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Assessing the application and value of participatory mapping for community bushfire preparation



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ABSTRACT

The increased ease for individuals to create, share and map geographic information combined with the need for timely, relevant and diverse information has resulted in a new disaster management context. Volunteered geographic information (VGI), or geographic information voluntarily created by private citizens enabled through technologies like social media and web-based mapping, has changed the ways people create and use information for crisis events. Research has focussed on disaster response while largely ignoring prevention and preparedness. Preparing for disasters can reduce negative impacts on life and property, but despite strategies to educate communities, preparation remains low. This study assesses the application and value of VGI in bushfire risk reduction through a participatory mapping approach. It examines VGI as a social practice and not simply a data source by considering the user experience of contributing VGI and the potential for these activities to increase community connectedness for building disaster resilience. Participatory mapping workshops were held in bushfire-risk communities in Tasmania. Workshop activities included a paper-mapping exercise and web-based digital mapping. Survey results from 31 participants at three workshops indicated the process of mapping and contributing local information for bushfire preparation with other community members can contribute to increased social connectedness, understanding of local bushfire risk, and engagement in risk reduction. Local knowledge exchange was seen as valuable, but the social dimension appeared even more engaging than the specific information shared. Participants reported collaborative maps as effective for collating and sharing community bushfire information with a preference for digital mapping. Some limitations of online sharing of information were also reported by participants, however, including potential issues of privacy, data quality and source trustworthiness. Further work is needed to extrapolate findings from the study sample to the broader population.

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1. Introduction and background

1.1. Bushfire preparation and community engagement

Community preparation is a fundamental component of bushfire safety. Preparation can assist residents to protect houses and property, and to evacuate safely. Recent studies have investigated factors influencing preparation decision-making (Prior, 2010), the importance of 'mental preparedness' (Eriksen & Prior, 2013), measures of adequate preparedness (Dunlop, McNeill, Boylan,

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Morrison, & Skinner, 2014; Penman et al. 2013), preparation costs (Penman, Eriksen, Horsey, & Bradstock, 2016), gender (Whittaker, Eriksen, & Haynes, 2016), and levels of preparedness in specific bushfires (McLennan, Elliott, Omodei, & Whittaker, 2013; Whittaker, Haynes, Handmer, & McLennan, 2013). Despite community education strategies and the impact of past events, active disaster preparation remains low (Gargano, Caramanica, Sisco, Brackbill, & Stellman, 2015; Hausman, Hanlon, & Seals, 2007; Paton, 2003). There is increasing recognition in emergency management that information provision alone is insufficient to increase community preparation and that more engaging, participatory approaches are needed. This reflects a shift in disaster management more broadly, where community participation is increasingly considered a fundamental principle of disaster risk reduction (DRR)



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and resilience building (e.g. UNISDR, 2015). In Australia, the principles of shared responsibility and community participation are embodied in the National Strategy for Disaster Resilience (COAG, 2011).

In Australia, community participation in fire and emergency management is a well-established practice. The Victorian Country Fire Authority's 'Community Fireguard' program, for instance, was established in 1993 to engage and educate groups of interested neighbours about bushfire preparation (CFA, 2016). The community development approach adopted by the Tasmania Fire Service (TFS) involves a 'Bushfire-Ready Neighbourhoods' (BRN) program, in which communities are selected based on bushfire risk, capacity and community interest, and bushfire education events and activities are tailored to their local needs. The program aims to provide information to enable people to develop their own bushfire survival plan and be better prepared for the bushfire season (TFS, 2014). Similar programs exist in Canada ('FireSmart-ForestWise') and the USA ('Firewise Communities'), with assessments suggesting that neighbourhood programs help to reduce bushfire (or wildfire) risk but also enhance social connectedness and resilience (MacDougall, Gibbs, & Clark, 2014; McGee, 2011).

Community engagement and participation in disaster management is typically initiated and managed by official agencies. Increasingly, however, community capacities for initiating and managing activities throughout the prevention, preparedness, response, and recovery (PPRR) phases are recognised (e.g. Scanlon, Helsloot, & Groenendaal, 2014; Whittaker, McLennan, & Handmer, 2015). Recent examples include the 'Student Volunteer Army' that formed in the aftermath of the 2010-11 earthquakes in Christchurch, New Zealand, to help residents clean up liquefaction (Villemure et al. 2012), and the group of local volunteers that travelled to Dalchowki village, 3 h from Kathmandu, following the 2015 Nepal Earthquake to distribute donated tarpaulins, food and anti-diarrheal tablets (Rousselot, 2015). Key advantages of such activities are that local volunteers often arrive on the scene before official agencies, have considerable local knowledge, and are highly responsive and adaptive to changing local needs. The greater accessibility and sophistication of information and communication technologies has seen considerable growth in digital volunteerism in disaster management, with the emergence of volunteered geographic information (VGI), in particular, changing the ways impacted citizens, the broader public, and emergency management agencies participate in disaster management (see Haworth & Bruce, 2015).

1.2. The emergence and promise of VGI

VGI refers to user-generated content with a spatial component, which involves the voluntary collection, organisation and dissemination of geographic information (Elwood, Goodchild, & Sui, 2012; Goodchild, 2007; Tulloch, 2008). Technologies such as the Internet, GeoWeb 2.0, global positioning systems, cloud storage, broadband communication, social media and personal locational devices, including smartphones, have enhanced the visibility of practices involving the creation and sharing of geographic information by private citizens (Goodchild, 2007; Palen & Liu, 2007). The wide usage of smartphones with multimedia capabilities and increased collaborative potential through the proliferation of social media provides innovative opportunities for individuals to contribute towards and consume a collective knowledge base, allowing users to engage with geographic information systems (GIS) in an unprecedented social way (Jayathilake, Perera, Bandara, Wanniarachchi, & Herath, 2011).

Researchers have reported on the promise of VGI to address issues and provide opportunities for a range of fields and applications. For example, as a resource for spatial data infrastructures, Genovese and Roche (2010) report on the opportunities for VGI to empower citizens in developing countries by making them part of collaborative local governance and enhancing the information used by decision makers. Community participation in local decision making has been recognised as fundamentally important for regional democracy, and thus the potential contribution of VGI is significant (Genovese & Roche, 2010). Elwood et al. (2012) describe opportunities for GIS and geography scholars provided by the dense network of individual, intelligent observers associated with VGI. Biggs et al. (2014) point to the opportunity of VGI to harness traditional ecological knowledge (TEK) under increasing climate and environmental pressures. TEK constitutes the cumulative and dynamic knowledge, practices and beliefs of local cultures about living things and the environment, and the importance of its inclusion in analyses of community livelihood security is gaining increased global recognition (Biggs et al. 2014).

Alongside the promise of VGI, there are important broader implications. Changes to traditional authoritative systems catalysed by VGI involve decentralisation of power and increased empowerment of citizens, where value is increasingly recognised in both expert- and citizen-produced information, initiatives and practices (Haworth, 2016).

1.3. VGI in disaster management

The increased ease of individuals to create, share and map geographic information combined with the need for timely, relevant and diverse information during disaster events has resulted in a new disaster management context (Goodchild & Glennon, 2010; Haworth & Bruce, 2015). Social media and web-based mapping platforms have changed the way people create and use information for crisis events (Liu & Palen, 2010; Ostermann & Spinsanti, 2011). This includes basic use of sites like Facebook to share text, images and videos (Bird, Ling, & Haynes, 2012; Taylor, Wells, Howell, & Raphael, 2012) as well as more complex activities such as data mining or crowdmapping (Meier, 2012). Bittner, Michel, and Turk (2016) describe a continuum of participation in volunteer mapping for crises, ranging from passive viewing to map establishment, and argue crisis maps promise bottom-up participation and a departure from hierarchical crisis communication and response. Through rapid exchange of geographic information between authorities and citizens for disaster response, and promoting community connectedness and engagement in disaster preparation practices, VGI contributes to all PPRR phases of disaster management (Haworth & Bruce, 2015).

VGI presents both opportunities and challenges for disaster management (Haworth & Bruce, 2015; Haworth, 2016). VGI costeffectively increases the speed and reach of communications between authorities, affected-communities and the broader public, and facilitates collection of large volumes of diverse information from people in and outside disaster-affected areas. While local knowledge is critical for understanding risk, vulnerability and specific emergency strategies, VGI enables people outside the disaster location to assist in managing disasters, as demonstrated by volunteer involvement around the world in mapping impacted areas following the 2010 Haiti earthquake (Meier, 2012). By giving citizens more control over information mobility, technologies such as social media, smartphones and the web empower people to be more involved in disaster management, more connected to each other, and potentially better-prepared to respond to an event. These technologies are becoming increasingly familiar to large portions of the global population. People in emerging and developing countries are more likely to engage in social media than developed countries, even though internet use is lower (Poushter, 2016). For

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