



Emergency management perspectives on volunteered geographic information: Opportunities, challenges and change



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ABSTRACT

Volunteered geographic information (VGI) refers to the widespread creation and sharing of geographic information by private citizens, often through platforms such as online mapping tools, social media, and smartphone applications. VGI has shifted the ways information is created, shared, used and experienced, with important implications for applications of geospatial data, including emergency management. Detailed interviews with 13 emergency management professionals from eight organisations across five Australian states provided insights into the impacts of VGI on official emergency management. Perceived opportunities presented by VGI included improved communication, acquisition of diverse local information, and increased community engagement in disaster management. Identified challenges included the digital divide, data management, misinformation, and liability concerns. Significantly, VGI disrupts the traditional top-down structure of emergency management and reflects a culture shift away from authoritative control of information. To capitalise on the opportunities of VGI, agencies need to share responsibility and be willing to remain flexible in supporting positive community practises, including VGI. Given the high accountability and inherently responsive nature of decision making in disaster management, it provides a useful lens through which to examine the impacts of VGI on official authoritative systems more broadly. This analysis of the perceptions of emergency management professionals suggests changes to traditional systems that involve decentralisation of power and increased empowerment of citizens, where value is increasingly recognised in both expert and citizen-produced information, initiatives and practises.

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1. Introduction

In January 2013 Australia was in the midst of a bushfire (wildfire) disaster. Fire swept across the state of Tasmania, stretching capacities of emergency services and devastating communities (DPAC, 2013). No fatalities occurred during the blazes, but the event left many in need of emergency assistance with significant access issues due to road closures, power and communications disruptions, and the destruction of 203 residential buildings (DPAC, 2013).

As the disaster unfolded people flooded social media to connect to each other and share relevant geographic information and resources. One Tasmanian resident observed the growing online activity and set up a social media page to help coordinate the flow of information. Interest in the Facebook page Melanie Irons established, “Tassie Fires We Can Help” (www.facebook.com/tassiefireswecanhelp), rapidly spread with people sharing their locations, their requirements for help, offers of

assistance and other disaster related information (ABC, 2013). Within 24 h the page had gained over 17,000 followers and had reached over 2 million individuals (ABC, 2013; DPAC, 2013).

“We understood quite early on that people were trusting this page, that people were sharing information and it was getting results. People were putting out requests for fuel, for generators, for food and people were responding. So it almost bypassed the official channels. Well, it did. It essentially became a way for volunteers to communicate directly with people that needed help, without having to go through the official channels.” — Damien McIver, journalist (ABC, 2013).

With emergency services consumed by other tasks, such as fighting the spread of fire, Ms. Irons’ page filled critical gaps in the response to the disaster. Social media and geographic information volunteered by the public proved highly valuable in responding to the disaster through increasing connectedness, sharing information quickly and widely, and provision of crucial local perspectives and data that met specific local needs. This citizen-driven initiative engaged the public and mobilised the population to undertake a whole suite of important tasks not able to be completed by the official emergency response.

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The activities described above fall under the definition of volunteered geographic information (VGI), and in a disaster management context have also been labelled “digital volunteering” (McLennan, Whittaker, & Handmer, 2015), or “digital humanitarianism” (Burns, 2014), among other terms. VGI refers to the widespread voluntary engagement of private citizens in the creation of geographic information, predominantly through sources such as social media, smartphones and inexpensive online mapping tools (Elwood, Goodchild, & Sui, 2012; Goodchild, 2007). VGI is quickly becoming a new type of asserted geographic information complementary to authoritative geographic information collected by governmental agencies or private organisations (Jiang & Thill, 2015). Neither the practise of citizens contributing geographic information nor high public involvement in disasters is new. However, the rise of information communication technologies, broadband internet and Web 2.0, along with the proliferation of location-acquisition technologies such as global positioning systems and smartphones, has dramatically enhanced these practises and increased their visibility (Goodchild, 2007; Palen & Liu, 2007). VGI has shifted the ways geographic information is created, shared, used and experienced. This has important implications for various applications of geospatial data, including disaster management. VGI technologies enable cost-effective, rapid sharing of diverse geographic information from large numbers of community members. But VGI also presents new challenges for disaster management, including a lack of data quality assurance and issues surrounding data management, liability, and the digital divide (see Haworth & Bruce, 2015).

The implications of these changing social practises need to be considered in the context of traditional disaster management. Historically, disaster management has been an authoritative system with a top-down ‘command-and-control’ structure (Palen & Liu, 2007). As with traditional map-making and geography more broadly, the system was centred on experts, in this case emergency organisations, disseminating controlled messaging and services to the public. In this hierarchical system, authorities effectively hold power over information while citizens often remain passive end-users. Assistance and services to communities are delivered through the four phases of disaster management: Prevention, Preparedness, Response and Recovery (PPRR) (Prosser & Peters, 2010; Zakour & Gillespie, 2013). In recent years, there have been international moves towards disaster management approaches that focus on resilience and building community capacity with emphasis on shared responsibility (McLennan & Handmer, 2012; Prosser & Peters, 2010). Current emergency management policy in Australia aims to use the PPRR model to achieve a more resilient nation (Prosser & Peters, 2010). Increasingly, community engagement is becoming a key feature of strategies seeking to achieve this goal (E.g. Frandsen, Paton, & Sakariassen, 2011).

The “Tassie Fires We Can Help” example, like other cases of online public volunteering or crowd sourcing information for disaster management (see Bird, Ling, & Hayes, 2012; Meier, 2012), represents a disruption to traditional authoritative systems of disaster management. If traditional disaster management is centred on the notion of experts having control, the bottom-up, unpredictable and spontaneous nature of VGI challenges conventional authoritative practises within disaster management. Traditional command-and-control models “do not easily adapt to the expanding data-generating and – seeking activities by the public” (Palen & Liu, 2007, p.727), and instances of digital volunteering in emergency management have thus far largely occurred outside of formal emergency management systems (McLennan et al., 2015).

The purpose of this study is to explore the implications of VGI for authoritative emergency management. Challenges associated with the impacts of digital humanitarianism identified by volunteers themselves have recently been reported (see Burns, 2014). This paper examines the perspectives of individuals working in formal disaster management. Interviews with emergency management professionals provided insights into the benefits and challenges of VGI, opportunities for ensuring

complementarity between VGI and authoritative practises, and perceived changes in disaster management catalysed by VGI. I discuss the implications of VGI on traditional expert systems more broadly with particular reference to the discipline of geography.

The terms *disaster management* and *emergency management* are used interchangeably, but the paper’s focus is on emergencies associated with *natural hazard events*, such as fires, earthquakes, floods and storms.

2. Background to VGI and emergency management

Academic research into VGI and emergency management has largely focussed on the application of citizen-contributed data in disaster response (Haworth & Bruce, 2015). To provide some examples, after the devastating 2010 Haiti earthquake, volunteers from all over the world worked together to map the event online using information provided by the public. In the days following the earthquake over 600 volunteers contributed over 1 million edits for Haiti to OpenStreetMap (Meier, 2012). Similar volunteered mapping, data sharing and knowledge creation have also been critical for responding to the recent Nepal earthquake crisis (Bailey, 2015). The Ushahidi Crowdmapper platform (www.crowdmapper.com) was utilised during the Haiti earthquake to collect and map information contributed by those impacted by the disaster, notably through a text message service (Crawford & Finn, 2014; Meier, 2012). VGI and Crowdmapper also proved useful in responding to cyclone and floods in Queensland, Australia in 2010/11 (McDougall, 2011). Social media was used by impacted community members and authorities to effectively collate and share information during the flood events and combat the spread of misinformation (Bird et al., 2012; Taylor, Wells, Howell, & Raphael, 2012). Further, VGI was demonstrated to provide an alternative to official information sources during wildfires in Santa Barbara in 2007–2009 (Goodchild & Glennon, 2010).

Studies emphasise benefits and important considerations of VGI in disaster management (see Haworth & Bruce, 2015). Benefits include timely information exchange and promotion of connectedness (E.g. Taylor et al., 2012), provision of complimentary information for disaster mapping in regions where other spatial data are poor or absent (E.g. McDougall, 2011), and the ability to capture data in near-real time without limitations of other technologies, such as satellite imagery being affected by weather (E.g. Triglav-Čekada & Radovan, 2013). Challenges reported that need careful consideration for effective VGI use include issues associated with demographics, internet use and technology access (Haworth, Bruce, & Middleton, 2015), data quality (Goodchild & Li, 2012; Ostermann & Spinsanti, 2011), trust and credibility of VGI sources (Flanagin & Metzger, 2008), security (Shanley, Burns, Bastian, & Robson, 2013), data management for large volumes of data (Spinsanti & Ostermann, 2013), and legal concerns around privacy and liability (Scassa, 2013).

While some claim VGI can empower citizens with the ability to georegister and transmit observations through the internet (Goodchild & Glennon, 2010), others have argued that VGI can also act to marginalise people, furthering the ‘digital divide’ (see Crawford & Finn, 2014; Sui, Goodchild, & Elwood, 2013; Van Dijk & Hacker, 2003). Haworth and Bruce (2015) question the link between VGI and citizen empowerment, arguing the relationship is a complex one dependent on a number of factors including community make-up, administrative structures, and existing power relations. Power has been defined as the ability to get things done (Pfeffer & Salancik, 1978). As described in the introduction to this article, power in emergency management traditionally lies with authorities. Power, or ‘the ability to get things done’, may be highly limited for particular communities or individuals. Morrow (1999) asserts the impacts of disasters are determined by everyday patterns of social interaction and organisation, and disaster vulnerability is constructed by the social and economic circumstances of everyday living. Risk is concentrated in certain categories of people, such as the poor, ethnic minorities, single-parent households, or women, for example (Morrow, 1999). Moreover, vulnerability factors

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