# Chapter 2
# The Use of Geospatial Technology in Disaster Management

**Scott Westlund**
*University of Manitoba, Canada*

## ABSTRACT

*The daily use of geospatial technology, such as the global positioning system (GPS), geographic information systems (GIS), and remote sensing (RS), is increasing. The use of geospatial technology in disaster management is a natural fit because almost every aspect of a disaster is referenced by location. This paper presents the results of a recent web-based survey of disaster management practitioners. Findings reveal that more than 60% of disaster management practitioners are currently using geospatial technology and 70% plan to use it in a future disaster management activity. However, the results indicate that most disaster management practitioners have a low level of knowledge of geospatial technology. The survey findings also show that geospatial technologies enhance situational awareness, cost is a major challenge for practitioners who would like to use them, and an opportunity exists for the academic community to engage with practitioners to help them raise their level of geospatial knowledge.*

## INTRODUCTION

Throughout the world the number of people living in regions susceptible to hazards is increasing and the potential for disaster brought on by events such as earthquakes, hurricanes, and flooding is growing. For instance, as a result of the sense of safety provided by structural mitigation projects, the United States has seen a rapid population increase in regions prone to earthquakes as well as in low-lying costal communities susceptible to hurricanes and flooding (Mileti, 1999). Indeed, recent natural hazards have resulted in high numbers of fatalities, economic losses, damage to the environment, and have had adverse effects on the livelihoods of vulnerable populations (Haque & Burton, 2005). As anticipated by many, the trend of mounting economic losses and escalating vulnerability is continuing. For example, Munich Re, one of the world's biggest re-insurance companies, recently

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noted that the impact of disasters on both human lives and in economic terms is tending to increase over time (Huge year for natural disasters, 2008). If vulnerability continues to rise and the impact of hazard events continues to intensify, there will be an increasing need for improvements in the way disasters are managed.

In this paper I examine the use of geospatial technology (commonly referred to as geomatics in Canada) in disaster management. I outline the results from my recent web-based survey of disaster management practitioners, which highlight practitioner attitudes towards technology, their knowledge of geospatial technology, how geospatial technology is used in practice, and the challenges and benefits for using geospatial technology in this field. The survey results provide new information regarding the actual use of geospatial technologies in practice, and may be useful for determining research objectives and informing community-focused academic research in the future.

## BASIS FOR INVESTIGATION

Geospatial technologies include global navigation satellite systems (GNSS) such as the global positioning system (GPS), geographic information systems (GIS), and remote sensing (RS). Geospatial technologies can provide accurate, current location based data for use in disaster management. Indeed, the use of geospatial technologies in disaster management is a natural fit because location is a key element of disaster management. Almost everything in a disaster, including the event, resources, risks, hazards, and people, is referenced by location (Gunes & Kovel, 2000; Kevany, 2005; Parker & Stileman, 2005). However, based on my personal observations, interactions, and discussions with disaster management practitioners in the province of Manitoba, Canada, the use of geospatial technology in disaster management, at least at the local level, is not common.

The use of geospatial technology requires specialized knowledge and, according to the academic literature, there are many organizational (data acquisition, data quality, and data sharing), economic (costs of equipment, data, and maintenance), cultural (legal and security concerns), and hardware and software challenges (communication infrastructure, data storage capacity, and poor computer-user interfaces as well as physical challenges) that further complicate its use in disaster management (Benini et al., 2003; Cai & MacEachren, 2005; Comfort & Kapucu, 2006; Cutter, 2006; Diehl & van der Heide, 2005; Erharuyi & Fairbairn, 2005; Gunes & Kovel, 2000; Holledig, 2005; Johnson, 2005; Kaiser et al., 2003; Kelmelis et al., 2006; Kerle & Oppenheimer, 2002; Parker & Stileman, 2005; Sugimoto et al., 2003; Toyos et al., 2006; von der Dunk, 2005; Walker, 2003; Wu et al., 2001; Zerger & Wealands, 2004). However, despite these challenges, there appears to be a willingness on the part of disaster management practitioners to use geospatial technologies. For instance, in response to the 2003 California wildfires, Hurricane Katrina, and the 2004 Indian Ocean earthquake and tsunami, geospatial technologies enhanced decision-making capabilities, facilitated map production, and allowed disaster mangers to analyze the location and extent of affected areas, determine the risk to life and infrastructure, estimate the number of people affected by events, and display information about secondary hazards (Ambrosius et al., 2005; Corbley, 2006; Crisis proves the value of GIS, 2004; GIS supports tsunami disaster, 2005; Johnson, 2005; Kelmelis et al., 2006; Kerle & Oppenheimer, 2002; Yarbrough & Easson, 2005). However, there seems to be uncertainty amongst practitioners about how to effectively implement geospatial technologies in a disaster management context as well as how best to resolve or minimize the organizational, economic, cultural, and hardware and software challenges (Cai & MacEachren, 2005; Cutter, 2006; Jacobson, 2006; Misra & Enge, 2006). Since all of the reasons for this uncertainty were not included in the academic literature, I developed a

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