TSUNAMI VERTICAL EVACUATION: BARRIERS TO RISK COMMUNICATION IN ACEH, INDONESIA

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This paper examines the effectiveness of risk communication on the uptake of tsunami preparedness measures, in particular vertical pedestrian evacuation, in Aceh, Indonesia. This paper aims to identify and understand the barriers to risk communication by conducting a survey of disaster risk reduction ('DRR') providers in Aceh and applying risk communication best practice criteria to guide the analysis of results. The survey results found that DRR practice sometimes departs from theoretical best practice. Namely, best practice promotes engagement with religious principles and institutions to increase community preparedness. However, in practice, DRR providers generally do not consider religious context as a relevant factor in designing risk communication strategies. Further, the local culture of gotong royong was highlighted as a key influence on programs by DRR providers, but is relatively unmapped in the literature. One inference that can be drawn is that a failure to engage with the predominant religious and cultural beliefs and structures potentially results in a perceived lack of credibility of DRR messages. The effectiveness of risk communication at increasing community understanding of and trust in vertical pedestrian evacuation procedures may be improved by integrating religious perspectives and institutions into DRR programs. For example through the transformation of secular tsunami evacuation buildings into places of worship, so that evacuation buildings will be better utilised in the event of a tsunami. This study contributes knowledge on the role of religion and culture in risk communication, in order to increase community disaster preparedness and social resilience.

Keywords: disaster risk reduction, risk communication, religious and cultural context, social resilience and community preparedness

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INTRODUCTION

The focus of this paper is the Indonesian province of Aceh. In 2004, the Indian Ocean tsunami resulted in unprecedented destruction and loss of life, more than 126,700 people died and over 93,200 people went missing in Aceh alone (Nakanishi et al., 2014). The epicentre of the 9.1-magnitude earthquake, which triggered the tsunami, was 250 kilometres southwest of Aceh (Samadhi 2014). The proximity of the triggering earthquake, compounded by the absence of early warning systems and resulting limited evacuation opportunity, greatly exacerbated the impacts in Aceh (Samadhi 2014). Aceh is also particularly vulnerable to tsunami impacts due to the high proportion of the population living along low-lying coastal area.

Before the tsunami event in 2004, there had been no major tsunami events for decades in Aceh. The community had little awareness about how to respond to a tsunami threat and therefore many did not attempt to evacuate in 2004. However, in 2007, 2008, 2010 and 2012, Aceh experienced earthquake scares, all of which, although not resulting in tsunamis, triggered panicked and disorderly evacuation attempts. The panicked reaction of the community is a result of the trauma still in living memory from the 2004 tsunami event.

For example, in 2010, an 7.2-magnitude earthquake hit Meulaboh, the third largest city in Aceh, resulting in a 'massive disorderly evacuation' including widespread traffic jams (Affan et al., 2012, p.6). Further, 'many coastal residents...failed to evacuate' all together (Matsumaru et al., 2012, p.16). Again, in January 2012, a 7.3-magnitude earthquake struck Aceh followed by a 8.6-magnitude earthquake in April (UNDP n.d). Criticism of the evacuation responses to the 2012 tsunami scares identified a failure of local authorities to create or implement 'clear emergency guidelines', including a failure of officials to open or operate the tsunami evacuation centres (Folger 2014). Further, reports suggested that many people did not know about, misunderstood or mistrusted the evacuation centres (Folger 2014). Both the lack of leadership and the failure to include and educate the community in evacuation planning led to the city being paralysed in this instance.

The main measure to save lives before a tsunami strikes is timely evacuation, either horizontal or vertical (Setiadi 2014; Yuzal et al., 2015). As part of the Aceh Rehabilitation and Reconstruction Master Plan, several *tsunami evacuation buildings* ('**TEBs**'), also known as tsunami evacuation centres, were constructed on the coast of Aceh (Budjario 2006; Goto et al., 2010). TEBs are specially-designed buildings located in the tsunami inundation zone, which pedestrians can

access on foot (City Council of Cannon Beach 2009). Evacuation to TEBs is called *vertical pedestrian evacuation* ('**VPE**'). TEBs are designed to capture pedestrian traffic from surrounding areas and decrease road congestion, therefore reducing the number of deaths from residents trapped in cars when the tsunami hits.

Aceh's low-lying coastal landscape combined with the fast onset of tsunami events makes early evacuation crucial to saving lives in the initial response phase. For TEBs to be effective, residents must understand how to undertake VPE in the case of an emergency warning (Yuzal et al., 2015). Whilst the holistic operation of TEBs requires consideration of a range of factors from structural integrity and design to management and accessibility (FEMA 2009), this report focuses only on the community's knowledge and use of TEBs, specifically risk communication and preparedness.

Evacuation, as defined by Setiadi (2014), involves firstly, the receipt of warning, followed by personal verification and/or comprehension of the warning, before any action is taken in response. Therefore, dissemination of tsunami warnings are only useful to the extent that the information is understood and acted upon appropriately (Setiadi 2014). Understanding and capacity to undertake evacuation procedures is an example of community preparedness because it is an action which reduces losses through pre-event measures (Cutter et al., 2008). Preparedness to undertake VPE would increase the community's disaster resilience. There are many different types of disaster resilience. This paper addresses only social resilience, as illustrated by 'improvements in communications, risk awareness, and preparedness' (Cutter et al.,2008, p.603).

Although risk communication strategies are currently in place to increase VPE, the community responses to tsunami scares have shown a disconnect between the inputs and the outcomes (Simanjuntak, 2008). It appears that there are unseen barriers in the process of risk communication that need to be resolved. The aim of this paper is to identify and understand the barriers to risk communication, in order to, improve community preparedness and resilience. Based on the analysis in this paper, barriers to effective risk communication will be identified and recommendations will be made as to how these barriers can be overcome in order to increase community preparedness and social resilience.

Literature review

A number of recent studies have been conducted on tsunami evacuation in Aceh. Affan et al., (2012) conducted a tsunami evacuation

simulation for Banda Aceh. One of the primary findings was that many casualties may occur during evacuation due to residents being trapped in traffic jams (**Figure 1a**). The study recommended that more residents 'go to the nearest evacuation building' as opposed to inland (Affan et al., 2012, p.6). The mode of evacuation was also important with the study recommending that 'automobile evacuation should be limited' and motorcycle evacuation should be re-directed to TEBs along with pedestrians in these areas (Affan et al., 2012, p.6) (**Figure 1b**).

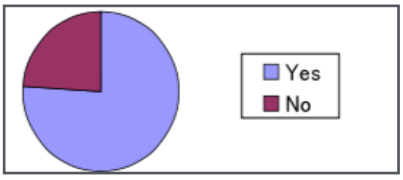

Figure 1a. Evacuees trapped in traffic jam

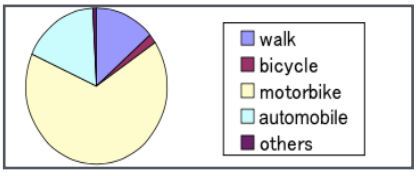

Figure 1b. Mode of evacuation used by evacuees

(Source: Affan et al., 2012, p.6)

Further, a study by Matsumaru et al., (2012) highlights the high probability of congestion slowing evacuees and the need for awareness to resolve this issue. In terms of risk communication, a survey conducted by Goto et al., (2010) emphasised that the construction of the TEBs alone would not be effective without community education and, especially, community confidence in the safety of the buildings. Lastly, a study conducted by Yuzal et al., (2015) noted that current disaster management plans do not include clear evacuation routes to TEBs and emphasised that the effectiveness of TEBs in saving lives is dependent on the effectiveness of risk communication. For example, clearly delineated and promulgated evacuation routes are essential to ensure that the capacity of some TEBs are not overwhelmed, whilst other TEBs are simultaneously under-utilised (Yuzal et al., 2015).

The limited capacity of TEBs complicates education about VPE. The Grand Mosque and Tsunami Museum are well-known, socialised TEBs. For example, the Grand Mosque, is not only religiously significant but, was one of the only coastal buildings which was not destroyed in the 2004 tsunami, therefore the community considers the mosque to be a safe evacuation destination. These TEBs were simulated by Affan et al., (2012) to have 100% occupancy in a tsunami evacuation. However, other buildings specifically designed as TEBs were 'all relatively empty' (Affan et al., 2012, p.8). This is because many respondents travelling by motorcycle went to the Grand Mosque and Tsunami Museum, as well as inland. The tsunami simulation predicted that many casualties would occur in these areas due to traffic jams. Therefore motorcycle and pedestrian evacuees need to be redirected to other designated TEBs

(Affan et al., 2012). Greater guidance of evacuation routes, both pre-event and in the response phase, are needed to equalise evacuation flows.

These studies show that there is currently a dangerous traffic congestion issue, which could be mitigated to an extent through the successful adoption of VPE. VPE has the potential to save lives by reducing congestion through redirection of pedestrian and motorcycle traffic to TEBs, however this is currently not being achieved. Further, this research establishes a need for effective risk communication to increase the community's understanding and uptake of VPE practices.

Theoretical framework

The analysis in this paper will be conducted within the framework of the disaster resilience of place (DROP) model established by Cutter et al., (2008) (**Figure 2**). The DROP model focuses on social resilience, whilst acknowledging that all types of resilience are interrelated. Social resilience will only be increased if relevant institutions and infrastructure are embedded within a framework of 'communication, risk awareness and preparedness' (Cutter et al., 2008, p.603). TEB's are therefore dependent on social systems for effectiveness and will not increase community resilience in isolation.

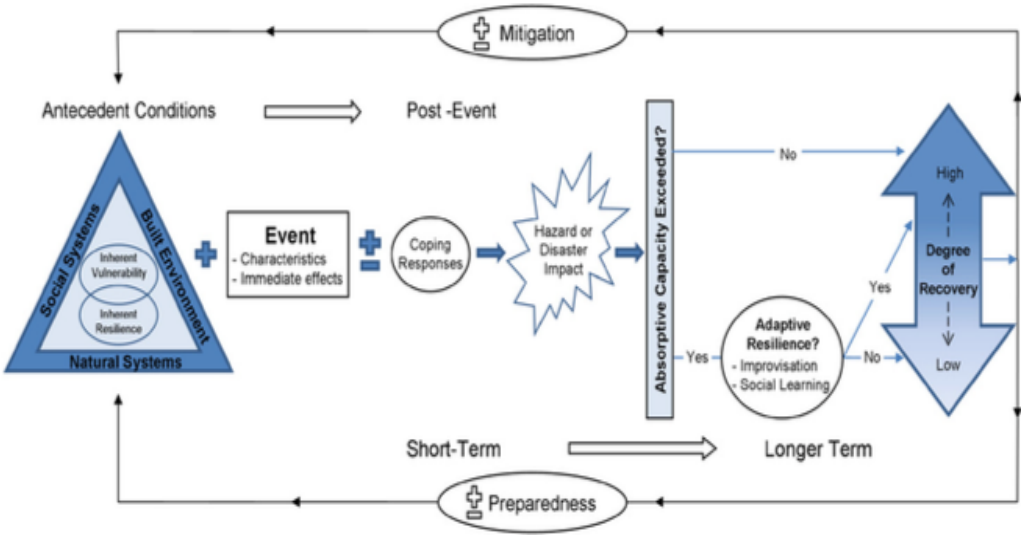

Figure 2. DROP model (Source: Cutter et al., 2008, p.602)

The starting point for Cutter et al.,'s (2008) DROP model is a snapshot of the communities inherent vulnerability and inherent resilience, which is the sum of all three systems: natural, built and social. The DROP model illustrates the role of resilience throughout the different phases of disaster management, i.e. response, recovery,

prevention and preparedness. As seen in Figure 2, the immediate effects of a hazard are:

> attenuated or amplified by the presence or absence of mitigating actions and coping responses in the community, which themselves are a function of antecedent conditions…After these coping responses are implemented, the hazard or disaster impact is realized (Cutter et al., 2008, pp. 602-3).

For the purposes of this paper's analysis, the DROP model could be improved by embedding risk communication throughout all disaster management phases. The inclusion of risk communication enhances the model as it acts as a support system to increase social resilience (ITC & CENN 2011; Takeuchi et al., 2012). In this paper, the embedded risk communication model will be applied during the adaptive resilience phase (i.e. after the initial hazard impact and before the next hazard event). At this stage, risk communication has a significant impact on whether social learning occurs. If risks are effectively communicated then the community is likely to be more prepared for the next disaster, with improved social resilience (Cutter et al., 2008).

Risk communication best practice was collated by conducting a literature review. Seven key aspects of risk communication were identified: content, clarity, continuity and consistency, channels, capability of audience, credibility and context (Lang et al., 2001) (**Table 1**). In theory, the presence, or absence, of these criteria will influence the effectiveness, or ineffectiveness, of risk communication strategies. The criteria of content, clarity, continuity and consistency, channels and capability will not be discussed in depth in this paper. The focus of this paper is credibility and context.

Table 1. Risk communication best practice

Key aspects of risk communication	
Content	Information which is communicated to the community (i.e. VPE and TEBs).
Clarity	Understandability of information.
Continuity and consistency	Sustainability of the program over time.
Channels	Channels differ depending on the target audience, both in terms of social group and stage of adoption (i.e. early adopters, early and late majority, laggards). Active channels (i.e. participatory approaches) are more likely to result in behavioural change than passive channels.

Key aspects of risk communication	
Capability	Existing local knowledge or socio-economic circumstances.
Credibility	The relationship of trust between the information provider and information recipient or community.
Context	The social environment in which risk communication takes place is the cultural and religious context.

(Source: compiled from State Emergency Service 2004; Bradley et al., 2014; Setiadi 2014).

This paper focuses on the criteria of credibility because reports after tsunami scares in Aceh suggest that residents mistrust the evacuation centres (Folger 2014). Trust in the source of information is important because the provision of information does not necessarily lead to changes in behaviour (Australian Government 2013). Trust is a part of the personal verification of information undertaken before taking action (Setiadi 2014; Zakaria & Mustafa 2014). If the recipient trusts the source, they are more likely to accept the information and change their behaviour based on that information (State Emergency Service 2004; Takeuchi et al., 2012). Trust takes a long time to build, therefore existing, informal social structures should be engaged (GFDRR & World Bank 2013). For example, by engaging with community leaders, risks can be communicated to the community by a trusted leader instead of an external organisation.

In terms of cultural and religious context, the UNDP (n.d) has stated that engaging with religious and cultural beliefs is a factor for success of risk communication strategies in Aceh. Religious social structures or institutions often hold a 'high level of trust among local communities' (Gaillard & Texier 2010, p.83). Therefore, it is suggested that religious leaders and organisations within the community can play a positive role in risk communication (Said et al., 2011; Adiyoso & Kanegae 2015). As religious beliefs play a role 'in shaping people's behaviour in the face of natural hazards' (Gaillard & Texier 2010, p.83) it is significant to note that Aceh's population is 98% Muslim and it is the only province in Indonesia to implement Shari'a law (Adiyoso & Kanegae 2015). 'Almost without exception' the 2004 tsunami was described as 'an act of God' by Acehnese residents (Fanany & Fanany 2013, p. 312). Studies conducted by Adiyoso & Kanegae (2013, 2015) in Aceh concluded that religious teachings have had a positive impact on community preparedness.

4. Method

Organisations currently implementing DRR programs in Aceh were surveyed using an online interview-style survey with 18 questions (in either English or Bahasa Indonesia). The first part of the survey aimed to establish the nature and scope of programs, for example to determine whether the program targets preparedness and includes vertical evacuation. In the second part, the respondents were asked whether risk communication criteria (established in the theoretical framework in Section 3) were considered, and if so, what actions were taken to incorporate these factors into the programs. In the third part, respondents were asked about their knowledge of tsunami scares (2007, 2008, 2010 and 2012 events) and to evaluate the community evacuation response to these events, in particular about the perceived risk communication barriers and potential improvements. Survey responses were gained from local NGO's BYTRA, Karst, Ibu Foundation, Citra Desa Indonesia ('CDI') and Suara Hati Rakyat Aceh ('SHRA').

5. Results

Whilst the programs run by BYTRA, Karst and Ibu Foundation were all established post-2004, CDI and SHRA indicated that their programs pre-dated the 2004 tsunami event. Out of these five respondents, only Ibu Foundation was not currently running or assisting in running a DRR program aimed at tsunamis. Ibu Foundation had previously run a program however the lifespan of the program was for the response and recovery phase only. The programs run by CDI, Karst, BYTRA and SHRA include the later prevention and preparedness phases. All four of these programs include education about VPE.

The most common risk communication strategy implemented by respondents was educational workshops, whilst none of the respondents ran evacuation drills. BYTRA carried out the broadest range of strategies: workshops, evacuation simulations, public lectures, school classes and community mapping, whilst SHRA only carried out educational workshops. CDI implemented simulations, lectures and signs showing the evacuation route. In addition to workshops, community mapping and school classes, Karst was unique in running DRR through seminars at Friday prayer and through written newspaper and online advertisements.

The main organisations with which the respondents co-operated to run programs or gain technical support were government bodies and domestic and international NGOs. BYTRA collaborated more broadly with universities and schools, and Karst collaborated with schools and religious institutions. In the first part of the survey, the respondents

identified that the inclusion of VPE in DRR programs was important to minimise the negative impacts of tsunami, in particular to reduce fatalities, and to improve the capacity of communities to self-evacuate (**Table 2)**.

Table 2. 'Why is community preparedness and inclusion of VPE in DRR programs important?'[2]

Survey responses	
Karst	*To strengthen capacity at the village level.*
BYTRA	*In order for orderly evacuations to be managed directly by the community without waiting for instruction from NGOs to reduce the number of victims.*
CDI	*In order for the community to spontaneously know where to run and save themselves when the disaster happens.*
SHRA	*Because education can increase community knowledge to strengthen the culture of disaster risk reduction.*

In the second section, assessing the design of the programs, the risk communication criteria (established in Section 3) were presented to the respondents. Out of the four respondents, three (SHRA, BYTRA, Karst) did not actively consider any risk communication criteria in the design of their programs. CDI was the only respondent to indicate that they actively considered these criteria in the design of their DRR program. CDI stated that consideration of trust, clarity and speed of uptake were very important in the design of the program, whilst religion and sustainability were also considered.

Karst (2015, pers. comm., 15 June) explained that the only major factor which influenced the approach was the local principle and practice of *gotong royong*, (which can be translated as 'community spirit of co-operation' or 'mutual assistance'), as opposed to enforcing an external ideology or methodology on the community. Although no best practice criteria were actively considered in the design of the program, on the other hand, prioritising the local culture could be interpreted as applying the risk communication criteria of social context.

[2] Note that the analysis in this section is based on translation of some responses. Therefore, many responses are not direct quotes as the surveys were generally completed in Bahasa Indonesia.

BYTRA stated that religion and beliefs were not relevant to tsunami evacuation 'as every person has a right to be safe'. Based on this response, the criteria of context (i.e. religion and culture) was interpreted by BYTRA in terms of differentiating in a discriminatory manner between community members. This is interesting because BYTRA is an NGO supported by the UNDP and the UNDP specifically identified religion and culture as a key element for DRR in Aceh.

SHRA stated that the current DRR program was designed for general application, but suggested that in future more specific strategies, considering differing capabilities, would be adopted to engage and include those with special needs. SHRA emphasised that it was either difficult or unnecessary to artificially manufacture or impose a particular approach to running the programs as culturally the Acehnese community has a participatory and collaborative approach and culture of working together. Therefore discussion and socialisation of VPE procedures still largely occurs through *gotong royong*.

The respondents were then asked to scale the effectiveness of risk communication strategies from least effective to most effective at improving community preparedness for a tsunami hazard. The strategies ranked closer to zero were perceived as the least effective, with the strategies ranked closer to 75 more effective. Overall, community mapping of hazard zones was ranked as the most effective, and seminars at Friday prayer and advertisements ranked the least effective. Between respondents, rankings varied greatly. The diversity in the evaluations may reflect the respondents different experiences, as each organisation operates in different areas and implements different strategies.

SHRA ranked simulations, drills and advertisements as ineffective, and signs marking the evacuation routes and school classes as effective. Workshops and community mapping were ranked the highest by SHRA. CDI similarly ranked advertisements as low, but ranked simulations, workshops, lectures and signs showing the evacuation routes as high. Again, community mapping was ranked highest, but opposite to SHRA evacuation drills were ranked equally high by CDI. The ranking of different strategies by SHRA and CDI was diverse, with some strategies ranked effective and some ineffective, whereas the results from BYTRA and Karst were homogeneous. Whilst BYTRA ranked all strategies as effective, except for seminars at Friday prayer, which were ranked 'somewhat ineffective', Karst ranked all strategies as ineffective or very ineffective.

A follow-up question was sent to Karst to clarify why all risk communication strategies were ranked this way. The representative from Karst (2015, pers. comm., 15 June) confirmed that their organisation

considered all risk communication strategies to be very ineffective because the community 'didn't participate to plan, implement, monitor and evaluate strategies.' For example, when an evacuation drill was conducted the community only participated because there was a monetary allowance for doing so. Further, Karst stated that other methods, like public lectures (which present scientific and technical information) and public advertisements, haven't resulted in increased resilience because these strategies only provide information and are not effective at increasing community awareness and participation.

In the third part of the survey the respondents' were asked to evaluate the community evacuation response to tsunami scare events. The following answers are based on the respondents' knowledge of different tsunami scare events. BYTRA and CDI had knowledge of all four events, SHRA only had knowledge of the 2007 event and Karst knew about both the 2007 and 2012 events. In terms of community response to tsunami scares, traffic congestion was ranked as the worst factor by CDI, BYTRA and Karst. Further, BYTRA, CDI and SHRA all identified community panic as the biggest barrier to adoption of VPE (**Table 3**). The results of the survey validate the secondary sources which suggested that traffic congestion and panic remain issues in tsunami evacuations (Affan et al., 2012; Matsumaru et al., 2012). Further, the respondents each made suggestions as to how current risk communication strategies could be improved (**Table 4**).

Table 3. 'What barriers are there to the adoption of VPE and a smooth and calm evacuation'?

Survey responses	
Karst	*Community participation is still 'so-so' (i.e. not ideal, full or maximum).*
BYTRA	*Communication is poor and the officials (who are responsible for evacuation warnings) communicate warnings to the community too late when a disaster occurs. This causes people to panic and run. The public is also still undisciplined and act only out of self-interest during an evacuation.*
CDI	*Community panic.*
SHRA	*The Acehnese community easily forgets the training that they have received after the 2004 tsunami), so when the next disaster (or evacuation scare) occurs the community panics.*

Table 4. 'How could risk communication strategies for VPE be improved to make current programs more effective?'

Survey responses	
Karst	*There should be an organisation within the community for implementing the disaster planning. This organisation needs to be developed and appreciated.*
BYTRA	*Build up co-operation amongst NGOs and creation of standard operation procedures, in particular procedures for communication, as well as a strengthening of the regulatory system for enforce.*
CDI	*By continuing to build community awareness so that they will be prepared for the next disaster.*
SHRA	*By implementing the knowledge/wisdom of the local Acehnese people.*

DISCUSSION

Overall, the capacity of both local officials and community members to implement VPE procedures is low, despite the government, community organisations and residents having a good general awareness of TEBs (UNDP & Indonesian Government 2012a, 2012b). BYTRA's identification of the need for standardisation and co-ordination of communication procedures is consistent with criticism that there is a lack of 'clear emergency guidelines' both for local authorities and also, subsequently, for residents (Folger 2014). The lack of organisation and co-ordination of officials is not directly addressed within the scope of this paper, however limited government capacity only increases the need for social resilience within the community. Pribadi and Mariany (2012, pp.140, 146) explain that if 'the communities cannot depend solely on government actions to protect their [lives], there is a need to improve their awareness and capacity in order to make them safe from disaster'.

The state of panic following an evacuation order, identified by the respondents as the primary barrier to an orderly and safe evacuation, is not solely a result of poor official direction but a lack of community preparedness. This barrier could be overcome by improving community preparedness to the point that residents have the capacity to confidently perform VPE procedures independently from official direction. Currently, however, the majority of individuals continue to panic and revert to default horizontal evacuation inland by motorcycle or car, instead of vertically evacuating to the nearest TEB by motorcycle or on foot, leading to dangerous traffic congestion.

Risk communication strategies

The survey shows that a vast array of risk communication strategies are currently being implemented with respect to VPE. However, there is no conclusive evidence about the effectiveness of most strategies, with the exception of community mapping, which had the highest average ranking of 65.25 out of 100, or 'somewhat effective' and, at the other end of the spectrum, advertisements (ranking 45.75 out of 100) and seminars at Friday prayer (ranking 41.25 out of 100) or 'somewhat ineffective'. One of the limitations of the survey is that the reasons why respondents ranked individual risk communication strategies as effective or ineffective are unknown. However, inferences can be drawn by assessing the risk communication strategies against best practice criteria. For example, community mapping being ranked the most effective strategy, whilst advertisements and seminars at Friday prayer were not considered effective, is consistent with the risk communication criteria. The criteria of 'channels' establishes that participatory and active DRR, as opposed to unilateral and passive information transfer, is more likely to result in material attitudinal or behavioural change (State Emergency Service 2004).

Seminars at Friday prayer were ranked as ineffective despite being a strategy which engages with religious institutions and organisations, which is promoted by the theoretical framework in order to increase preparedness (Said et al., 2011; Adiyoso & Kanegae 2013, 2015). These results were unexpected in the social context of a majority Muslim population, which is notoriously devout. In theory, this type of approach would be appropriate in the context, as well as engaging existing social structures and trust relationships. However, as mentioned above, it may be that, despite being consistent with the risk communication criteria of credibility and context, this strategy is a passive transfer of information and therefore still does not affect the desired behavioural change.

Interestingly, the UNDP and Indonesian Government (2012b, pp. 52-3) conducted an evaluation of the programs run by Karst, BYTRA and Ibu Foundation. The evaluation found the programs 'dramatically' increased community member 'awareness levels of the availability of evacuation facilities in their villages…from around 2 percent to around 51 percent'. On the contrary, Karst stated (2015, pers. comm., 15 June) that risk communication strategies are not, in fact, increasing community participation and social resilience. Here, the difference can be seen between active participation and behavioural change and the passive receipt of knowledge or mere awareness. Despite more people being

aware of the existence of TEBs, in the absence of effective risk communication, this has not led to an uptake of VPE practices and a subsequent increase in community preparedness.

Context and credibility: role of religion

The low effectiveness ranking for the risk communication strategy of seminars at Friday prayer can be distinguished from the fact that BYTRA, Karst and SHRA did not consider the risk communication criteria of religious and cultural context in the design of their DRR programs. Although the individual strategy of seminars was ranked ineffective, this does not negate the importance of religion in terms of social context. As discussed in Section 2, most people currently attempt to evacuate to well-socialised TEBs, such as the Grand Mosque. The Grand Mosque is a religious place as well as a TEB. There is a prevalent and ingrained belief that the mosque is protected by God and therefore, a natural, almost necessary, consequence is that believers seek refuge at the mosque at a time of need to pray to God for protection and salvation. This can be illustrated by Affan et al.,'s (2012) study, which shows evacuees preferring religious and culturally socialised TEBs over other TEBs.

The living memory of the 2004 tsunami has led to a lack of community confidence in TEBs (Goto et al., 2010; Folger 2014). The experience of residents in the 2004 event was that nearly all buildings in the coastal region were completely destroyed. The issue is not that residents are not aware of TEBs but that they do not yet have confidence in the structures. The Grand Mosque, which is viewed as safe due to its survival in the 2004 event, and religious significance, is actively recognised and used as a TEB during tsunami scares whilst other secular, foreign-built TEBs remain empty (Affan et al., 2012). Therefore, due to the strong correlation between natural disasters and seeking protection through prayer, existing secular TEBs could be transformed into religious spaces, such as mosques. This would likely enable greater utilisation of existing TEBs by engaging in the social and religious context.

Context and credibility: role of culture

The results of the survey showed that the importance of the local culture of *gotong royong* was emphasised by DRR providers. In particular, SHRA highlighted the importance of prioritising local knowledge and practices in future to improve risk communication effectiveness. Mardiasmo et al., (2015) have identified *gotong royong* as a double edged-sword. Although *gotong royong* can act as a positive cultural influence promoting cooperation and self-reliance, these organic

collaborative practices may also at times conflict with 'government led disaster response and recovery management activities' (Mardiasmo et al., 2015, p. 301). This is an area where more research is needed. Although the scope of this paper does not extend to a complete consideration of the dynamics between *gotong royong* and organised disaster preparedness programs, future research could investigate how *gotong royong* can be integrated with organised DRR programs and its potential can be maximised to increase social resilience. As *gotong royong* is a form of social capital (Mulyasari & Shaw 2014) integration or engagement with this social network could greatly increase the effectiveness of risk communication and, in turn, preparedness and resilience.

CONCLUSION

Credibility and context are key risk communication criteria which are currently not actively being incorporated into risk communication strategies by DRR providers in Aceh. Risk communication strategies that engage with religious and cultural beliefs are more appropriate to the local context, whilst simultaneously utilising informal community trust structures. Religion and culture have a significant role in shaping people's perspectives of disaster and in changing their behaviour (Said et al., 2011; Adiyoso & Kanegae 2015). The primary barrier to effective risk communication in Aceh is the failure to engage with, or in some cases the dismissal of, religious and cultural context. Organisations should focus on increasing community confidence in designated TEBs, other than the Grand Mosque and Tsunami Museum, through either socialisation by engaging with religious and cultural social structures, or functional transformation of secular TEBs into places of worship. Whilst including non-Muslim minorities, it is recommended that organisations take actions to integrate religious perspectives and institutions into DRR programs, as well as considering the local culture of *gotong royong.*

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