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Using social media for natural disaster resilience (booklet)

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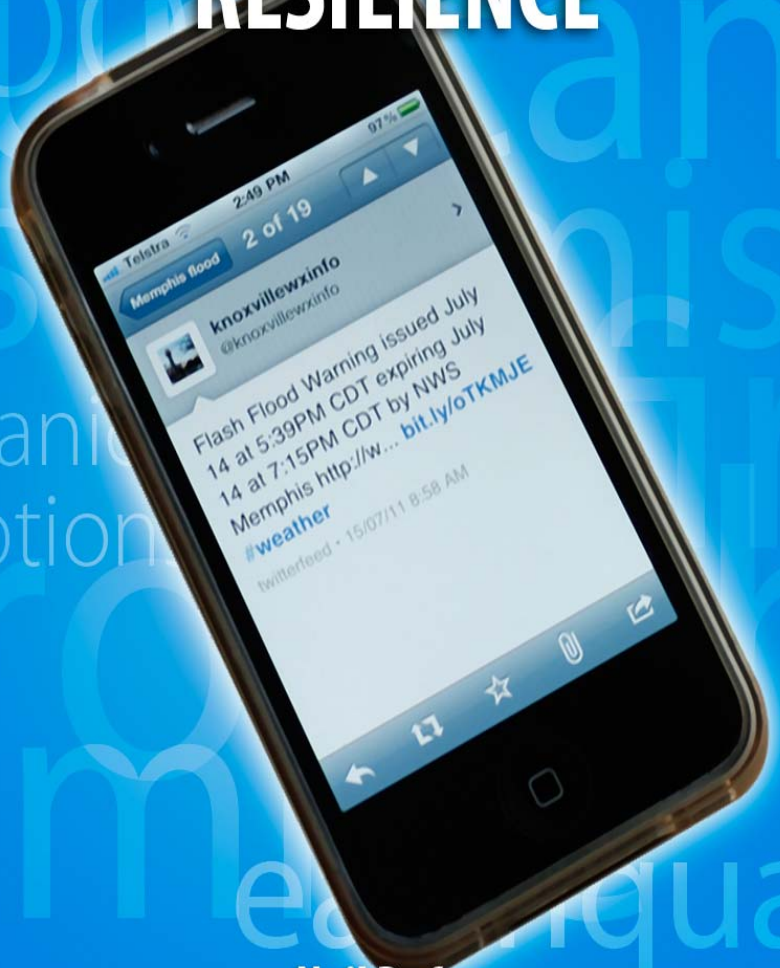
USING SOCIAL MEDIA FOR NATURAL DISASTER RESILIENCE



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FOREWORD

My initial experience of the use of social media in disasters was when my wife and I were involved in a near-disaster travelling on a plane. We were on a flight returning from San Francisco to Sydney during September 2010. Some 30 minutes into the flight, the plane gave an almighty shudder and lurched to the left. It was plain to see that the plane was in trouble as the flight crew were racing along the aisles. And all passengers on the right side of the plane could see the cause of the trouble: an engine was flaming like a roman candle!

As we were informed of emergency landing procedures by the pilot, I noticed a young man photographing the engine 'light show' using his smartphone. And the rest of the flight was good news: we successfully made an emergency landing back in San Francisco after jettisoning some 80,000 litres of fuel into the Pacific Ocean.

After landing, we were immediately set upon by a local San Francisco TV channel. At 2 AM (and only one hour after the explosion), I was amazed that the TV station knew about the near-disaster. It had apparently already accessed the young man's flaming engine photo which he had sent via Facebook to the Australian media and his friends.

More recently, I reviewed community responses to the 2011 Queensland and Victorian flood disasters in Australia. As reported in this booklet, emergency agencies and concerned citizens set up social media sites during these disasters to warn communities and provide support during and after the floods. I was amazed at the extensive and varied use of social media during the floods and other recent natural disasters such as the 2010 Haiti earthquake.

Through these experiences and my research into natural hazard education and engagement, I offer the following insight into the use of social media in building community resilience to future natural disasters. Hopefully, it will be of value to all who use or consider using social media for natural disasters.

Neil Dufty

THE UPSURGE IN SOCIAL MEDIA USE

Social media consist of tools that enable open exchange of information through conversation and interaction. Unlike the traditional internet sites, social media manage the content of the conversation or interaction in the online environment. As Keim and Noji (2011) state, 'social media rely on peer-to-peer (P2P) networks that are collaborative, decentralised and community driven. They transform people from content consumers into content producers'.

Social media are extremely diverse and include popular social network web sites such as Facebook and Twitter. In comparison with traditional media, Facebook resembles talkback radio whilst Twitter, with its limited character use and focus on what people are doing, is like a series of news flashes. Other social media share videos and photos (e.g. YouTube and Flickr), documents (e.g. Google Docs) and maps (e.g. Google Maps).

Facebook was by far the most popular social media site as at 2011 with almost 700 million users worldwide (as at July 2011). Twitter was second with 180 million users worldwide, then LinkedIn (100 million) and MySpace (80 million).

According to social media monitors Social Bakers (www.socialbakers.com), huge growth in South America and Indonesia is tipped to take Facebook to the billion user mark in 2012. The US has the most users at 149 million – almost half its population.

Social media use is becoming part of everyday life. On average, global web users across 10 countries spent roughly five and a half hours on social networks in February 2010, according to a study undertaken by the Nielsen Company. While the U.S. boasts the largest unique social networking audience, Italian and Australian web surfers led the way for average time on site with more than six hours, the study found.

A major factor in the increased number of social media users and the length of social media use is the upsurge in the number of people using smartphones. A smartphone is a high-end mobile phone that offers more advanced computing ability and connectivity than a contemporary feature phone (i.e. a modern low-end phone). A smartphone combines the functions of a personal digital assistant (PDA) and a mobile phone. Today's models typically also serve as portable media players and camera phones with high-resolution touchscreen, GPS navigation, Wi-Fi and mobile broadband access.

According to an Olswang report in early 2011, the rate of smartphone adoption is accelerating worldwide. For example, 22% of U.K. consumers had a smartphone, with this percentage rising to 31% amongst 24–35 year olds.

A Nielsen survey released in July 2011 indicates that 38% of all U.S. mobile consumers now own smartphones. Of those, 55% are recent handset

purchasers who selected a smartphone . By contrast, only 28% of U.S. mobile consumers were equipped with smartphones in the third quarter of 2010 when 41% of recent buyers said they had purchased a smartphone, according to the survey.

The increasing use of smartphones is a critical factor in the ability of people to access social media before, during and after natural disasters. During and after disasters, power supplies can be cut and thus access to social media via computers can be prevented. Assuming mobile communication towers are not compromised and the smartphones can be recharged at some stage, smartphones are a potentially powerful tool in disaster communication and learning.

RESILIENCE TO NATURAL DISASTERS

Natural disasters

Natural hazards are those components of naturally occurring events such as hurricanes, earthquakes and floods capable of threatening people and the things people value (Gregg and Houghton, 2006). Many natural hazards are interrelated e.g. earthquakes can cause tsunamis and drought can lead directly to famine.

Some parts of the world are prone to several types of natural hazards. These 'complex hazardscapes' include parts of Central America which are exposed to a range of the most violent natural hazards on earth, including earthquakes, hurricanes, and volcanic eruptions. Parts of Australia can experience both bushfires and floods in a year.

There is considerable debate over what constitutes a natural disaster, although most experts would agree that it occurs when a natural hazard event overwhelms a community's normal coping response mechanisms and external assistance is required. Some of the debate is related to when a natural disaster is proclaimed and external financial aid is required. For example, in the U.S. a Governor may determine, after consulting with local government officials, that the recovery appears to be beyond the combined resources of both the state and local governments and that federal assistance may be needed. In requesting supplemental Federal assistance under the *Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. §§ 5121-5206* (Stafford Act), the Governor must certify that the severity and magnitude of the disaster exceed state and local capabilities; certify that Federal assistance is necessary to supplement the efforts and available resources of the state and local governments, disaster relief organisations, and compensation by insurance for disaster related losses; confirm execution of the state's emergency plan; and certify adherence to cost sharing requirements (Federal Emergency Management Agency Fact Sheet). Federal proclamation of a disaster may involve economic aid for the disaster response, recovery and post-disaster mitigation of the order of hundreds of thousands to billions of dollars.

The number of declared natural disasters has increased worldwide. The number of natural disasters across the world at a country level has risen markedly from about 60 in 1975 to 432 in 2005, with a slight drop to 373 in 2010 (Centre for Research on the Epidemiology of Disasters, 2011).

These natural disasters have exacted sobering and extensive tolls on impacted communities. For example, recent figures show the 2010 Haiti earthquake killed up to 316,000 people (although initial estimates were 220,000 people dead). In 2005, Hurricanes Katrina, Rita and Wilma caused a total of $173 billion US in damages.

‘The increasing toll of natural disasters reflects conditions such as increasing population numbers and densities, expanding development, and the increasing value of resources we place in harm’s way’ (Gregg and Houghton, 2006).

There is considerable debate over whether climate change has and will cause a rise in the number and impact of natural disasters related to extreme weather events. However, according to the US Environmental Protection Agency, ‘human-induced climate change has the potential to alter the prevalence and severity of extremes such as heat waves, cold waves, storms, floods and droughts. Though predicting changes in these types of events under a changing climate is difficult, understanding vulnerabilities to such changes is a critical part of estimating vulnerabilities and future climate change impacts on human health, society and the environment’.

For the U.S., the Intergovernmental Panel on Climate Change Fourth Assessment Report (IPCC, 2007), makes the following observations:

‘Since 1950, the number of heat waves has increased and widespread increases have occurred in the numbers of warm nights. The extent of regions affected by droughts has also increased as precipitation over land has marginally decreased while evaporation has increased due to warmer conditions. Generally, numbers of heavy daily precipitation events that lead to flooding have increased, but not everywhere. Tropical storm and hurricane frequencies vary considerably from year to year, but evidence suggests substantial increases in intensity and duration since the 1970s.In the extra-tropics, variations in tracks and intensity of storms reflect variations in major features of the atmospheric circulation, such as the North Atlantic Oscillation’.

The IPCC report projects the likely, very likely, or virtually certain changes in extreme events and associated effects between now and 2100. For the U.S., these projections include an increase in the frequency of heavy precipitation events in most areas (that could lead to flood disasters), an increase in the area affected by drought and an increase in the number of hurricanes. It should be noted that directly linking any one specific extreme event (e.g. a severe hurricane) to human-caused climate change is not possible. However, climate change may increase the probability of some ordinary weather events reaching extreme levels or of some extreme events becoming more extreme.

Resilience

The term resilience has many meanings across a range of academic fields including psychology, sociology, engineering, physics and ecology. It is derived from the Latin root *resiliere*, meaning to ‘jump back’.

Several governments around the world now see resilience as a key strategy to adapt to climate change and to continue the move towards sustainability (Dufty 2008a). For example, in December 2009, the Council of Australian Governments (COAG) agreed to ‘adopt a whole-of-nation resilience-based approach to disaster management, which recognises that a national,

coordinated and cooperative effort is needed to enhance Australia's capacity to prepare for, withstand and recover from disasters. The National Emergency Management Committee subsequently developed the National Strategy for Disaster Resilience which was adopted by COAG on 13 February 2011'.

The purpose of the Strategy is to 'provide high-level guidance on disaster management to federal, state, territory and local governments, business and community leaders and the not-for-profit sector. While the Strategy focuses on priority areas to build disaster resilient communities across Australia, it also recognises that disaster resilience is a shared responsibility for individuals, households, businesses and communities, as well as for governments. The Strategy is the first step in a long-term, evolving process to deliver sustained behavioural change and enduring partnerships' (Australian Attorney-General's Department website: www.ag.gov.au).

The Strategy (COAG, 2011) identifies the following seven groups of actions to build disaster resilience in Australia.

1. Leading change and coordinating effort
2. Understanding risks
3. Communicating with and educating people about risks
4. Partnering with those who effect change
5. Empowering individuals and communities to exercise choice and take responsibility
6. Reducing risks in the built environment
7. Supporting capabilities for disaster resilience.

In relation to social media use, we are here primarily concerned with individual and community resilience to natural disasters (and not other types such as economic and ecological resilience). Even with this narrower focus, there is a plethora of definitions of community or social disaster resilience. For instance, psychologists may measure resilience in terms of mental health indicators such as post-traumatic stress disorder, whereas sociologists may look at resilience in terms of abilities to regain social networks and functions.

Whether emanating from sociology, psychology or education, most definitions of individual and community disaster resilience have in common the idea of 'the capacity to bounce back to usual functioning'. Paton (2006) argues that this is not sufficient and that resilience should also include seizing 'the new possibilities opened up by the changes wrought by the disaster'. According to Paton, these new possibilities include communities making choices about how to rebuild and to reorganise their social and institutional relationships for the better. Taking this extra dimension into account, Dufty (2008a) defines community disaster resilience as 'the ability of a community to not only resist and recover from a disaster but also to learn from and adapt to the changed realities that the disaster may cause'.

It is well-documented that the impact of natural disasters can be mitigated by engineering solutions (such as levees for floods), planning (e.g. not allowing further development along a fault line or on land prone to sea level rise) and

property modification (e.g. physically raising flood-prone houses, structural improvements to buildings prone to cyclones or hurricanes). Emergency agencies can also help individuals and communities with disaster preparation, warning, response and recovery. However, none of these methods can totally protect individuals and communities from natural disasters. Community resilience as defined above addresses the 'residual' risk to communities and is therefore a critical strategy in minimising loss of life, injury and damages relating to the increasing number of natural disasters around the world.

How can we build community resilience to natural disasters? Paton (2008) identifies two elements to community disaster resilience:

1. The existence of people's own resources or abilities that are required to facilitate coping with the disruption and the loss associated with the disaster. This makes preparation an important component of resilience.
2. The systems and competencies required by people and communities to use these human resources to coordinate and adapt to challenging circumstances and consequences. Dufty (2008b) suggests that these systems could include community warning systems, and relief and recovery systems (e.g. to mobilise volunteers). Competencies could include support networks (e.g. neighbourhood, community groups), leadership, mentoring, coordination, volunteering and communication skills.

As stressed above in the definition of community disaster resilience, it is also important for individuals and communities to learn from a natural disaster to improve their functioning including their preparedness, competencies and systems for future disasters.

To build disaster resilient communities a paradigm shift in emergency management is required. No longer can emergency agencies be largely responsible for disaster prevention, preparedness, response and recovery (PPPR). Communities must share some of the responsibility to prepare for, respond to, and recover from disasters. The concept of 'shared responsibility' is explained in the final report of the Royal Commission into the 2009 Victorian Bushfires in Australia:

'The Commission uses the expression "shared responsibility" to mean increased responsibility for all. It recommends that state agencies and municipal councils adopt increased or improved protective, emergency management and advisory roles. In turn, communities, individuals and households need to take greater responsibility for their own safety and to act on advice and other cues given to them before and on the day of a bushfire.

'Shared responsibility does not mean equal responsibility……there are some areas in which the government should assume greater responsibility than the community. For example, in most instances fire authorities will be more capable than individuals when it comes to identifying risks associated with a fire; the government should therefore assume greater responsibility for working to minimise those risks'.

As the Australian Government stresses in its National Strategy for Disaster Resilience, ‘achieving disaster resilience is not solely the domain of emergency management agencies; rather, it is a shared responsibility across the whole of society’.

The use of social media is one way to put shared responsibility into action.

THE USE OF SOCIAL MEDIA IN RECENT NATURAL DISASTERS

Potential use

As noted previously, particularly due to the upsurge in the development and use of smartphones in recent years, social media have become very accessible for use in natural disasters. A few studies have been carried out to gauge the potential use of social media in a disaster or emergency. An American Red Cross study conducted in 2010 found that three-quarters of those surveyed use at least one type of social media. There were a far greater proportion of those between 18-34 years (89%) that used social media than with those surveyed over 35 years (65%). Facebook was by far the most popular social media channel with use by 58% of those surveyed.

One-in-six (16%) of those surveyed in the American Red Cross study had used social media to obtain more information about an emergency such as a power outage, severe weather, flash flooding, flash flood, hurricane, earthquake or tornado. The television news (63%) was the most popular way to obtain emergency information, followed by local radio (44%) and online news (37%).

About half of the social media users in the American Red Cross survey confirmed that they would mention natural disasters on their social media channels. Of those that have posted information about an emergency or natural disaster (18%), about three-quarters have used Facebook, with 22% using a blog and 21% Twitter.

During an emergency, nearly half of those surveyed in the American Red Cross study said they would use social media to let loved ones know they were safe in an area-wide emergency. Almost all (89%) of these would use Facebook to post information about their safety, with 28% saying they would use Twitter.

The University of Western Sydney (UWS) conducted a study involving interviews and an online survey in Australia (Taylor, Howell and Raphael, 2011) during April 2011 using some questions from the American Red Cross study for comparison. Similar to the American Red Cross Survey results, of those that completed the UWS online survey about the use of social media, 78% were female and 71% were under the age of 44 years. Most of those interviewed (89%) used social media every day or nearly every day.

From the UWS study, 56% of respondents were equally likely to rely on ‘official’ (i.e. from emergency agencies) and ‘unofficial’ sources of information during disasters and emergencies. Males were more likely to rely on ‘official’ information than females.

There were several differences in responses between the UWS study and the American Red Cross study. For example, 73% of respondents in the UWS study would ask people to help them reach a response agency through a

social network like Facebook or Twitter to get help compared with 44% in the American Red Cross survey. Also, 52% of respondents in the UWS survey would post a request for help on a response agency's Facebook page compared with 35% in the American Red Cross survey. However, 28% of respondents in the American Red Cross survey would send a direct message via Twitter to a response agency requesting help compared with 18% from the UWS survey.

During natural disasters

Social media have been extensively used by individuals, emergency agencies and other organisations during recent natural disaster events. They have been used during those natural disasters such as floods, bushfires, tsunamis, hurricanes/cyclones and tornadoes where there is some warning time and the disaster event continues for a significant duration.

Already established prior to the Queensland floods, the Facebook page managed by the response agency the Queensland Police Service (QPS) grew from 6,000 'likes' to 160,000 'likes' in just 24 hours on 11 January 2011 as people across Queensland, the rest of Australia and the world desperately sought to obtain information about the ongoing disaster. There were 39 million views of the page in that day, over 450 views per second. 'Thank heavens it wasn't our website. January 11 blew us out of the water', head of the QPS media unit, Kym Charlton stated. She added, 'we realised this (social media) was easily the fastest, most effective way to get information to people in Queensland and also to our media stakeholders. It helped reduce fear. People felt like they were engaged and informed'.

An analysis of Twitter use during the Queensland floods was carried out by the Queensland University of Technology. It found that the QPS Twitter site was a major source of information during the floods between 11 and 14 January 2011. The mainstream media outlets were the other top news sources during the Queensland floods, the analysis showed.

Another interesting feature of the January/February 2011 Australian floods and Cyclone Yasi (which battered northern Queensland) was the establishment of social media sites by interested members of the public. For example, one person's page - 'Toowoomba and Darling Dows Flood Photos and Info' - was set up within one hour of the flood (and prior to official responses) as a repository of photographs and information about the missing. The site gained 37,000 fans.

After natural disasters

Social media have also been extensively used by individuals, emergency agencies and other organisations in the response to and recovery from recent natural disasters.

On 12 January 2010, a magnitude 7.0 earthquake struck Haiti, the poorest country in the Americas. The earthquake caused widespread damage to the densely populated capital of Port-au-Prince with over 250,000 people killed, 300,000 injured, and over one million people left homeless. Most of the government buildings were destroyed, and the major port and international airport were severely degraded.

Although there were over 9,000 UN troops in Haiti, most were dispersed across the country and thus were unable to quickly form as a relief force. Although numerous aid agencies operated in Haiti, most also lost infrastructure and unfortunately may aid workers were killed or injured. The United States was more fortunate in that its embassy was undamaged and its personnel were quickly able to establish contact with the Government of Haiti and emergency resources in the U.S., initiating a response effort. Within hours, search and rescue teams were on their way from all over the world.

Over the next few months a massive recovery operation was undertaken. Over 2.4 million bottles of water and 3.4 million meals were distributed, along with over 70,000 households given shelter materials. The issues of opening the port and international airport still remained weeks after the response. Ongoing care for civilians, including stabilising medical conditions and extending aid to mental health and trauma support, remained the top priority.

Social media were used to help coordinate the emergency response particularly using the Microsoft SharePoint information infrastructure. According to Yates and Paquette (2011), ‘the (SharePoint) platform could be considered “social” as it provided several key functions of social media: it allowed web pages to be created “on the fly” by anyone on the team. Further, all contributions were tagged with the contributor’s name and contact information’. Social media facilitated knowledge in two ways for the response effort: by increasing knowledge reuse within a staff and by eliminating the reliance on formal liaison structures between staffs.

Another feature of the Haiti earthquake response was the use of ‘crowdsourcing’ - data collection and information sharing where individuals assist emergency managers by tagging photographs, creating customisable maps, and offering cultural and other useful background information - to obtain valuable crisis information from the Haitian community. According to Heinzelman and Waters (2010), ‘the traditional information-gathering approach used by the United Nations and relief organisations is focussed on collecting intelligence through internal channels. In Haiti, the typical rapid-needs assessments were time demanding, especially for teams unfamiliar with the environment. The system lacked the ability to aggregate or prioritise information that came from outside sources, making it difficult to pull local intelligence into the process. Additionally, the mass of extra-organisational information was unwieldy. Organisations did not have the capacity to verify reports or develop networks of trusted sources and often faced challenges with language and translation’.

Ushahidi – an open-source crisis-mapping platform that had been originally developed following Kenya's 2007-08 post-election violence – came online in Haiti in the first two hours after the earthquake. Approximately 85% of Haitian households had access to mobile phones at the time of the earthquake and even though most of the phone towers had been destroyed, they were quickly repaired. Ushahidi enabled information to be gathered from Haitians though social media (e.g. blogs, Twitter, Facebook) and text messages sent from mobile phones. Reports about trapped persons, medical emergencies, and specific needs (e.g. food, water, shelter) were received and plotted on maps that were updated in real time by an international group of volunteers. These reports and associated geographic information were available to anyone with an internet connection. Responders on the ground soon began to use them in determining how, when and where to direct resources' (Heinzelman and Waters 2010). Further details about Ushahidi can be found at www.ushahidi.com.

The March 2011 Japan earthquake and tsunami further demonstrated the use of social media in helping determine the location and health of loved ones. Websites powered by broadband connections became a lifeline for many in Japan when mobile phone networks and some telephone landlines collapsed in the hours following the 8.9 scale earthquake. Many mobile phone networks were unable to cope in the immediate aftermath of a crisis, as hundreds of thousands of customers tried to make a call or send a text message at the same time. On the other hand, Twitter and Facebook were easy, quick and reliable ways of keeping in touch with relatives, as well as providing emergency numbers and information to those in stricken areas. Within an hour, more than 1,200 tweets a minute were coming from Tokyo. Even the US State Department issued the following tweet: 'Telephone lines disrupted; try contacting loved ones via email, text (SMS) or through social media'.

Skype - the phone service that operates over the internet – and Google – the information website – also became invaluable resources for those searching for missing relatives after the Japan disaster.

USING SOCIAL MEDIA TO BUILD RESILIENCE

As described previously for recent natural disasters, social media are fast becoming extremely useful tools for communicating in disaster response management. In fact, recent disaster experiences may have helped legitimise social media in the world of knowledge communications. As Yates and Paquette (2010) suggest, 'disaster response may be the ideal environment for "proving the worth" of social media as a serious knowledge management platform. Social media's value is predicated on frequent contributions of small knowledge chunks in various forms to acquire, share and, use. The information currency of disaster response is increasingly text messages, images, short videos, blog posts and web links – all encapsulated knowledge chunks. Social media's strengths are in supporting ad-hoc network formation bringing together various players with different expertise and contexts, and providing some level of common ground between them. Disaster response typically involves a coordinated response between individuals and agencies that in fact have different functions, expertise, and contexts. Finally, social media is designed to create order from chaos, using media as an artefact around which knowledge is organised in clusters, such as comments in blog posts or tags on images. Decision makers in disaster response require knowledge contributions to be highly contextualised because environments are fluid and misunderstandings are common. In short, it seems that social media are inherently flexible yet have the robust knowledge structures that are closely aligned with how knowledge is gathered, shared and employed in a disaster response'.

However, to make a difference in community disaster resilience, social media must not only benefit disaster response but also assist in other aspects of disaster management, in post-disaster learning and in building capabilities and systems. The following analysis identifies performance to date and opportunities across these aspects of disaster resilience-building. The key concept of 'sharing responsibility' between emergency managers and communities is highlighted throughout the discussion.

Disaster risk reduction

Disaster risk reduction (DRR) focuses on reducing the underlying factors that contribute to human disaster vulnerability and aims to enhance community resilience. It is a systematic approach to identifying, assessing and reducing the risks of disaster. DDR usually involves a series of steps including establishing context, identifying risks, analysing risks, assessing risks and treating risks. It has a broader and deeper focus than conventional emergency management which generally uses the prevention, preparedness, response and recovery (PPRR) model outlined below.

There are numerous opportunities for communities and governments to work together through the steps of DDR using social media. For example, this author has designed a consultation and communications plan including the use of social media for communities and local councils in coastal NSW,

Australia to discuss the risks of flooding, particularly as a result of possible sea level rise. Social media such as Facebook, Twitter and online feedback forms allowed a forum of property owners and other stakeholders to identify flood risks and put forward their views on possible ways to manage risks.

Climate change adaptation (CCA) is defined as 'an adjustment in natural or human systems in response to actual or expected climate change stimuli or their effects, which moderates harm or exploits benefit opportunities' (IPCC 2007). There is a strong link between CCA and DDR (Gero, Meheux and Dominey-Howes 2010) as both focus on reducing vulnerability and enhancing resilience. There are therefore opportunities for social media discussion and learning around DRR linked with CCA and climate change generally. There are a plethora of existing social media sites such as in Facebook, Twitter and blogs for this discussion about risk reduction and climate change to grow. There is also the opportunity for specific communities to establish social media sites to discuss and decide on disaster risk reduction measures as part of climate change adaptation.

Disaster prevention

Disaster prevention is the first stage of the PPRR model usually used by many emergency agencies around the world. It includes a range of mitigation treatments emanating from DDR. Mitigation treatments can include engineering solutions (e.g. building flood levees), legislation, planning (e.g. to control development in hazard-prone areas) and community education. The Australian Government has identified three categories of ways to mitigate the impacts of flooding (Department of Transport and Regional Services 2002):

1. Flood modification aims to avoid loss by keeping the water away from development. This is the traditional form of mitigation, provided by structural measures (e.g. levees, detention basins, dams) aimed at modifying the flow of floodwater.

2. Property modification aims to avoid or minimise loss by keeping development away from the floodwater using land use planning or building design, siting and materials.

3. Response modification aims to modify human behaviour through activities such as education, warning systems and preparedness planning.

There are opportunities to discuss these mitigation treatments with communities through social media and decide on the most suitable treatments. This discussion could lead to communities that understand their mitigation treatments (including limitations) and the roles they can take in prevention (e.g. regularly cleaning out gutters in bushfire-prone areas).

Disaster preparedness

It has become increasingly apparent that engineering and planning measures by themselves cannot protect communities in all natural disasters. The importance of well-prepared communities is thus paramount to reducing the

impact of natural disasters. Ways to achieve this is through ongoing community disaster education and engagement, pre-disaster drills (e.g. practising evacuations) and disaster simulations. It is critical that individuals, households and businesses have emergency plans that should be developed and reviewed as part of preparedness activities.

Many response and emergency agencies around the world have commenced a social media presence to engage with people about how to prepare for and respond to natural disasters. For example, according to Craig Fugate, Administrator, U.S. Federal Emergency Management Agency (FEMA) 'through the use of social media we can disseminate important information to individuals and communities, while also receiving essential real-time updates from those with first-hand awareness'.

As Mr Fugate stresses, 'FEMA uses multiple social media technologies to reach the public where they already go for information and provide valuable disaster and preparedness information'. FEMA utilises several social media channels such as YouTube, Facebook and Twitter as tools to communicate with the public. More than 33,000 followers access FEMA's Facebook page to receive updates on current situations and obtain preparedness tips through text, photographs and videos.

With FEMA's YouTube page, users can watch videos detailing FEMA's response and recovery efforts, along with clips on topics such as how to prepare a disaster kit, what to do and where to go in an emergency, and how to apply for disaster assistance.

FEMA's Twitter account offers brief updates to those looking for disaster preparedness or situational updates. FEMA uses 16 different Twitter accounts including the main FEMA account (@fema), the Ready campaign account, dedicated to educate and empower Americans to prepare for and respond to emergencies (@ReadydotGov) and Citizen Corps which helps coordinate volunteer activities (@citizen_corps).

In recognition of smartphones being in some cases the only method of communication in a natural disaster, in early 2010 FEMA launched its first-ever mobile website which allows the public to view web pages on smartphones. The mobile site features information on what to do before, during and after a disaster, along with the ability to apply for federal disaster assistance directly from the phone.

FEMA has also partnered with other organisations to set up social media sites that help people prepare for natural disasters Twitter users can follow topics of conversation that are of interest to them by following a 'hashtag' (the name given to a common topic of conversation on Twitter). FEMA created the #imprepared and #kidsfiresafety hashtags, and in partnership with the American Red Cross, created the #howihelp hashtag. The #imprepared hashtag is used to encourage individuals and families to get prepared, the #kidsfiresafety hashtag is used to encourage parents to practise safety tips and the #howihelp hashtag is used to encourage people to talk about how

they help their neighbours and communities. The Social Media in Emergency Management hashtag (#smem) allows all members of the U.S emergency management community to connect and discuss aspects of emergency management.

Emergency managers have provided online tools for households and businesses to develop emergency plans. For example, the NSW State Emergency Service in Australia has developed an online template for businesses to develop flood emergency plans as part of their business continuity plans.

Social media provide an opportunity to build competencies and systems that are an integral part of community disaster resilience. For example, YouTube has been used to provide visual online training for emergency volunteers. The potential extent and risk of a disaster can be explained and shared with others through Google Maps or other easily accessed spatial platforms.

It should be noted that some of the forays into social media use by emergency managers have been extremely well-timed. For example, the Queensland Police Service (QPS) – the response agency for the devastating February 2011 Queensland Floods in Australia – had trialled a Facebook page for six months prior to the floods. The QPS Facebook Page had 6,000 'likes' just prior to the time of the floods. Head of the QPS media unit, Kym Charlton said, 'early experiments such as live-streaming the funeral of an officer who died on duty failed, but the experience gained (for the floods) was crucial'.

Disaster response

There are opportunities to warn potentially-impacted people about some natural hazards such as floods, bushfires, tsunamis and hurricanes/cyclones. Unlike earthquakes where there is no warning, all of these other hazards allow some period of warning. In some cases, the warning time can be quite long e.g. residents in some towns along Australia's Darling River system have up to one month to respond to a flood.

Emergency agencies around the world are increasingly using social media in their systems to warn communities of potential natural disasters. For example, the Victorian State Government in Australia has developed a community bushfire warning system called 'One Source One Message' (OSOM) that is aimed at helping deliver 'timely, relevant and tailored' warnings. OSOM enables local bushfire incident management teams to issue centralised and consistent electronic warning messages to communities that are disseminated through the media (e.g. local radio), a telephone information line and the emergency agency's websites. OSOM is being further developed to enable these messages to be customised and sent out through social media (Facebook and Twitter). The OSOM system is coupled with the Australian national telephone warning system called 'Emergency Alert' which provides direct warnings to residents via messages through landlines and mobile phones.

In the U.K., the Environment Agency has recently launched a mobile phone application that provides the public with flood warnings. In England and Wales, more than five million people (one-in-six properties) are at risk from flooding from rivers and the sea. The app called 'Flood Alert' uses live data from the Emergency Agency to provide real-time updates on local flood warnings, as well as up to two chosen locations in England and Wales. The app also provides users with information on what they should do to help reduce flood risk e.g. home flood-proofing. The Environment Agency also uses its website, Facebook and Twitter to better inform local communities about potential floods.

Social media provide opportunities for emergency agencies to not only provide information during and immediately after a disaster but to also quell the spread of rumours and misinformation. For example, QPS used 'mythbuster' posts and tweets 'to puncture the many rumours about the 2011 Queensland floods that were rife at the time'.

Social media also provide opportunities for residents and other interested people to provide first-hand accounts about the disaster to the emergency agencies which may improve the information disseminated by the agency. Several non-government organisations have even established social media sites to provide people with the tools to warn others. For example, in Australia, a non-government organisation has set up Bushfire Connect (www.bushfireconnect.org) which enables users to report and locate bushfires, plus access warning messages and updates from fire authorities.

As noted in the previous chapter, there are several other uses of social media in natural disasters including locating and providing support to family and friends, providing real-time information to a worldwide media audience, obtaining advice as to appropriate actions and to coordinate response activities.

Disaster recovery

After the disaster event has ceased, the recovery phase commences. As described in the previous chapter particularly in relation to the 2010 Haiti earthquake, social media can be effectively used to locate need, and coordinate aid and recovery. It can also be used as a mechanism to donate money - during the first two days after the Haiti earthquake, social media users donated more than $5 million US to the American Red Cross.

After the 2011 Queensland floods, social media were used to seek volunteers to assist in the massive recovery. Over 60,000 volunteers registered from across Australia, with an additional 150 registering from overseas.

There is also growing evidence that using social media such as Facebook and Twitter can provide psychological benefits to those experiencing post-disaster mental health problems such as depression and anxiety. In relation to social media use, Keim and Noji (2011) state that 'disaster victims report a psychological need to contribute, and by doing so, they are better able to

cope with their situation. Affected populations main gain resilience by replacing their helplessness with dignity, control, as well as personal and collective responsibility'.

Post-disaster learning

As stressed at the start of this booklet, resilience should not only involve the ability of a community to return to its normal functioning but also to improve and seize on opportunities as a result of the disaster. Social media can assist in post-disaster learning which can help build communities after a disaster. For example, after the 2011 Queensland floods and Cyclone Yasi, Volunteering Qld hosted Queensland's largest ever Community Resilience Conversation on Thursday 17 February. The conversation enabled communities to connect in the aftermath of the state's recent severe natural disasters and to determine how to move forward together. Not only were the conversations advertised through social media, many were recorded on YouTube to share with others.

Social media can also be used to educate people about previous disasters in their community and to demonstrate resilience. For example, in Australia the Hunter-Central Rivers Catchment Management Authority produced a DVD with the NSW State Emergency Service, titled 'Memories come flooding back', featuring personal recollections from survivors and rescuers of the 1955 Maitland Flood. Abridged versions of some of the stories were uploaded to the Hunter-Central Rivers CMA YouTube channel: http://www.youtube.com/user/HCRCMA to commemorate the 56th anniversary of the flood.

ISSUES

Although there are numerous ways in which social media help build community disaster resilience through learning as described above, there are also some potential issues surrounding their use.

The use of social media for natural disasters is growing rapidly as shown by estimates that up to 15% of the resident population affected by the 2011 Queensland floods were using social media to obtain warning and other flood information. However, social media still remain less widespread and accessible than traditional media. In NSW (Australia), studies show that 12% of the state's population do not access the internet. This is most pronounced with the over 65 population where 42% do not access the internet. A further 16% of the state's population typically access the internet through a third party. With up to 30% not accessing the internet directly (a large proportion being potentially vulnerable older people) and only one-in-three of mobile users having a smartphone, it appears there is a need to retain the traditional disaster communication channels such as radio and television. This is supported by several studies e.g. from the UWS study that mainly focussed on the 2011 Queensland floods, 84% of respondents said they would turn to the television news in the event of an emergency or disaster, 58% would use local radio and 48% would turn to national radio.

Although the 'spikes' in social media use related to natural disasters can appear spectacular, they could blur the true effectiveness of social media as a disaster response and recovery communication medium. For instance, there could be many 'tourists' on these sites that may bump up usage numbers and divert discussion away from the real needs of affected people and their friends and families. Further analysis and social research is required to gauge the true effectiveness of social media in disaster response and recovery.

There can also be trust issues around misinformation emanating particularly from 'unofficial' sites. Also, in the absence of the normal checks and balances that regulate traditional media, privacy rights violations can occur as people use social media to describe personal events and circumstances.

There can be institutional issues for governments including emergency managers that are not use to this more fluid type of two-way or shared disaster communication. The traditional model of disaster response communications is unidirectional, authority-to-public information broadcasts. On the other hand, social media are collaborative, decentralised and community-driven. Some response agencies have demonstrated reticence in establishing a social media presence because of the paradigm shift required from 'controlling' the information flow to being part of it. Several agencies have stated that they will have to rewrite their communications policies as a result and there are issues around authorisation of their social media statements. Some have felt they are 'under-resourced' to monitor and manage the social media dialogues and respond as required (although experience shows that these sites are largely self-regulatory). Agencies also

wish to verify ‘crowdsourced’ intelligence prior to including this information in warnings and other response activities.

Social media ‘communities’ can be quite different to those targeted in conventional disaster communications and natural hazard education. Traditionally, disaster communications and education focus on discrete groups of people usually living in potentially hazard-affected areas such as rural towns or city suburbs. However, social media ‘communities’ can be much broader through their networks linking ‘friends’ both within and outside the hazard-affected area. Emergency managers need to understand and fully utilise these social media communities as well as the ‘traditional’ communities in their disaster communications and education.

Although confronted with the above and other issues, many emergency and response agencies have taken the social media step. As one disaster response agency officer stressed, ‘if we don’t get into social media, someone else will and take our place!’ There are numerous guides and practical tips for the use of social media by agencies such as those in a blog from David Micaleff of Fenton Communications:

‘1. Plan and test your social media strategy – Know how you will utilise social media if a disaster was to impact your organisation and make a plan for its monitoring and its use.
2. Keep information up to date – It is essential that information is updated and updated quickly in disaster situations. Ensure that you have plans in place to get content up quickly. Are your web team accessible 24 hours a day or will essential information end up waiting till them come back at 9am on Monday??
3. Monitor social media – Set up your means for monitoring social media. If you are working in a disaster area, set up searches to monitor discussion on the disaster. If the disaster is impacting a specific region, location based monitoring of a geographic area can be invaluable in seeing the online chatter coming out of that area.
4. Respond to issues, no matter how small they may seem – It is important to remember that what can often seem like a small issue to those outside of a disaster can often be a 100 times worse to those going through trauma.
5. Be vigilant about the accuracy of information and correct mistakes – Mistakes in disaster situations can often be the meaning between life and death, make sure that mistakes are corrected quickly.
6. Don’t assume that just because something is online, that everybody has seen it or understood it – Don’t just rely on social media, your communications plan must try to reach people using a number of different tools and tactics.
7. Remember that sometimes the best way to help someone is offline not online – While in this post I have been heralding the importance of social media, we cannot forget that human contact is one of the best ways of helping someone. Take things offline where possible’.

THE FUTURE

From the evidence in this booklet, there is no doubt that social media has and will play an increasingly important role not only in responding to disasters, but in building community resilience to future disasters. As Associate Professor Axel Bruns from the Queensland University of Technology states, ‘these natural disasters have been a wake-up call for us. It has been a clear pointer to the value of social media during crises and how we should use it for future events. We need to find the next steps to further develop some of these platforms and how we can use tools such as Facebook and Twitter to more effectively map and share information.’

Several organisations around the world are already planning improved ways of using social media in their disaster management. For instance, FEMA, understanding that people most likely will have cell phones on them during disasters, has developed a mobile website that is easily accessed by smartphones.

FEMA also continues to encourage state and local governments to engage with the public via social networking sites. According to Craig Fugate Administrator of FEMA, ‘many states and localities are already taking action, and we are happy to support those efforts. For example, in the aftermath of the 2009 flooding in Tennessee, we worked with the Tennessee Emergency Management Agency (TEMA) and set up a joint Facebook page that we used as a resource to provide the public with the latest information about ongoing disaster response and recovery efforts in Tennessee. Now that the main recovery phase has concluded, TEMA uses the Facebook page as its own means to share preparedness and disaster-related information.’

The use of social media may precipitate changes in the way people learn how to prepare for disasters. Mr Fugate of FEMA continues, ‘I have often said that a commitment to personal preparedness among the individuals, families and communities we serve is one of the most important keys to our success. Traditionally, that has meant doing things like having an emergency kit and a plan to reunite with one's family, and that remains important. However, cell phones and social media have created new ways in which individuals can prepare themselves for disasters. A family or personal communication plan for disasters might include the following:

- Store useful phone numbers in your phone, including local police, fire departments and your utility company;
- Create a group for your emergency contacts on your cell phone;
- Know what social media tools are available to you at the state and local level, so that you can quickly access them in the event of an emergency;
- Have an extra battery for your phone (or a solar charger) in your emergency kit;
- In the aftermath of a disaster, update your social media channels to let your friends and family know you are safe by simply saying "I'm OK."

This helps reduce the volume of phone calls in an area so that necessary communications can continue to be made.

Personal and family preparedness is extremely important regardless of the disaster. However, as technology grows and changes so will the ways in which individuals and families must prepare for disasters'.

Another future challenge is the need to evaluate the use and effectiveness of social media in building community resilience, particularly as technologies rapidly change. Currently, although there is a large amount of monitoring data that can be accessed for social media usage (e.g. number of 'likes', location of 'likes'), its increasing use in relation to traditional media will largely depend on this and other evidence that it is making a difference. It is therefore imperative that emergency agencies develop ways to monitor and evaluate the use and effectiveness of social media as part of their management plans.

Ongoing dialogue between communities and governments about how best to use social media is critical for future natural disaster resilience. This dialogue will allow individuals and communities to better participate in future disaster communications and education using social media. It will enable communities and authorities to share responsibility for a disaster-resilient future. As bestselling author Seth Gordin comments:

Social media gives power back to the people who have wanted it for so long

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