

# VOLUNTEERED GEOGRAPHIC INFORMATION FOR DISASTER MANAGEMENT WITH APPLICATION TO RAPID FLOOD DAMAGE ESTIMATION

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*All phases of disaster management require up-to-date and accurate information. Different in-situ and remote sensor systems help to monitor dynamic properties such as water levels or inundated areas. New Internet technologies have facilitated fast and easy data collection from the public, giving rise to the idea of using Volunteered Geographic Information (VGI) to aid disaster management. This paper discusses the opportunities and challenges of using VGI for disaster management with particular focus on information for the response and recovery phases. Different approaches to assessing VGI data quality are presented and discussed. In a case study, the fitness for use of observations from the affected population for rapid flood damage estimation is demonstrated to be comparable to estimates based on hydraulic modelling. Further research needs with respect to the case study and to VGI for disaster management in general are identified.*

*Toutes les phases de la gestion des catastrophes requièrent une information à jour et exacte. Différents systèmes de capteurs in situ et à distance aident à contrôler les propriétés dynamiques telles que les niveaux de l'eau ou les secteurs inondés. Les nouvelles technologies de l'Internet ont facilité une collecte de données facile et rapide par le public, donnant ainsi naissance à l'idée d'utiliser l'information géographique volontaire (IGV) pour contribuer à la gestion des catastrophes. Dans cet article, nous discutons des possibilités et des défis liés à l'utilisation de l'IGV pour la gestion des catastrophes en mettant l'accent plus particulièrement sur l'information reliée aux phases d'intervention et de rétablissement. Nous présentons différentes approches visant à évaluer la qualité des données de l'IGV et nous discutons de chacune d'elles. Dans une étude de cas, nous démontrons que l'à-propos d'utiliser les observations de la population touchée pour une estimation rapide des dommages causés par une inondation est comparable aux estimations fondées sur la modélisation hydraulique. Nous recensons finalement les besoins d'une recherche plus poussée concernant l'étude de cas et l'IGV pour la gestion des catastrophes en général.*



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## Introduction

Natural hazards cannot be prevented; however, measures can be taken to mitigate their impacts and prevent them from becoming disasters. Disaster management is a continuous process that aims at avoiding or reducing the impact of natural hazards. All phases of disaster management require up-to-date and accurate information. Information from many different sources has to be integrated, including different *in-situ* sensors, such as water gauges or seismometers, and aerial and satellite images. So far, observations of eye witnesses other than emergency staff are rarely taken into account systematically.

Recent disasters have shown that information contributed by eye witnesses via the Internet can greatly improve situational awareness. For example, when a magnitude 7.9 earthquake hit the Chinese province of Sichuan in 2008, within one minute the first discussion thread appeared in a popular Chinese Internet discussion forum, followed quickly by others discussing observations of

the earthquake and its impacts and even organising help actions [Yan *et al.* 2009]. After the 2007 wildfires in southern California, local residents shared their observations using social networking or local news websites, some of them using Google Maps to allow users to localise the information they contributed. This information was judged to be more useful than national news or official government websites by other affected residents [Sutton *et al.* 2008]. The potential of spatial information collected by volunteers from the public and shared over the Internet, so called “volunteered geographic information” (VGI), is increasingly being recognised and discussed. VGI offers a great opportunity to enhance awareness because of the potentially large number of volunteers to act as “sensors” observing important disaster management parameters in their local environment. However, a number of issues and challenges arise that need to be addressed for this information to be useful.