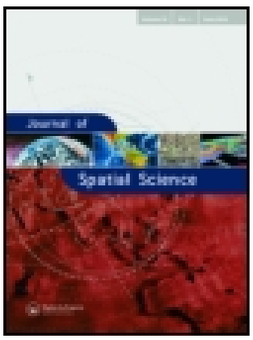

Journal of Spatial Science

ISSN: 1449-8596 (Print) 1836-5655 (Online) Journal homepage: http://www.tandfonline.com/loi/tjss20

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**To cite this article:** George Cho & Joep Crompvoets (2018): Prod-users of geospatial information: some legal perspectives, Journal of Spatial Science, DOI: 10.1080/14498596.2018.1429330

**To link to this article:** https://doi.org/10.1080/14498596.2018.1429330

Published online: 07 Feb 2018.

JOURNAL OF SPATIAL SCIENCE, 2018
https://doi.org/10.1080/14498596.2018.1429330

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# Prod-users of geospatial information: some legal perspectives

George Cho[a] and Joep Crompvoets[b]

[a]Faculty of Education, Science, Technology & Mathematics, University of Canberra, Canberra, Australia; [b]Faculty of Social Sciences, Public Governance Institute, Katholieke Universiteit Leuven, Leuven, Belgium

**ABSTRACT**

Producers and users (prod-users) volunteer, contribute and use geospatial information (GI) for a variety of mapping, documentary and other applications. The paper outlines some legal perspectives of crowd-sourced information by addressing general problems of the legal rights and obligations of volunteers and users. The volunteered geographic information (VGI) model is discussed within the meaning of Web 2.0 and understanding the risks of legal liability and responsibilities. Part of this understanding is an application of the role of the quality of VGI when contrasted with the OpenStreetMap experience. Ownership issues and the legal responsibilities of prod-users are discussed together with the special case of Good Samaritans. Proposed governance structures that could be developed across various countries that have engaged with VGI and prod-users are then suggested. It is concluded that current legal structures may no longer be appropriate to accommodate legal and regulatory mechanisms that may be helpful for governments, industry and prod-users.

**KEYWORDS**

Crowd-sourced; geospatial information; legal concerns; *prod-users*; liability; ownership; VGI

## 1. Introduction

A variety of terms have been used to describe the general subject area of crowd-sourced geographic information (GI) over time. The keywords used include volunteered geographic information (VGI) (Goodchild 2007), neo-geography (Turner 2006, Goodchild 2009), Webmapping 2.0 (Haklay *et al*. 2008), user-generated content (Clark 2014) and prod-users (Budhathoki *et al*. 2008, Ho and Rajabifard 2012). The proliferation of descriptors may in part reflect the rapid development and uptake of online web technologies. In part these also represent an alternative spatial data collection method that is removed from the more difficult, logistical or intellectually rigorous requirements associated with traditional geographic information systems (GIS) (Arifin *et al*. 2014). VGI may take many forms from geotagged photographs through websites such as Panoramio (https://www.panoramio.com) and Flickr (https://www.flickr.com), online maps such as OpenStreetMaps (OSM; http://www.openstreetmap.org) and Wikimapia (http://Wikimapia.org/), and three-dimensional VGI such as OSM-3D (http://www.osm-3d.org/) and OSM2World (http://osm2world.org/). The transition from traditional to neo-geography has been characterised by a blurring of

**CONTACT** George Cho George.cho@canberra.edu.au

the usual roles of producer, user, subject, communicator and consumer of geographic information (Rana and Joliveau 2009).

VGI is produced and may be harvested from diverse sources but with its production and use, concerns about data privacy, ethics and legal issues become evident. These challenges are complex and inter-related where the legislation may lag behind advances in technology with differences in practice between countries. Such concerns also arise from the re-use of VGI resources 'downstream' and by third parties far removed from the production and dissemination processes. The VGI obtained from volunteer resources may be used in different projects that can be very different from the original purposes of data collection. Such activities are facilitated by technology that integrates and conflates greater numbers of complex and disparate data sets. Where an activity, such as digitising or image fusion, takes place without permission of the relevant licences of owners or where false data are offered as accurate, there will be serious consequences especially where such data are used for decision-making in policy implementation or investment projects (Antoniou *et al*. 2017).

This paper seeks some answers to gaps in our understanding of several interrelated problems affecting volunteers, users and their legal obligations in producing VGI. Such problems are not very well studied or understood despite VGI becoming an important contributor to mapping and geographical analysis. There remain gaps in understanding the sensitivity associated with the privacy of user data and information. The role of volunteers and users is not always clearly defined, leading to a potential exposure to legal issues that in themselves provide no clear-cut answers (Mooney *et al*. 2017).

The first general problem is whether volunteers are aware of their legal rights, obligations and responsibilities when gathering and collecting GI. Such an awareness may not be usually in the forefront of thinking of volunteers who may be driven more by altruism and generosity of their time and efforts and contributing their expertise on the geography of their region. There may be no thoughts about the implications of the collected GI and the uses the data may be put to. As a user there may be other obligations such as an acknowledgement of the owners of the data, to fairly represent the interpretation of the data and to use the data as intended in its original collection.

A second problem is whether volunteer prod-users, the general public and lay persons know what their legal rights and legal obligations are with their seemingly innocuous contributions to the 'common good' by their volunteering. A common response is that one should leave it to the lawyers who know the law. Alternatively, producers and volunteers may come to know the law when they are confronted with a challenge and a legal problem. The law becomes very real when users seek redress for perceived loss or injuries they may have sustained when using faulty data with the prospect of a 'wicked' problem in trying to seek redress from known or unknown persons. It is only then that the law becomes very real to volunteers and users with the need to deal with these head-on.

A third problem is whether there is a need to both identify and define as precisely as possible what the legal rights, liabilities and obligations of volunteers and users are. While these seem to reside in civil litigation and public law, licensing and copyright as part of property rights, contractual rights and ethical considerations are important factors to be dealt with in GI production and use by public bodies and individuals.

The technological infrastructure, its evolution and rapid growth have disrupted traditional collection and usage of GI. There is a need to know the legal rights and responsibilities of collectors and users given that the concerns with the security of information, the protection

of the privacy of data, property rights and liabilities are not trivial. In addition to being unclear in their identification and definition, these matters need to be urgently resolved if the technological disruption is to be minimised and any losses mitigated. Laying out the legal perspectives could help to inform an understanding of the challenges ahead and to avoid geo-liability. In addition, there is also a need to understand the legal and policy frameworks and know where the legal traps are and what to look for. Some guidance and communication of legal concepts is also required in order to influence and guide future VGI collection.

This paper is presented in five parts. The first part discusses the Web 2.0 environment within which crowd-sourced maps and prod-users operate. It is within this technological infrastructure that the VGI model has evolved and facilitated the collection and sharing of GI. Examples of VGI in crisis situations are given together with a discussion of the risks of legal liability and personal responsibilities including contractual and ethical considerations. Then in part two, the quality of prod-user data is assessed in the context of authoritative data and public-sector use of VGI. Experiences from various jurisdictions are discussed as a contrast to the OpenStreetMap example of quality control. In part three the ownership of prod-user data is discussed as a concern of property rights, namely those of copyright vested in volunteers and shared with websites hosting the GI. Downstream and third-party use of GI from volunteers, ethical considerations and jurisdictional prohibitions are discussed. Part four outlines some legal responsibilities of prod-users, especially the exposure to, and mitigation of, liability, and the special case of the 'Good Samaritan' and the duties associated with them across various jurisdictions. The fifth part of this paper suggests the legal frameworks and governance structures that could be developed given experiences across various countries that have engaged with VGI and prod-users. This paper concludes with five propositions regarding: (1) the terms of use of VGI data; (2) new modes of data collection methods that take notice of liability, data assurance, integrity and ownership; (3) cloud computing as the next 'storage' media and the anxieties associated with information security, ownership and liability; (4) the different jurisdictional responses to VGI that may require careful re-evaluation; and (5) radical changes that may be required to mitigate geo-liability given that existing legal mechanisms may no longer be appropriate to assist governments, industry and prod-users to work collaboratively.

## 2. Web 2.0, crowd-sourced maps and prod-users

Sir Tim Berners-Lee's vision of the World Wide Web (WWW) or Internet was to be a space and 'a collaborative medium, a place where we [could] all meet and read and write' (DiNucci 1999, BBC 2005). The Web 2.0 landscape has extended the static desk-bound researcher to the mobile device and wearable technologies. But the ubiquitous application of mobile electronic devices and garments has raised new concerns with the law in general and liability in particular. Apart from issues of privacy of persons, net-citizens (netizens) who contribute to the collection, use and dissemination of GI have triggered a re-consideration of traditional legal frameworks and adaptations to the law. The law that was developed in the 'analogue' world may need to be re-engineered to adjust to the digital environment, including the acceptance of non-traditional forms of products and services. Even the very concepts of 'volunteered' (active) compared with 'contributed' (passive) data draw upon fine distinctions concerning the nature of the contributions and the unstated agreement entered into by their volunteerism (Blatt 2015). Volunteered information may include the active and

voluntary uploading of information such as a geotagged photos or descriptions of a site onto a website. Contributed data involve the volunteer having a choice of opting out of the data-production process, such as not releasing identity data generated automatically by smart devices (Harvey 2013). Sometimes there may be no choice because identity and locational information are embedded within the data that form part of the smart technology.

The Web 2.0 environment is dependent on and integral to the technological infrastructure. This new environment of mobile technologies on whatever device or 'surface' has opened up the landscape for nearly everyone to create and share content, leading to democratisation in the production of information. In the Web 2.0 environment communication takes place anytime, anywhere and anyhow. However, the governance of the activities in this environment is a place-based location where 'jurisdiction' is an important factor even within a borderless internet milieu. Apart from specific laws developed to govern electronic-based activities in a jurisdiction, existing laws and regulations will need to be re-fashioned to cater for and address new challenges to incorporate activities carried out in cyber-space. The adaptation of the law could be by way of analogising case by case or re-writing new rules and regulations for 'special or exceptional cases'.

In the Web 2.0 environment paper maps have made way for electronic crowd-sourced maps on the GeoWeb. Here the spatial information is merged with non-spatial attributes, which enables spatial searching of the internet involving clients, servers, service providers, portals, standards and collaborative agreements (See *et al*. 2016). The GeoWeb is an aggregate of geographically referenced or 'marked-up' machine-readable syntax that is used to organise and deliver content over the web (Leszczynski 2012). Prime examples of the GeoWeb include Geo-wiki and Ushahidi. Geo-wiki is an attempt to integrate high-resolution satellite imagery from Google Earth with crowd-sourced information into a single Web 2.0 application to increase the amount of open access information on land cover (Fritz *et al*. 2009).

*Ushahidi* ('witness or testimony' in Kiswahili) has evolved considerably from its interactive map platform, which was developed by concerned citizens during the disputed Kenyan elections in 2007. Initially this platform provided eyewitness accounts of violence across the country written in Ushahidi with images displayed on Google Maps (https://maps.google.com). In later applications crowd-sourced information on election results, conflicts and natural disasters is displayed on maps and written reports for general dissemination and further use.

Volunteered geographic information (VGI) is 'the widespread engagement of large numbers of private citizens, often with little in the way of formal qualifications, in the creation of geographic information' (Goodchild 2007). The user-generated content by the VGI community has played an influential role in both production and usage and those involved have sometimes been described as *prod-users (*Coleman *et al*. 2009). The portmanteau word combining 'production' and 'usage', popularised by Bruns (2008), refers to the type of user-led content creation that takes place in online environments such as Wikipedia and more particularly Wikimapia, a project to 'describe the whole world' by identifying and providing detailed description of point and area features at a locality (Goodchild and Hill 2008). While there is a blurring of boundaries between producing and using, the nature and motivations of prod-users have been part of an interesting discussion by Coleman *et al*. (2009). A typology of tasks in crowd-sourced geographic information has been proposed which distinguishes between classification, digitisation and conflation tasks (Porto de Albuquerque *et al*. 2016). The need for the distinction is because of the lack of clarity of the specific types of task that

volunteers can perform to derive geographic information from remotely sensed imagery, and how the quality of the produced information can be assessed for particular task types.

There have been many examples where VGI has been used to address the mapping needs in crisis situations in the context of forest fires, floods, hurricanes and other disasters including the Haitian earthquakes of 2010 (Zook *et al*. 2010), the Libyan crisis map in 2011 (Libyan Crisis Map 2011), the United Nations Organisation for the Coordination of Humanitarian Affairs (UNOCHA) 2012 maps (UNOCHA 2012), Transparency Morocco (2012), Transparency International (2013), Syrian Tracker (2013) and the Missing Maps (2014) project founded by the American Red Cross, the British Red Cross, the Humanitarian OpenStreetMap Team and Doctors without Borders to map the most vulnerable places in the world.

It is acknowledged that many contributors to these projects are novices and non-professional map creators. While the reliability and accuracy of VGI might be questioned, the timely production of maps in crisis situations has proven invaluable (Sui *et al*. 2013). The new digital environment has made nearly everyone with a mobile device a map-maker and a digital recorder. Smart phones with global positioning system (GPS) capabilities have made the spatial context all-important. Given that the new prod-user cartographer may be untrained in GIS technology they nevertheless can contribute to location-based services used by most and bringing GIS technology to the masses. But such activity also has legal risks and ethical considerations.

Risks of legal liability arise where the subscribed data might be biased, wrong or erroneous, including inadvertent false observations (Fekete *et al*. 2015). VGI service providers should be conscious that they do not engage in 'negligent' conduct and that they verify volunteer contributions. In common-law countries like the UK, Canada, Australia and New Zealand, 'negligence' is considered conduct that falls short of reasonable standards (Sappideen and Vines 2011, p. 123). The standard of conduct is the level of care that someone of ordinary prudence would have exercised under the same circumstances so that foreseeable risk of harm is minimised. The requirement includes acts of omissions where there is a duty to act. Negligence is said to be a matter of risk – to whom and of what (Sappideen and Vines 2011, p. 124).

Scassa (2013) has issued a timely warning of the potential risks of crowd-sourced data from the perspective of the operators of a VGI platform, contributors and users of VGI, together with important and timely lessons (Scassa 2010, Elwood *et al*. 2012). While the VGI host provides a platform from which data and information are shared, its use is, however, contingent on the terms and conditions that cover restrictions such as the background intellectual property, rights to the data, design, layout, software, trade-marks and confidential information. A VGI host may require users to implement certain data-protection and privacy measures within existing laws when using crowd-sourced data.

The legal obligation of volunteer contributors may lie in understanding the context within which the contributions are made and in particular the property rights of others, defamatory material, invasions of privacy that attract civil liability and jurisdictional constraints. The latter appear problematic on the Internet, where some conduct might be legal in one jurisdiction but not in others. Jurisdictional sovereignty suggests that the data contributed in a VGI context are protected by prevailing copyright laws in the jurisdiction where the information is used and published.

For users, a 'terms of use' contract might be appropriate to mitigate risks of liability. Licences for downstream users and disclaimers with limitation of liability for certain uses but with no ownership rights attached to the data transfer may be prudent measures to

take. However, the specific legal issues arising and the types of analyses that one may make would be determined by the nature of the information and activities.

Ethical considerations, whilst less clear-cut, nevertheless are present with the collection and use of VGI in research. Elwood *et al*. (2012) cite the work of Herlihy *et al*. (2008) on the ethics of community mapping among indigenous peoples. Clear limits are required on what volunteers can contribute about individuals or groups of indigenous peoples.

Ethical issues with respect to health and disease surveillance have been raised by Blatt (2015). The potential for VGI to augment data for public health disease surveillance raises issues of patient privacy and liability especially when data are contributed for public health research programs. Some of the volunteered information may be deemed to be an inappropriate disclosure of protected health information.

There may also be ethical considerations in the release of private information on public documents such as published maps. Scassa (2013) gave the example of *Proposition 8 Maps* – a mash-up of Google maps and Proposition 8 (Prop 8) donors to a campaign in support of a ban on gay marriages in California. The map revealed names, addresses and donation amounts of donors. Such revelations were unforeseen by the donors and some may not have consented to the use of the information in this manner. The potential for mischief, subsequent harm and tort liability as a result of posting of the information could affect the VGI host, contributor and innocent user.

Saunders *et al*. (2012) have considered licensing and copyright issues from a Canadian legal perspective. Scassa (2013) has noted that most data-privacy laws generally require the protection of personal information through which people might be identified. Earlier Scassa (2010) demonstrated the circumstances in which geographic information may be characterised as personal information. See *et al*. (2016) have suggested that there are other areas that might require further research in terms of data privacy and licensing such as the data and location-based devices which record identities, addresses and movement patterns of contributors of information and the re-use of data. Elwood *et al*. (2012) suggest that VGI as social practice may impact on habits and activities related to the sharing or concealing of information such as privacy, surveillance or identification which may have implications for how VGI might transform aspects of privacy or surveillance.

Arguably there may be legal challenges of a jurisprudential nature. Hence, in the focus on practical and technical issues, a deeper understanding of the quality of information, ownership and responsibilities could prove informative. Poor quality data may lead to erroneous analysis and interpretation and cumulatively to undesirable decision-making. Ownership issues involve rights of volunteers as well as contributors and whether these rights are relinquished to the web host and when the data become co-mingled with other data. Such concerns also involve the enduring responsibilities of all concerned – the producer, user and VGI host.

## 3. Quality of prod-user data

VGI by its very nature is characterised by its heterogeneous and diverse quality as it is collected by different methods and technologies (for example, GPS and devices with location-aware capabilities) and by different individuals with different motivations and personal preferences. In addition, the spread of contributors and data can be uneven over space (van Exel *et al*. 2010) with a spatial bias for urban rather than rural areas, with more popular areas

getting greater attention than obscure unknown ones (Antoniou and Schlieder 2014). Indeed, it has been observed that uncertainty over the data quality of VGI is one of the most important barriers to the use of this data source by national mapping agencies (NMA) and other government bodies (Goodchild and Li 2012, Antoniou and Schlieder 2014, Fonte *et al*. 2017).

The quality of the data volunteered and contributed by the 'crowd' relative to those produced by professional mapping agencies is a topic of critique for crowd-sourced data. Data authoritativeness may be closely linked to the background and training of the contributors and the quality-assurance processes involved. The term 'asserted' data has been used to suggest a lack of official sanction (Fekete *et al*. 2015). Arguably public-sector sources of framework geospatial data have been considered more 'authoritative' than data produced from other sources. But the alternate view of Keßler and Groot (2013) suggests that data quality may be assessed through the notion of trust as a proxy measure that may not require comparisons with a ground-truth data-set.

However, sometimes it may be a question of pragmatism and economics in so far as authoritative GI is concerned (Ball 2010). Extant evidence suggests that public-sector geospatial data producers may be struggling to obtain continuing funding support to maintain data or the legislative mandate to keep geospatial databases current. As evidenced by experiences in the State of Victoria, Australia and North Rhine, Westphalia in Germany, processes have been put in place to encourage the 'crowd' to help to add to the store of geospatial data (Coleman 2014). In these jurisdictions, rigorous screening and editorial processes have been established before the data are added to the 'authoritative' data.

In other instances of public use of crowd-sourced data, creative adjustments have had to be made and new licences created. In France, the Base Adresse National (BAN 2015) project initiated a solution to a number of practical problems such as the return of 300 million letters and parcels each year to their shipper at a cost that reduces revenues, and the many different, incomplete and incompatible address databases in use. BAN is the result of a collaborative model between a governmental administration (IGN), the French Post Office company and OSM France to build an authoritative registry for the economy, society and public services. Incompatibilities of project data were shared using a dual licensing system (Mooney *et al*. 2017; http://openstreetmap.fr/ban/).

In the developed world, Haklay *et al*. (2014) found that organisational practice, regulations and legal issues such as licence conditions are much more likely to restrict government use of crowd-sourced location information and that significant issues need to be considered from the start of any VGI project. However, in developing countries there may be a dearth of GI in these places and VGI could be the next most accurate, complete and timely data.

Professional users will be cognisant that the life cycle of GI collection of data, cleansing and assembly of results is prone to inaccuracies unless the data are carefully edited and their integrity checked on the ground. Even with checking mechanisms in place, inaccuracies might creep in through the incorrect interpretation of observations, errors in digitising, changes as a result of resampling and projections used as well as the final assembly of results (Hunter 2009). To be universally accepted the issues of quality control and monitoring of VGI contributions to ensure that the contributed data are of the requisite quality need to be unequivocal.

In Canada the Centre for Topographic Information, a division of Natural Resources Canada, has been assessing the potential of a collaborative mapping model that combines

contributions from provincial and municipal organisations with those from citizens (Canada Natural Resources Canada 2012a). In Australia the State of Victoria's Department of Sustainability and Environment has developed a process for receiving crowd-sourced GI through a Notification and Editing Service. The OpenStreetMap Collaborative Prototype (OSMCP) project of the US Geological Survey (USGS) and the Swisstopo Revision Service of the Swiss Federal Office of Topography have been experimenting with similar ideas.

OpenStreetMap (OSM) is a well-known VGI project and one of the most studied in the literature (Arsanjani *et al*. 2015, Mooney and Minghini 2017). The belief is that OSM was established in 2004 as a response to the strict copyright laws and the high costs charged by the Ordnance Survey (OS) (Leszczynski 2012). In truth, OSM (http://www.openstreetmap.org/) is a collaborative project to create a free editable map of the world to overcome restrictions on use or availability of map information across much of the world.

With OSM any interested party could view and edit geographic data. Registered contributors could make additions, modify inaccurate features, delete stale or invalid data and generally edit features to improve the quality of the geospatial database. In addition to individual contributions, organisations have donated complete data sets to OSM. The quality of the data is refined over time through iterative corrections of the submitted data by subsequent contributions (Ather 2009). The procedures to enhance quality during the acquisition and compilation stages have been analysed (Haklay 2010, Haklay *et al*. 2010, Goodchild and Li 2012) with respect to positional accuracy and completeness together with proposals for quality-control mechanisms for crowd-sourced data. Such measures have meant that OSM data are used world-wide with a level of trust.

## 4. Ownership of the prod-user data

An emergent concern with contributed and volunteered data is that of intellectual property rights (IPR), especially in regard to the ownership of copyright. In most jurisdictions copyright is vested in the author of an original work. The work is the expression of an idea that also involves a degree of skill and judgement. The Australian Copyright Council (2009) has suggested several steps to manage and minimise potential liability risks when posting data on websites. These include terms and conditions that contain several recitations. One is that the service provider will not infringe copyright and that there will be an indemnity and some warranty in the use of the data. Another recitation is that assurances must be given that the agreements between providers and users are contractually binding. Furthermore, steps should be taken to educate users not to post material without the relevant copyright owner's consent, the right to remove material if copyright is infringed, and to moderate contributions with a clear statement as to how to complain and how to assert one's rights (Australian Copyright Council 2009).

With many contributors adding to the volunteered geospatial database, there might be difficulties in tracing provenance and lineage of the copyright. The 'conflated' data may 'lose' its copyright status by providing contributors with only a generic claim to the copyright by the user agency (Porto de Albuquerque *et al*. 2016). The term 'conflation' was proposed based on the common use of this word in the geospatial domain to indicate 'the process of combining geographic information from overlapping sources so as to retain accurate data, minimize redundancy, and reconcile data conflicts' (Porto de Albuquerque *et al*. 2016, p. 5). This loss is because it might be nearly impossible to trace the ownership of small bits of

information to their proper owners. Over time the owners themselves may become untraceable as they may have moved on. It has been suggested that the use of Creative Commons licences and copyright regimes could assist in alleviating the problem of tracing and permissions and to avoid what Scassa (2013) has described as the 'Wiki' effect – where data are combined from thousands of disparate sources to form one or more coherent works (Creative Commons 2017). The perverse outcome may be that the conflated data may become more inaccurate, corrupted with further errors, and no one may be individually liable as copyright holder or there may be too many owners to be held accountable.

Traditionally, geospatial data produced by government agencies retain copyright. In such instances the government or public agency may assert these intentions through terms and conditions of use. Volunteer contributors, on the other hand, may relinquish ownership by giving permission to use their data as well as defining the extent of the permitted uses. The agreement between the agency and contributors could include statements that the contributors have retained certain rights to the contributed data, as well as a request for attribution and acknowledgement of their contributions. In most jurisdictions, moral rights clauses may apply to provide such attribution (Australian Copyright Council 2009).

Moral rights, recognised by Australia, Europe and the Berne Convention – *droit moral* – protect the integrity of a creator's works in terms of: (1) the right to attribution (claim to ownership of a work); (2) right not to have authorship of a work falsely attributed; and (3) a right to integrity (a right to object to distortion, mutilation or other modification which might be prejudicial to the creator's honour or reputation) (Berne Convention 1886).

In cases where the VGI contributed data contain material that infringes copyright whether advertent or otherwise, diligent efforts may need to be made to remove such material and to take steps to prevent further infringement. Also disclaimers may be used to alert users to the limitations of the data which may help mitigate and prevent litigation.

In managing the risks there may be other ownership issues related to consents to the release of the data containing private, confidential and sensitive information (Blatt 2015). Implicitly, the host VGI website may have access to all data. However, risks exist where the data are disclosed to third parties innocently, advertently, inadvertently by accident, and deliberately by unauthorised persons or vandals. The key to such security risks is the contractual relationship between user and host VGI website and how these risks are managed. In practice, such risks may be managed by the terms of service of the website, which include the disclosure of information to third parties, data-protection protocols including indemnities and warranties, and other legal obligations in contract clauses between the parties involved.

Jurisdictional prohibitions may prevent the transfer of data across international borders. The EU Data Protection Directive, for example, regulates the processing of personal data within the European Union (European Union 1995). Important components of this Directive include privacy and human rights (Mantelero 2012). In 2012 the European Commission unveiled the EU General Data Protection Regulation superseding the Data Protection Directive, which may have direct implications for crowdsourced geospatial data, usage and deployment on websites (European Union 2012). While the Regulation affects all entities that collect and process personal data, the obligation is on all data controllers and processors, such as website owners. Privacy and data protection are a fundamental right in the EU and the Regulations introduce the digital right to be forgotten, such as the deletion of certain information, as well as a right to data portability, without hindrance. Arguably these

regulations could apply to web platforms that handle VGI which contains sensitive information, such as location data on individuals.

## 5. Legal responsibilities for prod-users

A general principle of responsibility is that any prod-user should exercise due care and diligence in collecting and using geospatial data and to avoid harm. In legal parlance a failure to heed this responsibility is described as a tort and breach of a duty. The causal link between the negligent act and the injury suffered has to be established. In the case of volunteers who may lack specialised training or expertise in mapping, some mistakes and errors may be made in data collection. Provided all care and responsibility were exercised, there may be no liability attached. The threshold test for tortious liability is thus whether there was an exercise in due diligence of a reasonable person.

Liability can also take other forms such as in contract law with reference to breaching terms of use. In contractual liability, the relationship between the VGI website service provider and users expresses the 'duty' in the 'Terms of Use' posted on the web site and the warranties and indemnities that might be attached to the data-set. Thus, volunteers should take particular care by not promising any type of warranty, guarantee or indemnification for the data they have submitted. To do so might expose and heighten the risk of legal liability for errors in the data (Blatt 2015).

VGI site operators must insist that users accept the terms of use of their data as a finished product. This should also include any advice about data limitations to avoid tortious liability. VGI web site owners may be liable for the negligent contributions of erroneous data or false observations that result in injury or damage to persons who have relied on that data (Scassa 2013).

While accuracy is critical for VGI hosts the extent of the responsibility for user-generated content hinges on several factors, including: (1) the degree of quality control in the data it receives; (2) the editorial and filtering of data; (3) the nature of the data; and (4) the degree of control asserted over the data. Under tort law the greater the control the greater is the responsibility and as a consequence exposure to liability should anything go wrong. Professional geospatial data producers are deemed to assume a higher duty of care. Such producers may be sued for providing incorrect, misleading or negligent data and defamatory information, as many leading cases in tort law suggest. While there is yet to be litigation in the courts involving geospatial information that is incorrect, misleading or negligent to date, the precedence is to follow previous court cases such as the English case of *Bolam v Friern Hospital Management Committee* [1957] 1 WLR 582, where a discussion on higher standards of care is required for professionals practising in their field of expertise. In contrast, it may be difficult to hold amateur contributors to the same standard of care as professional data providers.

One other concern for volunteers is the exposure to liability under 'Good Samaritan' legislation. In many jurisdictions Good Samaritan law is not found on statute books but is a concept adopted by the courts and applied as public policy. In Australia, the various states have enacted Good Samaritan laws that protect professionals providing assistance to people needing help at the scene of an accident or any emergency. Most of these provisions define a Good Samaritan (rescuer) as a person acting without expectation of payment or other consideration who comes to the aid of another. The argument is that a Good Samaritan

should not be liable for assisting in an emergency if s/he was exercising all reasonable care and skill (Australian Capital Territory *Civil Law (Wrongs) Act* 2002; New South Wales *Civil Liability Act* 2002).

However, the laws in much of Europe criminalise a failure to help people in peril in an emergency. Indeed, in Germany the failure to provide first aid to a person in need of help is punishable under § 323c of the German Criminal Penal Code (Public Broadcasting Service 1997).

The US courts have taken the view that there is no duty to rescue (Jackson and Vaurio 1999). Robson (2011) has noted that the Good Samaritan laws in the U. do not require a person to rescue another even if the person could do so safely. The justification for the law suggests that: (1) a volunteer group that undertakes to rescue others exposes itself to liability; (2) a duty to rescue arises only when a person puts another in danger and a responsibility arises to mitigate that harm and danger; and (3) a duty to rescue becomes mandatory where there exists a special relationship between the parties. The landmark common law case of *M'Alister (or Donoghue) v Stevenson, HL* [1932] A.C. 562 spells out Lord Atkin's neighbour principle and *Chapman v Herse HCA* (1961) 106 C.L.R. 112 one's duty to rescuers.

Volunteers may be put in an invidious position when faced with a somewhat harsh legal regime such as that described above. A volunteer may not undertake a rescue in case something goes wrong. Crowd-sourced maps in natural disasters and crises may never be produced because of the law. The volunteer could assume the role of a passive observer and not communicate with the victims to avoid any liability. The alternative course of action could be the use of disclaimers and other notices drawing attention to the consequences of using and relying on the information.

Yet, concerns about legal liability remain in a number of different other ways: (1) crowd-sourced data might be misused; (2) volunteers could get injured when collecting the data; (3) the legal responsibility for the data is unascertained and unascertainable; and (4) the legal status of the volunteers themselves is uncertain (Robson 2012). The US Federal statute *Volunteer Protection Act of 1997 (VPA)* offers some protection to a broader range of volunteers such as volunteers operating under an organisational structure and limiting volunteer compensation by courts of law.

## 6. Legal frameworks and governance

The VGI community of contributors and users in general, and the crisis mapping community in particular, may need to develop general standards that address issues of quality, ownership and liability. Each of these standards is necessary where the crowd-sourced maps are deployed whether in a disaster situation or in the surrounds of a crisis centre. There is an undercurrent of thought that laws which regulate the use of technology and governance of volunteered information are a looming challenge for policy-makers and governments. One view is that if the legal questions are not properly managed, tort liability might 'destroy the model before it realises its potential' (Robson 2012).

The conclusion may have been over-stated and there is as yet no extant case law to support the sentiment. In fact, the opposite may be the case where crowdsourced geospatial data and information have grown over the last decade. Statistics on OSM usage have demonstrated the accelerating growth in usage in tandem with smart devices equipped with GPS such as the iPhone (http://wiki.openstreetmap.org/wiki/statistics/). Both volume and usage

of crowdsourced geospatial information have grown in extent and in depth – the former in numerous commercial projects and the latter as base layers and background maps (Neis and Zielstra 2014, Begin *et al*. 2016). VGI has assumed a mainstream presence in the GIScience domain, and by its very nature the driving force behind VGI is in the crowd (Minghini *et al*. 2017).

Given the need for large-scale data among the mapping community and the ubiquity of geospatial data and its promises, unresolved legal questions need immediate resolution. A project to develop ethical guidelines and best practices for the use of VGI and remotely sensed imagery in crisis situations has been under way since 2016 under the auspices of the American Association for the Advancement of Science (AAAS 2016). This project promotes the ethical and rigorous use of techniques and provides guidelines to users to reduce the risk to the general public arising from quality control in data collection and analysis, the representativeness of the collected data and the potential for data gaps. The two key questions addressed by the project are: (1) the standards needed for the collection, analysis, use and dissemination of geolocation data during crisis situations; and (2) the best means of engaging a diverse set of users in developing and disseminating those standards, ethical principles, guidelines and best practices so that they are acceptable and implemented in studies that use geolocation data in crisis situations.

Since 2010, the Ordnance Survey (OS) GB, the National Mapping Agency in the UK, has made geospatial data available to the public to encourage innovation and assist government transparency (OS 2010). OS GB uses cloud computing as part of its web mapping service, hosted on the Amazon Web Services (AWS) platform (http://aws.amazon.com/), to deploy geospatial data to customer websites and enterprise systems such as the OS OnDemand Web Map Service.

While cloud computing offers a myriad of advantages in its use, VGI platforms that rely on storage in the clouds invite vulnerabilities. On this platform the security and protection of the data and information are of foremost importance. Any unauthorised access to the site and use of services may risk the exposure of personal, confidential and sensitive data. Natural Resources Canada's *Primer on Cloud Computing* lists 10 different security risks. Among these risks are abuse and malicious use of cloud computing by spammers and hackers. Breaches in security have been identified as: (1) weak application programming interfaces that expose cloud computing users to confidentiality and integrity risks; (2) technological vulnerabilities arising from shared technologies; (3) data leakage; (4) service and traffic hijacking; (5) delegations of authority to third-party vendors; and (6) encryption issues (Cloud Security Alliance 2010, Canada Natural Resources Canada 2012b).

The European Network and Information Security Agency has proposed an information assurance framework that responds to the identified risks with cloud computing (European Network and Information Security Agency (2009). In the framework an understanding of the roles and responsibilities of both the vendors and users are as important as assessing the threats and mitigating losses. Where these rights and duties are established, the burdens may need to be shared and apportioned by mutual consent through arbitration and mediation.

The International Bar Association (IBA) has proposed an *International Geoinformation Convention* that addresses GI data and usage. The convention focuses on (1) the reliability of information for the specific application for which it is to be used and (2) the limits the law should seek to impose on that information's undoubted power. By addressing the many

conflicting and overlapping existing rules and regulations associated with the collection and processing of GI, the IBA expects that a new industry may develop with commercial certainty about rights and obligations of participants and gain the confidence of public opinion (International Bar Association 2013).

The United Nations initiative on Global Geospatial Information Management (UN-GGIM) has become the lead agency for the development of global GI. The Committee of Experts disseminates best practices and experiences of national, regional and international GI bodies. These practices relate to legal instruments, management models and technical standards. The Seoul Declaration on Global Geospatial Information Management (GGIM) 2011 outlined the legal and policy frameworks for GI (UN GGIM 2016). Further suggestions on the global development of VGI have been made by Minghini *et al*. (2017), for instance, attention to ensuring high-quality data collection during the data-capture phase. Developing and adopting generic and flexible guidelines, best practices and protocols for VGI collection is one suggestion. Guidelines and best practices provide sets of rules, instructions, suggestions, recommendations or situations that indicate how VGI should be collected, with protocols giving a strict sequence of instructions to regulate VGI. However, these requirements need not discourage citizens from contributing data, rather, they should simultaneously ensure that the collected data are of an acceptable quality for the purposes of the specific VGI project. Furthermore, these tools should ease and facilitate the reuse of VGI for projects and applications other than the one(s) the data were originally collected for.

## 7. Conclusion

To conclude, five propositions are evident from this paper. First, the terms of use of VGI data need to be accepted together with an acknowledgement that amateurs may unknowingly contribute erroneous data. Volunteered and contributed geospatial databases raise issues about protections from liability and Good Samaritan laws in some jurisdictions. However, the severity of the Good Samaritan laws is mixed, given the hard-line US position to the more benevolent in Australia and Germany. For policy-makers the challenge is that if volunteers have no legal protection then the ensuing litigation may stunt the evolution of a rapidly developing VGI model.

Second, the Web 2.0 environment has witnessed a new wave of data-collection methods, data use and data analytics. How the data are managed is very challenging as cloud computing, the internet of things, open standards and open-source software are disruptive of traditional means of 'professional' data creation, collection, processing and storage. With public-sector funding of the collection of geospatial data becoming scarcer in straightened economic times, public-sector mapping agencies may have to use data that might be crowdsourced. Protection through licensing and new modes of data ownership may have to be developed, as would standards and new usage policies. All these developments are the background to issues of tort liability, data assurance, integrity and ownership.

Third, cloud computing, as the next 'storage' medium, fulfils the needs of neo-geography par excellence. Cloud computing has disrupted the way geospatial information and geospatial analytics are managed. However, the issues of security of information, the protection of personal, confidential and sensitive data, intellectual property rights and aspects of tort liability need urgent exposure through debates, communication and knowledge-sharing.

Fourth, the record among different jurisdictions is mixed. For example, newly developed countries like China and India and developing countries like Indonesia have been very 'security conscious' and sensitive about GI data. Indonesia provides an example where all geospatial data must be collected and distributed by a public central agency. The Indonesian *Geospatial Information Act No. 4, 2011* provides the legal framework for acquiring geospatial data and spells out the regulatory framework for the administration of national geospatial information and the process of how geospatial information is acquired and distributed. The Act sets a standard for acquiring geospatial information and the processes for getting permission to collect GI. There are restrictions applying to prohibited areas, if data collection can have a hazardous effect on the collector and if GI is to be collected by foreign-owned vehicles (such as airplanes and vessels but not satellites). Criminal sanctions will deter the collection of geospatial data by private persons without official permission (Zeiss 2011).

Likewise in India, the *Geospatial Information Regulation Bill 2016* makes it illegal to acquire any data by any means without a licence. The Bill regulates the acquisition, dissemination, publication and distribution of any GI that may be likely to affect the security, sovereignty and integrity of India (India 2016). It may be too early to tell whether such measures can be successful. However, issues such as obtaining surveying permits have already been raised by data entry and quality assurance specialists who have worked in the Humanitarian OpenStreetMap Team (HOT) 2016 project on Disaster Management Early Warning and Decision Support Capacity Enhancement Project in Indonesia (https://www.hotosm.org/ and http://osm.id/en/).

Fifth, radical changes are needed to mitigate *geo-liability*, as extant legal liability theories governing GI are largely under-developed, with a tendency for the law to lag behind technology relative to technology developments. The disparities between legal and policy frameworks are evident in the previous discussions. Legal and policy frameworks tend to trail technology and are developed inconsistently. Such under-development may lead to a degree of uncertainty and perhaps a 'chilling' effect on venture capitalists, who might baulk at investing in new and innovative enterprises for 'fear' of unknown legal repercussions and legal uncertainties. Addressing legal and policy challenges head-on may encourage developments in GI production and use. A legal framework that provides certainty and security in all ways could lead to long-term benefits. In the final analysis in a borderless world of the internet some kind of a 'relational' law is required within a framework where technology, networked governance and legal protection of GI is established. In such an environment it may be feasible for volunteers to work to a code of practice that is universally accepted and practised. This soft-touch co-regulatory approach could prove fruitful and more easily acceptable and adopted by like-minded geospatial professionals and by the map-using first-responder community – the prod-users and countries around the world.

## Disclosure statement

No potential conflict of interest was reported by the authors.

## ORCID

*George Cho* http://orcid.org/0000-0002-9766-5732
*Joep Crompvoets* http://orcid.org/0000-0003-1077-597X

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