Chapter 4
Social Media in Disaster Management

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Abstract The role of social media in disaster response and recovery is becoming more and more prominent, as it was seen during and after the 2010 earthquake in Haiti, the 2011 Tohoku earthquake and tsunami in Japan, the 2012 Hurricane Sandy in the USA, and a great number of crisis events ever since. Social media platforms are also increasingly used by a variety of actors—from ordinary residents, to local and international organizations, governments, and traditional media outlets—to a different degree and to different effects. Facebook, Twitter, Instagram, Youtube and others are now among the primary means for information dissemination, mapping and sending instant reports, organizing volunteers and help groups, connecting with family members, and donation gathering. Nonetheless, some concerns over personal data privacy, “fake” news, scams, misinformation and difficulties in outreach to older populations have also been identified. This chapter will provide a brief overview of the available literature on the role of social media for disaster management, and the types, uses, benefits and potential threats and challenges. A review of relevant case studies is included to identify some good and bad practices and derive lessons learnt. Finally, the chapter will pinpoint some key takeaway messages for practitioners and policy-makers in an attempt to chart the way forward.

Keywords Social media · Disaster management · Fake news · Twitter · Facebook safe alert

4.1 Introduction

The Sendai Framework for Disaster Risk Reduction (SFDRR) specifically mentions using social media, among other communication channels, with the aim of raising awareness and strengthening public education on disaster risks. It urges governments to promote their national strategies through online networks, as well as to use those
for sharing data and for risk communication, in line with Priority Action 1: Understanding Disaster Risk (24 (m); 25 (c)). Usage of social media for sharing risk data and improved preparedness also directly links with Target G of the Sendai Framework, which focuses on increasing communities’ access to early-warning systems, risk information and assessments (UNISDR: SFDRR 2015).

Ever since the terrorist attacks of 9/11 in 2001 in the USA, social media has shown that it has a prominent role to play in crisis response (Reuter and Kaufhold 2017). In the past 20 years, social media platforms, such as Facebook, Twitter, Instagram, YouTube, blogging tools, websites, as well as mobile apps, have been used for vital disaster management functions, such as sharing information on shelters, safe routes and supplies, for connecting families, for damage and needs assessment, as well as for fundraising and providing moral support. At times, social media is the only available communication channel during disasters, when infrastructure and telecommunications are destroyed or disrupted (Peary et. al. 2012).

Social media also has the benefit of providing respondents with the most up-to-date information from the ground during disasters, as it is the affected people themselves who are sharing content. This capability has proved to be crucial in disaster response, as it was evident from a number of past events, such as the 2010 earthquake in Haiti, the 2011 Tohoku earthquake and tsunami in Japan, and the 2013 typhoon Haiyan, among others.

In recent years, social media has practically become a part of everyday life for a large number of people worldwide. In the last quarter of 2019, Facebook had 2.5 billion monthly active users, Twitter—330 million (by mid-2019), and Whatsapp—more than half a billion (Statista 2020a, b, 2019). Overall, by the beginning of 2020, 3.8 billion people were actively using different social media platforms every day (Kemp 2020).

Humanitarian organizations and governments have taken notice of the vast outreach and the multiple benefits of social media platforms and have started to use these channels in all stages of the disaster management cycle. What is more, residents are now expecting respondents to pro-actively share disaster information on social media, prompting emergency managers to consider new working practices and policies that would be able to accommodate both the needs of the communities they serve, and the challenges that inevitably come with sharing sensitive content online (Alexander 2013).

The present chapter aims to provide a brief overview of the available literature on the role of social media for disaster management, and the types, uses, benefits and potential threats and challenges. A review of relevant case studies is included to identify some good and bad practices and derive lessons learnt. Finally, the chapter will pinpoint some key takeaway messages for practitioners and policy-makers in an attempt to chart the way forward.
4.2 Brief Literature Review

Extensive literature on the topic of utilizing social media platforms in disaster management has emerged in the past 20 years, with researchers focusing on various aspects of their application.

Giroux et al. (2013) provide an overview of the opportunities and risks in which governments should consider in relation to using social media in the pre-disaster, response and recovery phases of the disaster management cycle, and Dragović et al. (2019) compile a comprehensive list of case studies with a view to exemplify how social media was used in practice during the different phases. That said, Ngamassi et al. (2016) note that social media is mostly used in the response phase of disasters and underused in the other phases, which is seen as a gap.

Hong et al. (2018) analyze data collected from Twitter during 18 snowstorms in Maryland, USA, revealing some insights on how information changes based on the rural–urban divide or the severity of the snowstorms, and suggest that local governments should adapt their messages to the public to match the context and the specific needs of the communities they serve. Olteanu et al. (2015) evaluate information collected from Twitter, concerning 26 crisis events between 2012 and 2013, concluding that the type of messages shared by the public changes according to the type of crisis situation at present. Liu et al. (2008) pay special attention to imagery information uploaded by citizens to the photo platform Flickr in times of a crisis and Peters and De Albuquerque (2015) take the 2013 floods in Saxony, German, as a basis to assess the usefulness of posting images for situational awareness.

A number of papers are focused on a specific country or on an incident. Ambinder and Jennings (2013) thoroughly describe the activities by citizens during super-storm Sandy, which hit the USA in October 2012, and how they managed to organize a huge support network using social media. Cheong and Cheong (2011) analyzed Tweets to made deductions on the types of online communities and identify active online players during the 2010–2011 floods in Australia, and Ehnis and Bunker (2012) looked into the ways the Queensland Police Service utilized social media to engage with the public and tackle false rumors during the same crisis. Kongthon et al. (2014) analyzed posts on Twitter and other social media to understand the role online platforms played during the 2011 Thai floods, and Gunawong and Jankananon (2013) provided gender-segregated data extracted from Twitter and Facebook to identify how men and women reacted to the same event, which could have important implication for disaster response.

Peary et al. (2012) look at the 2011 Tohoku earthquake as a case study to analyze which, to what extent, and how useful different social media platforms were during and after the disaster.

Sakurai and Murayama (2019) provide some specific examples of how information technology, including social media, could be used during the different disaster phases, focusing on Japan. They underlined the need for developing a more holistic approach to using such technology in all disaster phases, as well as setting
data standards for information sharing among the various information systems and stakeholders.

The importance for governments to set up frameworks and guidelines, in order to adequately utilize social media tools, has also been highlighted by Chan (2013) who identifies three key capabilities in which governments need to develop: mechanisms for early detection through community engagement on social media; optimized task handling through dedicating resources; an integrated public alert and feedback system for improved two-way communication.

Ehnis (2018) specifically explores useful ways of integrating social media into the day-to-day activities of emergency and disaster management organizations, including in their internal organization communication, as well as with other similar organizations, or with the public and media outlets. Mauroner and Heudorfer (2016) pay attention to how volunteer groups and organizations are formed through social media around disaster events, such as the 2013 floods in Germany and typhoon Haiyan in the Philippines in the same year. The authors showcase that public participation is evolving, but at the same time caution that such activities can only be one part of strategies for disaster response and early warning and not the whole strategy.

Reuter and Kaufhold (2017) present a summary and analysis of the previous 15 years of research on social media in emergencies, emphasizing usage patterns and types of interactions and users. The authors further differentiate perception patterns of both authorities and the public, and conclude that the use of social media in crises has matured in recent years and will continue maturing in the future.

The above-mentioned studies represent only but a tiny portion of the available research on social media uses in disaster management. As social media platforms develop and data mining and analysis technology improves, such studies will only multiply to showcase new possibilities as well as new threats in the field.

4.3 Social Media Overview

4.3.1 Types, Uses and Benefits

Chan identifies four main functions of social media: (1) information sharing; (2) planning and training (e.g. with games); (3) collaborative decision making through crowdsourcing and analyzing information from different social platforms; and (4) information collection, utilizing information and footage shared by the public (Chan 2013). The Global Disaster Preparedness Center of the International Federation of the Red Cross and Red Crescent Societies gives a more in depth description of the possible uses of social media at the household, the community organization, and the local and national government levels. According to the Center social media could be utilized as an emergency management tool: apart from raising awareness about risks it could be used for monitoring and early warning, for providing specific instructions and real-time alerts to populations, for mobilizing volunteers, to support search and
rescue operations through identifying risk areas and survivors and victims, to support fundraising activities, to improve the lessons learnt process and to disseminate information on recovery and reconstruction. If properly used, social media could also assist in building trust between different stakeholders and between respondents and the communities, as well as could be used to counter inaccurate or false information that might spread during crises (GDPC 2017).

At the household and community organization levels, crowdsourcing platforms, such as Ushahidi, Sahana foundation, and Geeks Without Bounds, provide the opportunity for ordinary citizens to assist in crisis management in different parts of the world. Ushahidi, for instance, was developed by volunteers who wanted to map and report incidences of violence after the 2008 elections in Kenya. The platform received messages from the communities via SMS or online. The reports helped to improve situational awareness and assisted people in identifying safe zones. In that first instance of using the platform, more than 40,000 reports were sent and verified by a team. Since then, the platform was developed further and now exists as a service, having been deployed in approximately 160 countries and having accumulated more than 50 million reports related to different crisis events. In 2015 the platform was used to help coordinate aid activities after a 7.8 earthquake struck Nepal on 25 April. As there were no established formal ways for people to report their condition and needs to authorities, the platform was used to collect voices on the ground, to the result of improved needs assessment and better coordination of relief activities (Ushahidi Website 2020).

During and immediately after the 2011 Tohoku Earthquake in Japan, Twitter became one of the main information channels for people to share and receive updates, with 1200 related Tweets posted every minute (Akhgar et al. 2013). Twitter, Facebook and local networking social platforms, such as Mixi, were widely used to provide support in the affected area—to locate affected people, to provide information on damages, to record needs, and to coordinate efforts. In the aftermath of the disaster, these platforms were also offering moral support to the affected and were used for organizing fundraising campaigns and a multitude of other volunteer initiatives (Peary et al. 2012).

In 2016, during the Kaikōura Earthquake in New Zealand, residents started uploading content, pictures and videos from affected areas, which assisted respondents in identifying priority zones and in organizing their response actions (Fakhruddin et al. 2019). One of the advantages of this method is that while satellite imagery is effective, it may not always provide such detailed information as could photos and videos on the ground, or may simply not be available. Utilizing both satellite and social media information simultaneously could provide a more comprehensive picture of what is truly happening in affected areas (EKU online 2020).

This and other such instances have provided insight into the benefits of using data obtained from social media and more and more big data analysis tools are being developed for improved assessment of public opinion, trends and needs. Big data analysis can also assist agencies and organizations in early prediction and forecast
of disasters, as well as in identifying areas of higher risk or vulnerable communities (Ayers 2018).

Organizations, local and national governments have largely tapped into using social media to reach out to populations, creating their own social media accounts and pages. This has allowed for two-way communication between decision-makers and citizens: while citizens receive the opportunity to voice their needs and worries, public institutions have the opportunity to inform communities of their activities, to better understand their environment and to counter false rumors around important events or in times of crises (Giroux et al. 2013). Thus, for instance, the US Centers for Disease Control and Prevention has more than 1.9 million followers on Twitter and is using its account to send out useful information and instructions to improve early warning and preparedness related to public health, as well as to assist response efforts during disease outbreaks, such as the current spread of the COVID-19 virus. The social media channels, which the organization is using, are updated and monitored by trained specialists and follow a detailed information dissemination process (Giroux et al. 2013; Twitter 2020).

A number of social media platforms have developed functions and services in response to the increasing number of disaster events across the world. Facebook, for instance, has embedded a function that allows people to mark themselves safe and thus inform close ones in times of crisis and has also released a Disaster Maps tool, which shows the location of users and their movement patterns. This feature has been used to identify places, which needed supplies of respiratory masks during the 2017 Southern California Wildfires. The tool was also used to show Internet and cellular phone network coverage during disasters in several instances, such as during Hurricane Maria which hit Puerto Rico in 2017 and after the eruption of the Alotenango volcano in Guatemala in 2018. Google has added a Crisis Map tool to its functions, where users can find emergency updates, including satellite images, weather-related information, evacuation routes and shelters, etc. This service is still limited to a small number of countries and areas, but has the potential to expand (ITU 2019).

Apart from instant messaging platforms, such as Twitter or Instagram, there are also various other information outlets, which provide space for more elaborate discussions between groups and sub-groups: the social network Reddit; different blogging platforms, such as Blogger or Wordpress; the crowd-sourced information page Wikipedia; or platforms providing free or cheaper calls, such as Skype and WhatsApp. Such outlets could be used also in the mitigation and preparedness phases of disasters, sharing content on climate change impacts, possible disaster risks, basic emergency response measures or warnings about expected disaster risks; as well as in the recovery phase of a crisis event to support coordination and community engagement in recovery activities, to connect affected persons, helping them share their experiences, as well as to keep a record of the events, thus facilitating the lessons learnt process. Table 4.1 shows some of the possible benefits of utilizing different types of social media in the different phases of the disaster cycle.

Social media was extremely useful in spreading alert messages in the pre-disaster phase of Hurricane Sandy, which hit large areas in the USA in 2012. A great amount of
### Table 4.1 Possible uses of social media during the different disaster phases. Source Authors; adapted content from GDPC (2017)

| Social media/ Crisis phase | Pre-crisis | During crisis | Post-crisis |
|---------------------------|------------|---------------|-------------|
| Facebook                  | News are shared through the platform— awareness raising; early-warning messages | Facebook safety check function is activated, real-time updates; links people | Crowd-funding and other initiatives |
| Twitter                   | News and messages are shared through the platform— awareness raising; early-warning messages | Real-time updates and coordination; links people | Could be used for crowd-funding and other initiatives |
| YouTube                   | Informative videos for awareness raising | Live footage and updates, information sharing | Record of events and visual information on post-crisis efforts |
| Google Maps/Docs          | – | Real-time updates and coordination | Coordination of relief efforts |
| Interactive mapping tools (Ushahidi, Sahana) | Can be used to map high-risk areas and resources | Real-time updates and coordination; used for search and rescue | Coordination of relief efforts |
| Mobile apps               | Disaster risk games for improving awareness and preparedness | Real-time updates and coordination; links people | Link people, could provide psychological and other assistance |
| Blogs                     | Awareness raising and public discussion; early-warning messages | Public discussion, updates, analysis | Discussion and analysis, could be used for crowd-funding and other initiatives |
| Websites and social network websites | Awareness raising and public discussion; early-warning messages | Public discussion, updates, analysis; coordination of efforts | Discussion and analysis, could be used for crowd-funding and other initiatives; could provide psychological and other assistance |

evacuation information was posted on different platforms and the National Hurricane Centre kept updating its Facebook page with the location and movement of the storm in order to warn citizens to evacuate on time (Dragović et al. 2019).

During the devastating bushfires in Australia in 2019 and 2020, social media has been widely utilized by both citizens and authorities to share images and information as well as for fundraising. More than one million people and a number of popular figures donated funds in support of the efforts by firefighters and other respondents. The Australian comedian Celeste Barber raised more than 50 million dollars through a campaign on Facebook, and a group of professional tennis players managed to raise approximately 5 million dollars in a day. Religious groups such as members of
the Jewish and Islamic communities also used social media to coordinate volunteer initiatives and to offer support through providing shelter and meals (Sokolov 2020).

During and in the aftermath of the disastrous 2010 earthquake, which took the lives of more than 250,000 people and displaced more than 5 million people in Haiti, a plethora of social media platforms were used to support relief and recovery efforts (World Vision 2019). The Ushahidi platform was used to crowd-source volunteer assistance to create an interactive map. Among the volunteers were many people of Haitian descent who were helping translate messages in Creole, which sped up search and rescue activities (Wendling et al. 2013). In the weeks and even years to follow, social media platforms such as Facebook, Twitter and the messaging mobile application Whatsapp played a big role in connecting Haitians in the country with the diaspora abroad, which was offering donations and psychological support (Bojarski 2020).

These examples come to show many benefits in which social media could bring to each phase of the disaster cycle. In the next few paragraphs, two more case studies have been described in greater detail, in order to showcase the specific steps that were taken by residents and respondents, as well as to identify some gaps and lessons learnt.

4.3.2 2013 Typhoon Haiyan (Yolanda), the Philippines

Typhoon Haiyan (also known as Yolanda) was a Category 5 storm, which hit the Philippines on 8 November 2013 and which affected more than 14 million people across 44 provinces. Over 6,000 people lost their lives and approximately 4.1 million were displaced. More than a million houses were destroyed and the overall economic loss amounted to $5.8 billion (Reid 2018).

All telecommunication networks in the affected areas were destroyed and there were no electricity, telephone or Internet connections until 20 November. The typhoon also destroyed essential infrastructure such as hospitals which significantly limited the access to healthcare providers. The World Health Organization (WHO) Representative Office in the Philippines did not traditionally use social media for sharing information with communities prior to the disaster but decided to include social media components in its response strategy to disseminate important public health messages (Cool et al. 2015).

The UN International Telecommunications Union (ITU) provided the WHO with satellite phones with GPS to support the search and rescue efforts of the organization, and set up Inmarsat Broadband Global Area Network terminals to restore Internet connectivity in the affected zones. At that time over 37 million people, or 36%, in the Philippines were Internet users (over 105 million people total population), of whom 34 million were active Facebook users. By 27 November, the WHO established a social media team, created a Facebook page, and started sharing useful information on the crisis (Claravall 2015). In the following days, the organization also set up Twitter and Instagram accounts. It was assessed that among the social media platforms used
in the Philippines, Facebook had the highest penetration, especially in rural areas, and was therefore prioritized by the respondents (Cool et al. 2015).

In the beginning, the messages contained mostly text and pictures focused on the WHO emergency response activities but over time, with the increased demands of the affected people, those changed to messages which urged people to follow public health advice. Illustrations and infographics were used to provide easy to understand and remember information (Cool et al. 2015).

As the WHO had no prior experience in actively using social media for disaster response and recovery, the only evaluation tools available at the time were the Facebook and Twitter analytics sites. The respondents could assess the number of viewers, posts and re-posts but could not assess to what extent this effort had practical implication on people’s behavior. This became one of the lessons learnt for the WHO and the organization updated its emergency risk communication (ERC) strategy to include new evaluation methods. The methods included conducting surveys on the ground and monitoring change in behavior to determine if messages on social media had an impact in real life (Cool et al. 2015).

The second important lesson was that social media presence and strategies should be developed before emergencies strike, which would allow for outreach activities, gaining a wider follower base and assessment on which types of messages are most useful. Finally, the WHO underlined the need for effective cooperation and coordination among partners, as different groups had different priorities, which they wanted to share with the communities. Existing social media outreach cooperation mechanisms were also deemed necessary for improved response (Cool et al. 2015).

In the aftermath of the disaster, relief teams from across the world joined the efforts, introducing new ways of using social media to reach out to and localize victims. Real-time maps were created to identify what was needed where and by whom. A volunteer platform called MicroMappers was checking content posted on social media and assessing the validity of the messages and giving them identifying tags depending on the content (does it contain image, is it a request for help, etc.), after which they were forwarding relevant information to aid workers on site. The platform-assisted respondents in obtaining situational information related the level of destruction of infrastructure and supplied them with up to date maps from rural areas that were previously unavailable (Mackenzie 2013). Hundreds of volunteers joined the initiative. For quality control purposes, every post or picture was validated and tagged by three different volunteers. A special task force team was then performing a second-level assessment before finalization. The MicroMappers team significantly assisted humanitarian agencies in making sense of the huge amount of social media content, which allowed for timelier and more adequate response actions (Howard 2013).
4.3.3 2015 Chennai Floods, India

In November 2015, Chennai, the capital of the Tamil Nadu state in India, received 1,049 mm of rain in that month alone generated by an annual northeast cyclone influenced by El Nino. Towards the middle of the month large areas of the city were flooded, killing over 500 and displacing more than 1.8 million people. Shortly after, on 1 December, heavy rains hit the city once more, leading to over 60% power cuts, and a number of schools and hospitals closed doors (Lal 2017; Nair et al. 2017; Janardhanan 2015). Supply of basic goods was disrupted and prices increased manifold in the days after the floods. The army and police dispatched rescue teams and emergency telephone numbers were set up and promoted. Several telecom companies offered free calls and messaging but the lines were soon overloaded (Express Web Desk 2015).

As official response was slow and insufficient some ordinary citizens turned to social media to seek and provide information and to reach out to their stranded friends and relatives. They were quickly followed by others and between 1 and 4 December Twitter saw conversation volume of approximately 1.4 million Tweets (Express Web Desk 2015). The Tweets contained various types of messages—weather forecast, safety instructions, helpline phone numbers, transport updates, updates from specific areas as well as messages to friends and relatives (@sowmyarao_2015).

Seeing the massive flow of information a few citizens realized the potential of using the platform to share and receive up-to-date information and to coordinate efforts among volunteers. A simple spreadsheet was created that was linking people who could offer shelter and assistance with people in need and it was shared online. Twitter India promoted three main hashtags: #ChennaiRainsHelp, #ChennaiRescue, and #ChennaiVolunteer that were used each according to the type of the message the user was posting, which helped in distinguishing between the Tweets and organizing activities faster. Two social groups: @ChennaiCares and @ChennaiRainsOrg were also set up in order to link seekers with providers of help and for raising funds in support of the affected communities. Over 100,000 people used this social media channel during and in the aftermath of the floods and hundreds of volunteers joined the efforts from around the world. People on the ground could receive instant updates and send immediate feedback as well (@sowmyarao_2015).

Twitter and other social media platforms were also used by organizations, NGOs, and popular figures to express and provide support and to ask for donations. During the disaster, Facebook activated a “Chennai Flooding safety check” feature which allowed people to mark themselves safe and thus let their contacts know they are well. Set-up online payment systems also played a role in collecting donations when ATMs became unusable (Pradnya 2015).

In 2016, Twitter India organized a workshop and meetings to discuss lessons learnt and how response could be improved in the future. The use of standardized hashtags was identified as a good practice, which helped quickly organize and link information in a logical flow. On this occasion, volunteers and citizens acted according to unwritten agreement to be responsible and honest in their conduct but this is not the
case in all disastrous events and some there should be mechanisms for information verification in place. Also, online social media platforms were still available when emergency landlines were overloaded but still they can only be used in areas with higher level of ICT penetration, which is usually urban areas, such as Chennai (ITU 2019; @sowmyarao_ 2015).

The examples above show that social media could be a powerful tool, capable of improving disaster response activities. That said, there are also certain challenges and threats related to using social media in emergency contexts, which respondents and authorities should consider.

### 4.4 Threats and Challenges

Research conducted after the 2011 Tohoku earthquake in Japan revealed that while social media substantially assisted people in connecting with their close ones and in coordinating activities, there were also many hoax calls for help. A wide spread of inaccurate or misleading information also became an issue but there was not enough response from the government or the mass media to try to counter such messages (Peary et al. 2012). In 2016, false information spread during the Kumamoto earthquake, Japan, about a lion escaping the local zoo. The Tweet was reposted more than 20,000 times and the zoo received a multitude of phone calls and inquiries, after which they filed a complaint with the police. Such fraudulent or misleading information could create mass panic and prompt authorities to mobilize resources in vain (Sakurai and Murayama 2019; JapanToday 2016).

Another challenge lies in the ability and capacity to extract and analyze relevant and reliable information out of the noise in social media and from different dynamic content platforms at the same time. The majority of information is conversational in nature and might not contain usable data on the given disaster. Twitter, for instance, is also limited to messages of 140 characters that are usually written in informal way and using multiple abbreviations or jargon words, which makes the effective assessment of the information rather difficult. During the 2015 Nepal earthquake, the abbreviation “KTM” was used by residents on social media when sharing posts about the situation in Kathmandu. Intelligent algorithms and information analysis tools need to be able to pick up such specificities. This task becomes even more challenging when different languages are involved. Objectivity of the reported information is also questionable, as it reflects the user’s personal perception of the risk. A Tweet by a user describing the water level during a flood based on their height (e.g. at knee level), for example, could be unintentionally misleading or inaccurate (Ghosh et al. 2018; Alie and Ogie 2018).

Social media platforms and mobile application could have a limited outreach to users. Facebook, for instance, is not widely used in a number of countries and content is filtered according to the user’s preferences and shared among the users friendship list, which could have some negative effects in relation to people’s perception regarding the response to a disaster or in relation to disaster risk awareness and
preparedness efforts. At the same time, initiatives by citizens organized through social media could be very helpful in times of a crisis or in the rebuilding phase but could also unintentionally obstruct or duplicate efforts by authorities and respondents, if not coordinated in advance (Peary et al. 2012; Giroux et al. 2013).

Millions of bots and spam Tweets are generated every day, as well as fake or fishing accounts, which use the same hashtags and keywords as official accounts but might be aiming to collect users’ personal information, or to promote certain products, to change public perceptions on a topic, or could have other malicious intent. Approximately, 50% of the Twitter accounts created in 2014 were identified as spamming or fraudulent and suspended by the platform, revealing the huge amount of potential misleading profiles on social media (Nazer et al. 2016).

Social media could also exacerbate existing ethnic, racial or religious tensions in times of disasters or other crises when certain groups are targeted and the negative messages are widely shared (Ghosh et al. 2018). It is worth noting that the most vulnerable groups in societies might be exactly the ones who have the least access to technology and social media channels. Divisions could exist along the lines of race, class, gender, age, and culture among other factors. The majority of social platform users across the world still is typically more economically stable, male, and living in urban environments (Alexander 2013; Larsson 2017).

Last but not least, as identified by Watson and Rodrigues (2017), there is a multitude of risks and challenges related to personal data privacy, which policy-makers and respondents should take into consideration. If issues such as cybersecurity, surveillance and unrestricted or unauthorized collection of personal information are not addressed it could lead not only to grave consequences for individuals and for the society as a whole but also to diminishing trust in public institutions and organizations (Watson and Rodrigues 2017).

One of the risks in this relation is that people could be photographed or taken videos of without their knowledge and/or consent. Even if those were taken with a good cause in mind it might harm the person, if the image or video are used for different purposes. As posts are usually public is it very difficult to predict the possible second uses of online content. To add to this, users are unaware of actors involved in data mining and analytics. Apart from governments, such actors could include also civil society organizations, private companies, and even private individuals, who could all have different intentions. The unregulated collection of sensitive data of persons affected by disasters, cyber-attacks and system failures also pose severe risks related to data leakage and misuse, or intrusion into private life (Watson and Rodrigues 2017).
A study by Sakurai and Murayama (2019) on the implementation of information technologies, which include social media, indicated that local governments in Japan had no comprehensive strategy on the use of specific technologies for specific crises and there was no clear division of responsibilities among staff. According to an official report, in 2017, 941 (54%) out of 1741 local governments in Japan were using social media channels for disaster response. Nonetheless, most of the offices used social media only to share information and only 22 of them were also collecting situational information from online posts. Sakurai and Murayama (2019) further explain that even though there has been an effort from the central government to develop an ICT (Information and Communications Technology)-Business Continuity Plan (ICT-BCP), officials were finding it difficult to implement social media strategies, as well as to commit human resources to the task.

Giroux et al. (2013) reiterate on the importance of establishing coherent social media policies and strategies by governments and organizations, adding that in this time and age failing to provide regular information through social media channels and following up on comments by residents might put the credibility of such institutions in danger. This could be particularly problematic if there is not enough trained staff during disasters, when there are sudden peaks of information flow and requests for assistance coming through social media. The authors recommend allocating time and funds for hiring and training staff that would have the responsibility to lead the social media presence of organizations. They also mentioned that one way of managing expectations would be for institutions to release public statements, in order to clearly delineate their possibilities and limitations in relation to what they could provide in reaction to messages from social media. Realistically, organizations cannot respond to each and every inquiry or request by users, especially amidst a crisis situation (Giroux et al. 2013).

Allocating human and financial resources for social media maintenance, however, might be challenging for a great number of institutions and organizations. One possible way to address this issue could be through collaborating with or nurturing crowdsourcing initiatives. Open-source platforms such as the OpenStreetMap and Sahana could be used for every phase of the disaster cycle. More and more private sectors are also tapping into data mining and assessment. That said, a more sustainable way, which would support community resilience, would be to reach out to the communities themselves and engage young people and the academia in order to grow local networks of social media teams who are trained in advance. This will allow for an improved understanding of the local context and situation on the ground and would raise awareness in the society. All such efforts should be envisaged in national and local long-term strategies to ensure continuity and institutional memory and follow-up.

Respondents should also be very clear and specific in their social media posts so that residents can easily understand what the message is about and what is expected.
from them. Updates on the results of activities should be shared so that transparency can be ensured and trust is built. The work of volunteers and partners should also be recognized publicly so that networks can grow (Kaul 2016).

An important aspect of social media strategies is educating the public on how to relay messages during disasters, e.g. to use specific hashtags or words, or combination of words, that could be caught by analytical systems. For instance, simply using “Chennai” might give a multitude of results, which could be related to other events or tourism promotions, etc., which would pollute the data and make the analysis more difficult. At the same time, other messages with relevant content might not be picked up by the systems if not tagged in a certain way. Engaging the public early on could improve responses (Maron 2013).

Even though large social media platforms, such as Facebook and Twitter are increasingly working together with governments and organizations and have started to detect and regulate false content, rumors and incorrect or outdated information are still very difficult to catch immediately before they spread widely. The US Federal Emergency Management Agency (FEMA) has dedicated a special page on its website under the name “Rumor Control” in order to prevent misinformation during crisis events (Maron 2013). Another good practice would be to have a team of trained staff or volunteers who can quickly pick up false messages and counter them through regularly sharing credible information. Coordinating social media activities with other organizations, local governments, and trusted individuals, could significantly support these efforts. Establishing preliminary agreements with partners before a disaster strikes would immensely speed up coordination afterwards. Working together with traditional media, such as radio and television, would make information shared on social media appear much more credible and would reach out to more social and age groups (DHS 2018).

An April 2011 survey, conducted among 1,891 individuals who were using social media during the Tohoku earthquake, showed that 63.9% of people who used Twitter during the disaster felt that the platform was useful in providing information and 30.7% felt it did not help them in any particular way. In relation to Facebook, 34.7% provided positive feedback about the application and 49.4% provided negative feedback. The local social network platform Mixi received 26.0% positive and 57.9% negative responses (Peary et al. 2012). Following this and many other examples in the literature, it is evident that even though social media could be highly beneficial, it should not be the only, or the main, communication channel of governments and organizations.

Giroux et al. (2013) also warned about the risk of sending out mixed messages. Even though organizations and respondents could and should use different social media platforms, adjusting the language to fit the specific platform and the targeted group, all posts should essentially transmit the same message. As users from the public might react to those messages, the official responses should also be coordinated among platforms and institutions (Giroux et al. 2013).

Another take-away message that was identified is that instead of using written messages and instructional materials only, agencies could use more engaging methods to reach to the communities, such as streaming videos or activities on
channels such as YouTube, Instagram and others. These could, for instance, be short videos introducing local staff members and “behind the scenes” activities presented in humane or even humorous ways, while also including essential information. Different initiatives could be created to target different age groups—e.g. these could be in a cartoon format for the youngest. Such measures could be especially useful in the mitigation and preparedness phases of disasters, addressing an important gap in the disaster cycle, when there is enough time to develop such programs and collect feedback from viewers. In this respect, the power of crowdsourcing could be used as well, for example, through asking people to comment on the result of emergency drills and sirens, thus also checking if systems are operating properly in all areas (Crowe 2012).

A major issue is ensuring the security of social media accounts and the protection of data. If people with malicious intentions manage to hack the accounts of disaster management agencies it could have disastrous effects for hundreds of affected people (Giroux et al. 2013). Watson and Rodrigues (2017) suggest that organizations should include guidelines in their national and local plans and strategies on using social media in a transparent way, and establish mechanisms for lawful and accountable monitoring of social media in times of disasters. Further on, rules and standards should also be developed to regulate the monitoring and data analysis done by private sectors and third parties. Privacy and data protection impact assessments should be conducted in regular intervals to allow identifying gaps and readjustments of policies and practices (Watson and Rodrigues 2017).

Another suggestion by the authors is to encourage the principle of “Privacy by Design” which would mean certain security breaks and measures would be in-built in the design of information and communication technologies (ICT) from the start (Watson and Rodrigues 2017). This recommendation is reiterated by De Stefani (2017) who considers that data mining and analytical software tools should be sophisticated and flexible enough to accommodate a wide range of legal and institutional specificities and context-related characteristics in their design. The purpose is to ensure that in the process of collecting and retaining personal information, no human rights are being violated, and that tools are built based on a preliminary analysis of the legal codes and social norms of the communities where they are going to be used (De Stefani 2017). A number of organizations and bodies have already developed guidelines and principles in this area. The International Committee of the Red Cross (ICRC) has published a comprehensive Handbook on Data Protection in Humanitarian Action, dealing with the issues of data collection, processing, retention and sharing, which could be a useful reference by bodies, which have still not developed their own strategies (ICRC 2017).

Finally, new and more complex tools for data collection and analysis have appeared on the scene in recent year and keep evolving. For instance, the Qatar Computing Research Institute (QCRI) has released an Artificial Intelligence for Digital Response tool (AIDR), which is capable for processing large amount of data in real time during disasters. The system classifies messages through combining machine computation with human intelligence through machine learning. One more example is the European Media Monitor (EMM) tool, which monitors news
from traditional and social media across the world, using sources in more than 70 languages, classifying the information according to the subject. The tool is updated every 10 min. Still, cultural differences, linguistic specificities, reliability and completeness of data, machine learning, big data processing and timely geographical coverage remain among the challenges yet to be solved (Mugnai et al. 2018; EU Commision 2020).

References

@sowmyarao_ (2015) Guest post: online activism for #ChennaiRainsHelp on Twitter. Twitter blog. https://blog.twitter.com/official/en_in/a/2015/guest-post-online-activism-for-chennairains help-on-twitter.html. Accessed 05 April 2020
Akghar B, Fortune D, Hayes RE, Guerra B, Manso M (2013) Social media in crisis events: open networks and collaboration supporting disaster response and recovery. In: Conference paper: technologies for homeland security (HST), 2013. https://doi.org/10.1109/THS.2013.6699099
Alexander DE (2013) Social media in disaster risk reduction and crisis management. Sci Eng Ethics (2014) 20:717–733. DOI: https://doi.org/10.1007/s11948-013-9502-z. Springer Science+Business Media, Dordrecht
Alie AU, Ogie R (2018) Social media and disasters: highlighting some wicked problems. Technology and Society. https://technologyandsociety.org/social-media-and-disasters-highlighting-some-wicked-problems/. Accessed 31 March 2020
Ambinder E, Jennings DM (2013) The resilient social network @OccupySandy #Supperstorm-Sandy. Homeland Security Studies & Analysis Institute. https://www.documentcloud.org/documents/1357203-the-resilient-social-network.html. Accessed 14 Oct 2019
Ayers R (2018) How Big Data assists in disaster relief and preparedness. Dataconomy. https://dataconomy.com/2018/12/how-big-data-assists-in-disaster-relief-and-preparedness/. Accessed 23 March 2020
Bojarski S (2020) Social media and its role connecting earthquake survivors with the diaspora. Pulitzer Center. https://pulitzercenter.org/reporting/social-media-and-its-role-connecting-earthquake-survivors-diaspora. Accessed 12 April 2020
Chan JC (2013) The role of social media in crisis preparedness, response and recovery. Vanguard, RAHS Think Centre. https://www.oecd.org/governance/risk/The%20role%20of%20Social%20media%20in%20crisis%20preparedness,%20response%20and%20recovery.pdf. Accessed 20 March 2020
Cheong F, Cheong C (2011) Social media data mining: a social network analysis of tweets during the 2010–2011 Australian floods. In: Seddon PB, Gregor S (eds) Proceedings of the 15th Pacific Asia Conference on Information Systems (PACIS), Brisbane, Australia, 2011, 46
Claravall MCL (2015) Social media in natural disasters: lessons from Typhoon Haiyan (presentation). The WHO. https://www.itu.int/net4/wsis/forum/2015/Uploads/S/233/WHO-C7eHealth-25May2015-Disasters-Claravall.pdf. Accessed 08 April 2020
Cool CT et al (2015) Social media as a risk communication tool following Typhoon Haiyan. West Pac Survell Response J 6(Suppl 1):86–90. https://doi.org/10.5365/wpsar.2015.6.2.HYN_013
Crowe A (2012) 6 ways to utilize social media before a disaster strikes. Government Technology. https://www.govtech.com/em/disaster/6-Ways-Utilize-Social-Media-Disaster.html. Accessed 04 April 2020
De Stefani P (2017) (2017) Using social media in natural disaster management: ahuman-rights based approach. Peace Human Rights Govern (PHRG) 1(2):195–221. https://doi.org/10.14658/ pupj-phrg-2017-2-3
Dragović N, Vasiljević D, Stankov U, Vukičić M (2019) Go social for your own safety! Review of social networks use on natural disasters—case studies from worldwide. Open Geosciences 11(1). https://www.degruyter.com/view/journals/geo/11/1/article-p352.xml?tab_body=fullHtml-69327. Accessed 04 April 2020

Ehnis CF (2018) Social media within emergency management organisations—a case study exploring social media utilisation for emergency and disaster management. Athesis submitted in fulfillment of the requirements for the degree of Doctor of Philosophy, The University of Sydney Business School, Australia. https://ses.library.usyd.edu.au/handle/2123/17938. Accessed 02 April 2020

Ehnis C, Bunker D (2012) Social media in disaster response: Queensland Police Service-public engagement during the 2011 floods. In: Lamp J (ed) ACIS 2012: location, location, location. Proceedings of the 23rd Australasian conference on information systems, Geelong, Australia, 2012

EKU online (2020) 4 ways Big Data is Revolutionizing emergency management. Eastern Kentucky University. https://safetymanagement.eku.edu/blog/4-ways-big-data-is-revolutionizing-emergency-management/. Accessed 23 March 2020

European Commission website (2020) EMM—European media monitor. https://ec.europa.eu/knowledge4policy/online-resource/emm-european-media-monitor_en. Accessed 12 April 2020

Express Web Desk (2015) Chennai struggling to return to normalcy after raging floods. The Indian Express. https://indianexpress.com/article/india/india-news-india/live-chennai-hit-by-heaviest-rains-in-a-century-normal-life-thrown-out-of-gear/. Accessed 14 March 2020

Fakhruddin B, Chu E, Li G (lead authors) (2019) Next generation disaster data infrastructure. A study report of the CODATA Task Group on linked open data for global disaster risk research. CODATA, IRDR, Chinese Academy of Sciences and Tonkin & Taylor. https://reliefweb.int/sites/reliefweb.int/files/resources/White-Paper_HR.pdf. Accessed 23 March 2020

Ghosh S, Ghosh K, Ganguly D et al (2018) Exploitation of social media for emergency relief and preparedness: recent research and trends. Inf Syst Front 20:901–907. https://doi.org/10.1007/s10796-018-9878-z

Giroux J, Roth F, Herzog M (2013) Using ICT & social media in disasters: opportunities & risks for government. Background document: 3RG special report. Center for Security Studies (CSS), ETH Zürich, Switzerland. https://www.researchgate.net/publication/255723714_Using_ICT_Social_Media_in_Disasters_Opportunities_Risks_for_Government. Accessed 22 March 2020

Global Disaster Preparedness Center (GDPC) (2017) Social media in disasters. https://www.preparednesscentre.org/topics/social-media-disasters. Accessed 14 Oct 2019

Gunawong P, Jankananon P (2013) Social network reactions to a flood situation. In: Conference paper: the technology innovation and industrial management conference (TIIM), at Phuket, Thailand, May 2013. https://www.researchgate.net/publication/291747206_Social_Network_Reactions_to_a_Flood_Situation. Accessed 04 April 2020

Hong L, Fu C, Frias-Martinez V (2018) Information needs and communication gaps between citizens and local governments online during natural disasters. Inf Syst Front 20:1027–1039

Howard BC (2013) Scanning social media to improve Typhoon Haiyan relief efforts. National Geographic. https://www.nationalgeographic.com/news/2013/11/131108-typhoon-haiyan-philippines-crisis-mapping/. Accessed 08 April 2020

International Committee of the Red Cross (ICRC) (2017) Handbook on data protection in humanitarian action; Kune C, Marelli M (co-edit) Geneva, Switzerland. file:///C:/Users/user/Desktop/4305_002_Data_protection_and_humanitarian_action_low.pdf. Accessed 12 April 2020

International Telecommunication Union (ITU) (2019) Disruptive technologies and their use in disaster risk reduction and management 2019. https://www.itu.int/en/ITU-D/Emergency-Telecommunications/Documents/2019/GET_2019/Disruptive-Technologies.pdf. Accessed 4 Oct 2019

Janardhanan A (2015) Now Chennai struggles to lay its dead to rest. The Indian Express. https://indianexpress.com/article/india/india-news-india/now-chennai-struggles-to-lay-its-dead-to-rest/. Accessed 11 March 2020
JapanToday (2016) Man arrested for posting false tweet claiming lion on the loose after Kumamoto quake. https://japantoday.com/category/crime/man-arrested-for-posting-false-tweet-claiming-lion-on-the-loose-after-kumamoto-quake. Accessed 24 March 2020
Kaul M (2016) Twitter for crisis and disaster relief. Twitter blog. https://blog.twitter.com/official/en_us/a/2016/twitter-for-crisis-and-disaster-relief.html. Accessed 10 April 2020
Kemp S (2020) Digital 2020: 3.8 billion people use social media. WeAreSocial. https://wearesocial.com/blog/2020/01/digital-2020-3-8-billion-people-use-social-media. Accessed 12 April 2020
Kongthon A, Haruechayiasak C, Pailai J, Kongyoung S (2014) The role of social media during a natural disaster: a case study of the 2011 Thai flood. Int J Innov Technol Manag 11(03), May 2014. https://doi.org/10.1142/S0219877014400124
Lal A (2017) How social media showed its unique power of crowdsourcing during the Chennai floods. Scroll.in. https://scroll.in/article/859304/how-social-media-showed-its-unique-power-of-crowdsourcing-during-the-chennai-floods. Accessed 11 March 2020
Larsson N (2017) How technology can help disaster response. The Guardian. https://www.theguardian.com/global-development-professionals-network/2017/jan/25/the-future-of-technology-in-disaster-response. Accessed 18 Jan 2020
Liu SB, Palen L, Sutton JN, Hughes AL, Vieweg S (2008) In search of the bigger picture: the emergent role of on-line photo sharing in times of disaster. In: Information Systems for Crisis Response and Management, ISCRAM, Proceedings of ISCRAM 2008—5th International Conference on Information Systems for Crisis Response and Management, Washington, DC, United States (4 May 2008—7 May 2008)
Mackenzie D (2013) Social media helps aid efforts after Typhoon Haiyan. NewScientist. https://www.newscientist.com/article/dn24565-social-media-helps-aid-efforts-after-typhoon-haiyan/. Accessed 04 April 2020
Maron DF (2013) How social media is changing disaster response. Scientific American. https://www.scientificamerican.com/article/how-social-media-is-changing-disaster-response/. Accessed 10 April 2020
Mauroner O, Heudorfer A (2016) Social media in disaster management: how social media impact the work of volunteer groups and aid organisations in disaster preparation and response. Int J Emerg Manag 12(2):196. https://doi.org/10.1504/IJEM.2016.076625
Mugnai F, Fonio C, Annunziato A (2018) Social media in crisis management: outcomes of the 7th JRC ECML crisis management technology workshop. European Union. https://publications.jrc.ec.europa.eu/repository/bitstream/JRC104806/jrc104806_online.pdf. Accessed 12 April 2020
Nair MR, Ramya GR, Sivakumar PB (2017) Usage and analysis of Twitter during 2015 Chennai flood towards disaster management. In: 7th International conference on advances in computing & communications, ICACC-2017, 22–24 August 2017, Cochin, India. ScienceDirect, Elsevier B.V.—Procedia Computer Science 115 (2017) 350–358. https://www.sciencedirect.com/science/article/pii/S1877050917319038?via%3Dihub. Accessed 11 March 2020
Nazer TH, Liu H, Xue H (2016) Information filtering in social media during disasters. Middle East Institute. https://www.mei.edu/publications/information-filtering-social-media-during-disasters#edn4. Accessed 30 March 2020
Ngamassi L, Ramakrishnan T, Rahman S (2016) Examining the role of social media in disaster management from an attribution theory perspective. Short paper—social media studies. In: Proceedings of the ISCRAM 2016 conference—Rio de Janeiro, Brazil, May 2016. https://pdfs.semanticscholar.org/39d4/f7860c69d16d5951ba127d35fda88b375ffa.pdf?%20-%20?. Accessed 02 April 2020
Olteanu A, Vieweg S, Castillo C (2015) What to expect when the unexpected happens: social media communications across crises. CSCW 2015, March 14–18, 2015, Vancouver, BC, Canada. https://www.academia.edu/13371040/What_to_Expect_When_the_Unexpected_Happens_Social_Media_Communications_Across_Crises. Accessed 05 April 2020
Peary BDM, Shaw R, Takeuchi Y (2012) Utilization of social media in the East Japan earthquake and tsunami and its effectiveness. J Nat Disaster Sci 34(1):3–18
Peters R, De Albuquerque JP (2015) Investigating images as indicators for relevant social media messages in disaster management. In: Conference paper: Proceedings of the ISCRAM 2015 conference—Kristiansand, May 24–27, At Kristiansand, Norway. https://www.researchgate.net/publication/275153042_Investigating_images_as_indicators_for_relevant_social_media_messages_in_disaster_management. Accessed 05 April 2020

Pradnya (2015) How social media helped during chennai floods as a disaster management tool. Digital Vidya. https://www.digitalvidya.com/blog/how-social-media-helped-during-chennai-floods-as-a-disaster-management-tool/. Accessed 05 April 2020

Reid K (2018) (updated) 2013 Typhoon Haiyan: facts, FAQs, and how to help. World Vision. https://www.worldvision.org/disaster-relief-news-stories/2013-typhoon-haiyan-facts. Accessed 08 April 2020

Reuter C, Kaufhold MA (2017) Fifteen years of social media in emergencies: a retrospective review and future directions for crisis informatics. J Conting Crisis Manag 26(1):41–57. https://doi.org/10.1111/1468-5973.12196

Sakurai M, Murayama Y (2019) Information technologies and disaster management—benefits and issues. Prog Disaster Sci 2, July 2019, 100012. https://doi.org/10.1016/j.pdisas.2019.100012

Sokolov M (2020) Social media as a force for good: the case of Australian bushfires. The Drum. https://www.thedrum.com/opinion/2020/02/17/social-media-force-good-the-case-australian-bushfires. Accessed 04 April 2020

Statista (2019) Twitter: number of monthly active users 2010–2019. https://www.statista.com/statistics/282087/number-of-monthly-active-twitter-users/. Accessed 12 April 2020

Statista (2020a) Number of Facebook users worldwide 2008–2019. https://www.statista.com/statistics/264810/number-of-monthly-active-facebook-users-worldwide/. Accessed 12 April 2020

Statista (2020b) Daily active users of WhatsApp Status 2019. https://www.statista.com/statistics/730306/whatsapp-status-dau/. Accessed 12 April 2020

Twitter (2020) https://twitter.com/. Accessed 22 March 2020

US Department of Homeland Security (DHS) (2018) Countering false information on social media in disasters and emergencies. https://www.dhs.gov/sites/default/files/publications/SMWG_Countering-False-Info-Social-Media-Disasters-Emergencies_Mar2018-508.pdf. Accessed 10 April 2020

UNISDR (2015) Sendai framework for disaster risk reduction 2015–2030 (SFDRR). Geneva, Switzerland. https://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf. Accessed 18 March 2020

Watson H, Rodrigues R (2017) Bringing privacy into the fold: considerations for the use of social media in crisis management. J Conting Crisis Manag March 2018, 26(1), 89–98. https://doi.org/10.1111/1468-5973.12150

Ushahidi Website (2020) Case studies. https://www.ushahidi.com/impact-report/case-studies. Accessed 20 March 2020

Wendling C, Radisch J, Jacobzone S (2013) The use of social media in risk and crisis communication. OECD Working Papers on Public Governance No. 24. OECD-publishing. https://read.oecd-ilibrary.org/governance/the-use-of-social-media-in-risk-and-crisis-communication_5k3v01fskp9s-en#page1. Accessed 12 April 2020

World Vision (2019) (updated) 2010 Haiti earthquake: facts, FAQs, and how to help. https://www.worldvision.org/disaster-relief-news-stories/2010-haiti-earthquake-facts. Accessed 12 April 2020