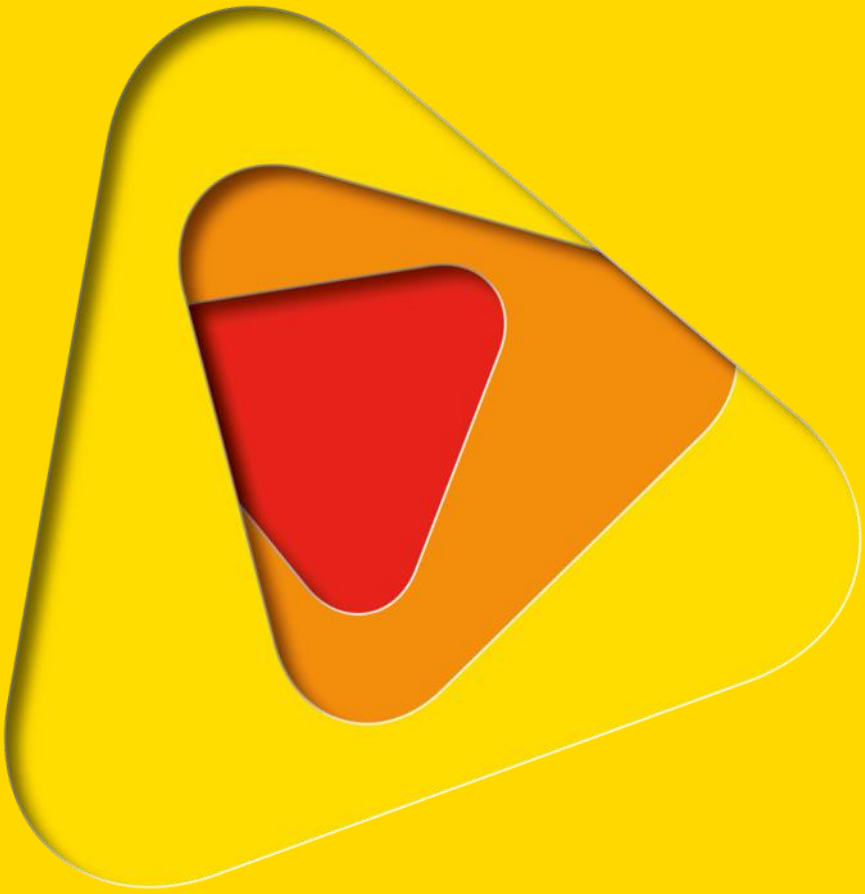

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ABSTRACT

The recent earthquake that occurred in Lombok in August, 2018 presented an opportunity to study the responses of those affected in the immediate aftermath of the event. We find that tourists caught up in disasters are uniquely vulnerable. Few followed the encouraged actions of what to do in the event of an earthquake and were largely reliant on local residents and tourist operators for advice in the immediate aftermath. This article summarises the earthquake, how people responded and provides some reflections for policy makers.

INTRODUCTION

The recent earthquake that occurred in Lombok in August, 2018 presented an opportunity to study the responses of those affected in the immediate aftermath of the event. We find that tourists caught up in disasters are uniquely vulnerable. Few followed the encouraged actions of what to do in the event of an earthquake and were largely reliant on local residents and tourist operators for advice in the immediate aftermath. This article summarises the earthquake, how people responded and provides some reflections for policy makers.

The island of Lombok is located in the Nusa Tenggara Barat Region of Indonesia. It lies on the boundary between the Australian Plate and the Sunda Plate, which has produced numerous powerful earthquakes in the past. The region is a popular tourist destination, with rapidly increasing numbers of visitors since developed countries lifted travel warnings following the 2002 and 2005 Bali bombings and the SARS (severe acute respiratory syndrome) outbreak between 2002 and 2004. Tourism is a major source of income for Lombok and the neighbouring Bali and Gili Islands, with millions of visitors from around the world each year.

The August 5, 2018, M 6.9 earthquake ('the earthquake') occurred as the result of a shallow thrust fault on or near the Flores Back Arc Thrust. The earthquake occurred in a subduction plate boundary region where the Sunda and Australia plates converge (USGS, 2018). In the region surrounding the location of the earthquake, there have been six other events of M 6.5 or larger over the previous century. Four of these are likely to have occurred on the Back Arc Thrust system: a M 6.5 in the Bali region to the west of Lombok in July 1976 and three events of M 6.5, M 6.5 and M 6.6 in the Sumbawa region to the east of Lombok in November 2007 and November 2009. The Sumbawa earthquakes were associated with several deaths, hundreds of injuries, and the destruction of hundreds of houses. This history of recent earthquakes means that locals would have been familiar with the impacts of damaging earthquakes.
The earthquake occurred at a depth of 31.0km centred at the northern tip of Lombok. The local time was 7:46pm. It was preceded by a main foreshock on July 29, 2018 of M 6.4, and numerous aftershocks including a M 5.9 event on August 9, 2018 (USGS, 2018). The earthquake caused severe shaking in Lombok and surrounding islands, including Bali and the Gili Islands and was felt as far as Sumbawa in the east (Cochrane, 2018) and Trenggalek Regency in the west (Solichah, 2018). Following the earthquake, tsunami warnings were issued: however, the maximum expected height was only half a metre and the warning was later cancelled.

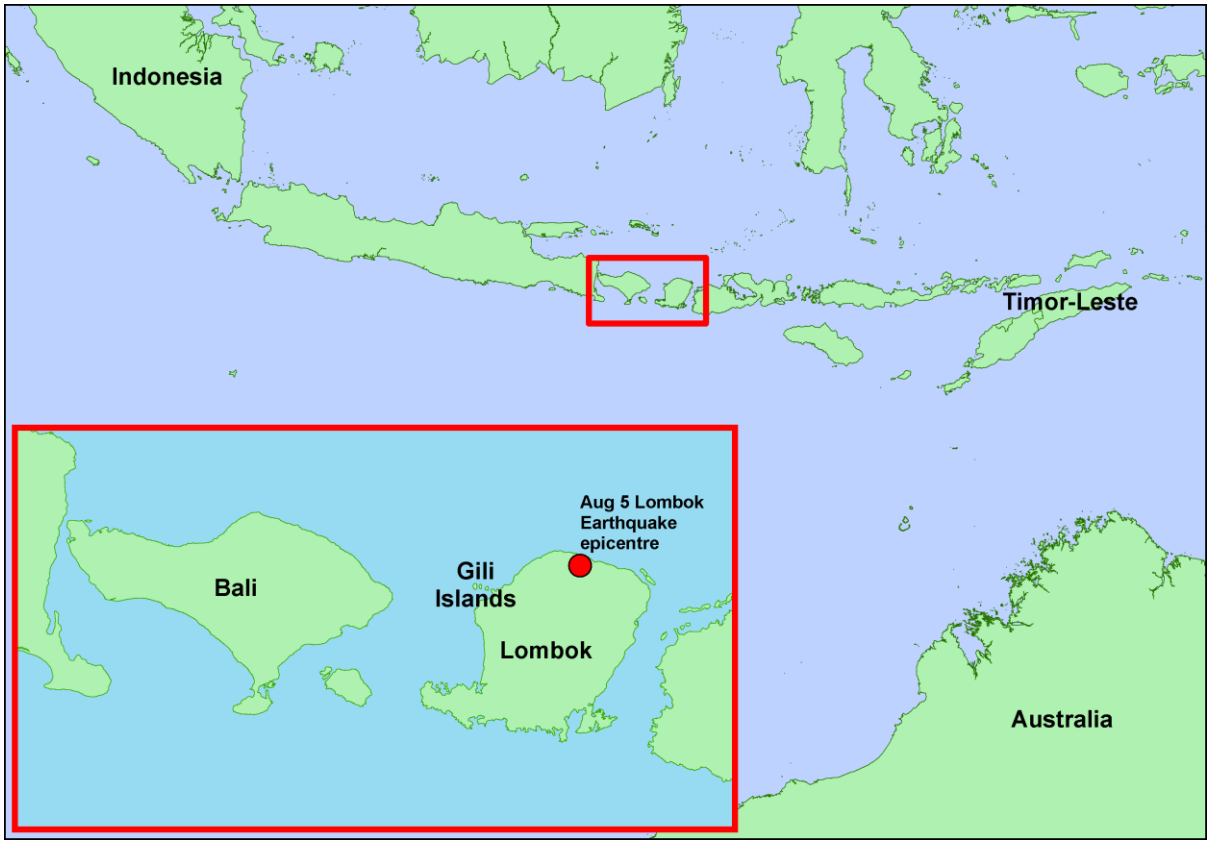

FIGURE 1: EARTHQUAKE LOCATION WITH REGIONAL CONTEXT

Most of those affected by the earthquake were in North Lombok, East Lombok and Mataram City. Reports indicated that there were 392 fatalities, 1353 injuries and damage to 67875 houses, 606 schools, six bridges, three hospitals, ten health centres, 15 mosques, 50 prayer rooms and 20 office units (Badan Nasional Penanggulangan Bencana, 2018).

It is important for emergency managers to have an understanding of human behaviour during extreme events so that they can best develop their plans. In an effort to understand the behaviour of tourists and others following the earthquake, researchers from Risk Frontiers conducted a rapid assessment study utilising media analysis containing interviews with survivors. The method involved locating some 120 news articles sourced from a variety of online international, national and local media outlets. From these articles, interviews with 152 people who experienced the earthquake were extracted and analysed to identify damage that occurred and how people behaved during and after the earthquake.

RESULTS

A significant majority of interviewees were tourists (n=108), who conducted interviews with media outlets from their home countries either remotely or after returning home. Other interviews included local residents (n=20) and expats (n=9), with a further ten not stating where they were from.

At the time of the earthquake interviewees were located on the island of Bali, approximately 50km to the east of Lombok (n=54); on Lombok (n=46); on the Gili Islands (n=28) and at other locations in the area (n=3). Twenty of those interviewed did not state where they had been at the time of the earthquake. The interviewees came from a variety of nations, including Australia (n=38), Britain (n=25), Indonesia (n=25), Ireland (n=9), America (n=8), New Zealand (n=8), Singapore (n=5), France (n=4), Canada (n=3), South Africa (n=3), and one interviewee each from Africa (country unstated), Belgium, Denmark, the Netherlands, India, Malaysia, Malta, Pakistan and Spain. The age of interviewees was captured either by statement in the article or by approximation if a photo was available. Of those interviewed, 105 were categorised between 18 and 60 years old. Three were recorded as above 60 years old, and one was less than 18.

Most interviewees said they were with other adult/s when the earthquake occurred (n=56), or with both children and adult/s (n=24). Ten interviewees said they were with someone but didn't specify their age/s and nine said they were alone.

In relation to their location at the time of the earthquake, interviewees stated that they were at a restaurant (n=29), in a hotel (size not stated) (n=14), at home and awake (n=9), in a single storey hotel (n=8), in a multi storey hotel (n=7), hiking on Mt Rinjani (a volcano in North Lombok) (n=6), at home and asleep (n=3), in a shop or shopping centre (n=3), at the beach (n=2), on a footpath (n=2), in a car (n=1) or on a boat (n=1).

Consequences the interviewees observed from the earthquake included collapsed buildings (n=46), debris/objects falling (n=29), injuries (n=24), power cuts (n=22), loss of water from swimming pools (n=15), cracked walls (n=13), food shortages (n=11), deaths (n=11), water shortages (n=6), broken glass (n=4), downed cables (n=4), loss of sanitation (n=2), ground subsidence or uplift (n=1), flooding (n=1) and fires (n=1). Those located in Lombok and the Gili islands observed the most significant damage. Four of the hikers on Mt Rinjani observed landslides or rocks and boulders falling or rolling downhill.

During the earthquake, interviewees most commonly reported, of their own behaviour, that they ran outside (n=43). Others reported that they dropped to the ground as they could not remain standing (n=6), sheltered under a table or bed (n=5), ran outside onto the beach (n=4), moved away from buildings (n=4), sheltered in doorways (n=3), deliberately dropped to the ground (n=2)

or moved away from trees (n=2). Two of the hikers on Mt Rinjani said they sought shelter from rocks falling downhill, while another said they fell and hung off a cliff.

During the earthquake, interviewees observed others most commonly either running from buildings (n=44) or screaming (n=38). Other observed behaviours were crying (n=10), moving away from buildings (n=7), caring for others (n=6), running specifically to the beach (n=4), seeking shelter under tables or beds (n=3), dropping to the ground (n=3), holding onto objects or other people (n=3), panicking (n=3), seeking shelter under doorways (n=2), and calling or messaging others (n=2).

Immediately after the earthquake, those interviewed moved to higher ground (fearing a tsunami) (n=29), sought advice on what to do from locals (n=9) or from hotel reception/staff (n=6), gave first aid to the injured (n=4), called or messaged someone (n=4), informed others of tsunami threat levels (n=3), climbed trees (fearing a tsunami) (n=3), searched for family member/s or friend/s (n=3), put on life jackets (fearing a tsunami) (n=2), assisted rescuing trapped person/s (n=2), were themselves incapacitated/requiring treatment (n=2) and extinguished fires (n=1). Two people on Mt Rinjani reported they ran downhill fearing volcanic activity, while another two were stuck on the mountain overnight due to destroyed trails and collapsed bridges.

Interviewees observed that immediately after the earthquake, others moved to higher ground (n=24), were screaming (n=13), panicking (n=11), caring for others (n=10), running (n=8), assisting the injured (n=6), crying (n=5), remaining on the beach (n=4), calling others (n=4), climbing trees (n=3), searching for others (n=3) and moving debris (n=1).

People said their actions immediately after the earthquake were directed by local residents (n=9), hotel staff (n=9), local authorities (n=3), other tourists (n=2) and by a minister of religion (n=1).

For those interviewees who said they contacted someone, contacts included their parent/s (n=8), other relative/s (n=5), friend/s (n=2), spouse/partner (n=2), children (n=1), authorities (n=1), neighbour/s (n=1) or a stranger (n=1). Six people contacted someone but did not specify who.

Many of those interviewed were not from countries which are associated with high earthquake risk. People's previous experiences of earthquakes or education provided in their country of origin may have influenced some responses. This possibility is evidenced by the following responses:

> *"Everyone I spoke to just wants to get out but there's not one free seat out of here today. About 90 per cent of us were westerners and we're not trained for how to react in this situation." (Interviewee from a country not prone to quakes)* (Darvall and O'Shea, 2018).

> *"It's scary when the ground is buckling under your feet. My partner and I were out of bed and under the table in a flash and we then immediately evacuated the house. When I was a child at school we had earthquake drills. Best training ever." (Interviewee from a quake-prone country)* (NZ Herald, 2018).

Descriptions of interviewees' emotions during and immediately after the quake included feeling fearful (n=41), panicked (n=15), calm (n=9), concerned (n=7), upset (n=5), terrified (n=5), in shock (n=4), apathetic (n=2), surreal (n=2), or other (n=6). Some 84 interviewees did not state their emotions during and immediately after the quake.

Interviewees said they obtained information about tsunami risk from local residents (n=9), the internet (n=6), warning sirens (or the lack thereof) (n=4), social media (n=3), hotel staff (n=2), calling family or friends at home (n=2), other tourists (n=2), local authorities (n=2), observing the ocean (n=2) or overhearing other people (n=2).

Over subsequent days, a significant number of people said they evacuated soon after (n=32). Some stayed to assist rescue, medical or relief efforts (n=11), although these were mainly locals and expats.

The evacuation of tourists from the Gili Islands was said to be chaotic due to the combination of the lack of capacity to evacuate tourists and the fearful state of tourists and locals. There were reports of long waits, pushing and shoving and passage being offered to the highest bidders.

Those interviewees who experienced the evacuation described it as:

> *"People were just throwing their suitcases on board and I had to struggle to get my husband on, because he was bleeding."* (Embury-Dennis, 2018).

> *"We just witnessed one of the boats get completely overfilled with tourists climbing on, with the officials trying to keep them back off the boat, pushing them and shoving them. That boat still hasn't left yet."* (ABC News, 2018).

> *"People are punching and hitting each other."* (Osborne, 2018).

DISCUSSION AND CONCLUSION

Many tourist destinations both within Australia and abroad are susceptible to a range of natural hazard risks. For example, some 26 Australians lost their lives during the Asian tsunami in 2004.

Often, many of the elements that make locations aesthetically appealing to tourists are associated with natural hazard risk. For example, warm, shallow seas and sandy islands make idyllic tropical resort getaways, but these places are often at risk from severe weather, while scenic mountain vistas are often the product of tectonic activity which causes earthquakes and volcanism.
Tourists are uniquely vulnerable. Tourists may be unaware of risks present at their destination, lack local support networks and encounter cultural and communication barriers. Research has previously shown that tourists do not exhibit the same behaviours as local residents. During evacuations they tend not to shelter with family and friends, but seek shelter at public evacuation centres, simply return home or find another hotel (Drabek, 1999). Observations from the Lombok disaster support such conclusions: in particular, that many tourists simply leave soon after a disaster and are reliant on locals for direction. Many of those interviewed ran from buildings or observed others running from buildings. This behaviour is in conflict with actions encouraged by international and local authorities, which promote the actions of drop, cover and hold.
Counter to some research that suggests that people do not panic in the aftermath of disasters (Lorenz et al. 2018), observations from this event show that panic and chaos can occur. This suggests that in more extreme and less predictable events, panic and chaos could be more likely or that tourists are more likely to panic. Such questions require further exploration.

Promotion of disaster risk by travel agents and tourism operators conflicts with wider tourism promotion. The Australian Department of Foreign Affairs does provide some details about natural hazard risk on its Smartraveller website, although more needs to be done than passively informing travellers. There could be an opportunity to engage with the medical profession and travel health clinics to promote natural hazard risk and safety behaviours at the time travellers seek travel health advice.

Finally, tourists in Australia are not immune from the impacts of natural hazards, as illustrated by the impacts of Cyclone Debbie in the Whitsunday Region. It is important that tourism operators are engaged regarding disaster preparedness and connected with disaster management structures.

REFERENCES

ABC News (2018) Witness describes chaos when earthquake hit the Gili Islands. *ABC News*. 7 August 2018. [Accessed 8 Oct. 2018].

Badan Nasional Penanggulangan Bencana (2018). Korban Gempa Lombok Terus Bertambah, 392 Orang Meninggal Dunia. [online] Available at: https://www.bnpb.go.id/korban-gempa-lombok-terus-bertambah-392-orang-meninggal-dunia [Accessed 31 Aug. 2018].

Cochrane, J. (2018) Powerful Indonesia Earthquake Kills at Least 82. *The New York Times.* 5 August 2018. [Accessed 10 Oct. 2018].

Darvall, K and O'Shea, M. (2018) "I just want to get off the island now": Bondi restaurant owner shares terrifying evacuation footage after earthquake hit Lombok while he was holidaying with his girlfriend. *Daily Mail Australia.* 6 August 2018. [Accessed 8 Oct 2018].

Drabek, T.E. (1999) Disaster evacuation responses by tourists and other types of transients. *International Journal of Public Administrations*, 22(5), pp.665-677.
Embury-Dennis, T. (2018). Lombok earthquake: Tourists "forced to pay to board rescue ships". *The Independent.* 6 August 2018. [Accessed 8 Oct. 2018].

Lorenz, D.F., Schulze, K. and Voss, M., (2018) Emerging citizen responses to disasters in Germany. Disaster myths as an impediment for a collaboration of unaffiliated responders and professional rescue forces. *Journal of Contingencies and Crisis Management*, 26 (3), pp.358-367.

Osborne, S. (2018). Lombok earthquake latest: Tourists flee Indonesian island after powerful magnitude-7 quake kills at least 98. *The Independent.* 6 August 2018. [Accessed 8 Oct. 2018].

Solichah, Z. (2018). Warga Jember dan Banuwangi rasakan gempa Lombok. *Antara News.* 5 August 2018. [Accessed 10 Oct. 2018].

USGS (2018). M 6.9 - 0km SW of Loloan, Indonesia. [online] Available at: https://earthquake.usgs.gov/earthquakes/eventpage/us1000g3ub#executive [Accessed 31 Aug. 2018].

NZ Herald (2018) New Zealanders in Indonesia describe the violence of Lombok earthquake. *NZ Herald.* 8 August 2018. [Accessed 8 Oct. 2018].