

The role of social media in emergency management during the 2019 flood in Poland

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Abstract

Objectives: The aim of this article is to discuss the role of social media platforms, Facebook and Twitter, during the floods that took place in Poland in May 2019. The following research questions guided the study: (1) How is social media used by different actors at various stages of the disaster management cycle? (2) To what extent were social networking sites used during the 2019 floods in Poland?

Methods: The study employed social media analytic tools to analyze social media data published on Facebook and Twitter qualitatively and quantitatively in the period from 1 March to 10 June 2019.

Results: Social Media is used during emergencies by various actors for different purposes: emergency services use it to broadcast weather alerts and situational updates; authorities communicate weather alerts and offer assistance; mass media outlets share up-to-date information; individual users connect and share their experiences of the disaster as well as express political views; organizations spread general comments, situational updates and political comments.

Conclusions: Despite several drawbacks, such as the chaotic spread of messages, their unreliability and the politicization of the news-feed, social networking sites support disaster management. Therefore, they should be incorporated as an additional communication channel during emergencies.

Keywords:

emergency management, crisis management, crisis communication, Social Media, flood

Introduction

At the outset of the paper, it is necessary to clarify exactly what is meant by emergency management. According to the Act of 26 April 2007, disaster management refers to actions undertaken by public administration to prevent crisis situations, to prepare to take control over them through planned action, to react to crisis situations, to remove their consequences, and to reconstruct resources and critical infrastructure. Crisis situations can be caused either by natural agents (e.g. floods, hurricanes, and earthquakes) or man-made hazards (e.g. accidents, acts of terror, and attacks); typically, they take place suddenly and unexpectedly and require the integrated and coordinated effort of both authorities and institutions, e.g. the police and fire departments (Marszałek *et al.* 2013). The Ministry of the Interior and Administration is responsible for disaster management; the Government Centre for Security monitors potential threats, coordinates information during a calamity, and coordinates emergency management efforts. Local authorities (at the level of community, county and voivodship) are responsible for monitoring threats at the local or regional level, coordinating rescue operations, maintaining public order, and carrying out all issues related to civil protection (Gryz and Kitler 2007, Lewandowski and Bieniek 2019).

Social media is integrated and interactive media uses digital code (Dijk 2006, p. 9). Facebook is a platform that allows users to post comments and hyperlinks, share multimedia and chat live. Twitter is a microblogging site that allows users to send and receive 140-character tweets that can include hyperlinks. The ubiquity of social network platforms has an impact on the economy (Castells 2002, Dijk 2006), politics (Castells 2002, Domalewska 2016, Żakowska and Domalewska 2019), education (Świerszcz 2016, Domalewska 2017, Gawlik-Kobylińska and Maciejewski 2019, Urych 2019), and security (Górnikiewicz and Szczurek 2017, Bielawski and Grenda 2019, Soboń 2019).

Implementing social media in emergency management is a complicated issue since its use will vary depending on the type, intensity and range of the emergency. Moreover, digital media is used differently by each actor taking part in crisis communication (i.e. emergency services, authorities, organizations, and individual users). Furthermore, its use varies depending on the stage of the disaster management cycle (see Fig. 2 below). In the mitigation and prevention stage, social media is used to carry our risk communication (Sandman 1993), to educate and inform citizens. In the preparedness stage, social networking sites help to increase situational awareness, broadcast alerts and current news, get in touch with a great number of users and the emergency services, give or find the location of the disaster and the location of victims, initiate coordinating activities and provide emotional support. In the response stage, social media can broadcast up-to-date information, mobilize citizens, organize on-site response activities, and complement emergency services' documentation of the disaster. Finally, in the recovery stage, social networking sites can provide a platform for collecting financial or psychological support.

The aim of this article is to discuss the role of social media platforms, Facebook and Twitter, during the floods that took place in Poland in May 2019. The following research questions guided the study: (1) How is social media used by different actors at various stages of the disaster management cycle? (2) To what extent were social networking sites used during the 2019 floods in Poland? The study employed social media analytic tools to analyse social media data published on Facebook and Twitter in the period from 1 March to 10 June 2019. During the study, 10,755 Facebook posts and 7,709 tweets were collected and analyzed qualitatively and quantitatively.

Literature review

Social networking sites are playing an increasingly important role in disaster management. The first documented use of social media during an emergency took place after the 9/11 terrorist attacks on the World Trade Center in New York when individual users created wiki to collect information about missing persons (Vieweg *et al.* 2008a). Since then, research into the role of social media in emergency management has intensified. The role of social media in crisis management has also changed. In fact, the perception of social media use varies among users, as individual users presume that authorities monitor social media on a regular basis (Aldehoff *et al.* 2019). Reuter *et al.* (2012) argue that 2 main actors participate in crisis communication in social media: the public and organizations (i.e. authorities, emergency services and other private or public institutions) taking on the role of a sender and receiver (see Figure 1).

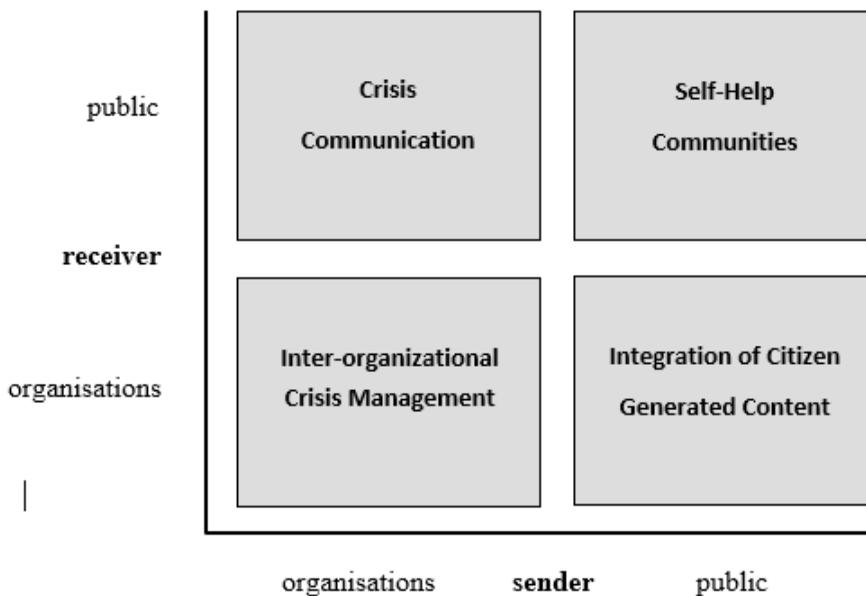


Fig. 1. Classification matrix for social software in crisis management (Reuter *et al.* 2012, p. 11)

Emergency services and authorities issue alerts and publish up-to-date emergency-related information targeted at civilians (crisis communication). Organizations also communicate with one another (inter-organizational crisis management) to improve inter-organizational awareness (Reuter *et al.* 2012), facilitate the exchange of knowledge and expertise, and develop informal bonds (Meijer and Torenvlied 2016).

The public use social networking sites to create self-help communities and organize neighbourhood aid. When disaster strikes, people want to provide help and social media is a handy tool for mobilizing civilians (digital volunteerism), organizing on-site response activities in the immediate aftermath of an emergency (Schmidt *et al.* 2018), and also for successfully distributing help, coordinating action and managing knowledge (Sutton *et al.* 2008a, Palen and Hughes 2018) to optimize crisis management in the response and recovery phase of the disaster management cycle. Social networking sites can be used by citizens to identify victims as well as to find out if relatives and friends have been affected by the disaster (Reuter *et al.* 2012).

Finally, emergency services make use of citizen-generated content to supplement the documentation of the calamity (Latonero and Shklovski 2011) and provide eyewitness

information (e.g. recorded footage by dashboard cameras). Civilians provide crisis-related information; therefore, they should be included in the information infrastructure. The information generated by the public can also be useful to the victims affected by the disaster (Sutton *et al.* 2008b, Vieweg *et al.* 2008b). Moreover, social media analytic tools are an easy-to-use and accurate instrument to monitor online discourse and analyze public sentiment (Serrano *et al.* 2017).

The classification of actors involved in the social-mediated crisis management discussed above sheds light on how social networking sites can be implemented at various stages of the disaster management cycle, as illustrated in Figure 2.

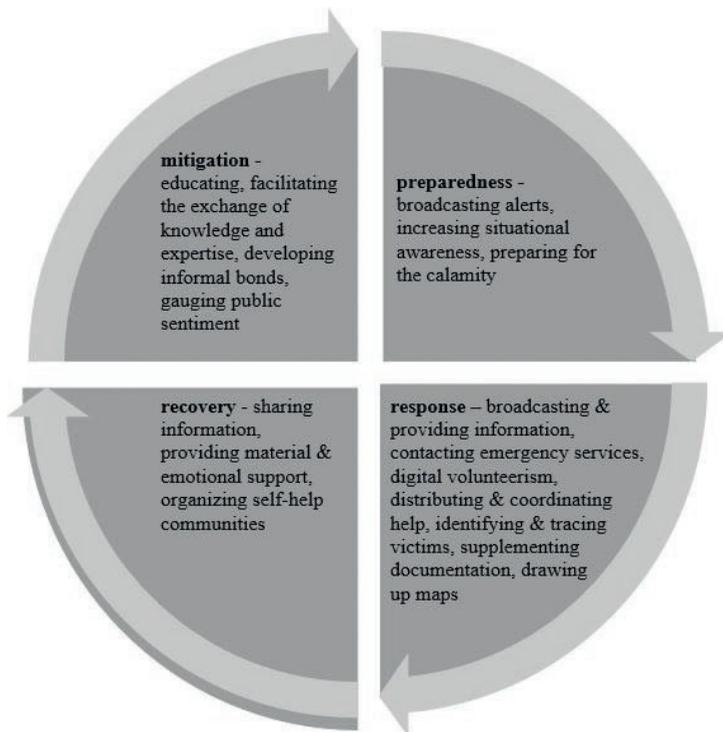


Fig. 2. The use of social media in the disaster management cycle

As can be seen in Fig. 2, social networking sites provide a platform that can be used to complement and support disaster management. Bhuvana and Arul Aram (2019) provide several examples of social-mediated crisis management. First, in the aftermath of the tornadoes that struck Joplin, Missouri in 2011, Facebook pages, such as “Joplin Tornado Citizen Checks,” were set up to help to distribute up-to-date information, to trace relatives and friends affected by the calamity, and to identify victims that were missing. Second, during the Chennai floods, WhatsApp facilitated the crisis management. With poor internet connectivity, voice calls were unavailable, but the app was used as a messaging service to distribute information (including situational updates and weather alerts) and upload photographs and videos. Thanks to the app, it was possible to rescue stranded flood victims, mobilize and distribute volunteers for relief efforts. Similarly, during the Mount Merapi Eruption in 2010 and the earthquake and tsunami that hit the east of Japan in 2011, Twitter was used for communication where the mobile network failed. Moreover, Twitter played an important role in helping people to prepare for the calamity at the local level before the disaster and to organize help for vulnerable members of the population in the recovery phase (Ichiguchi 2011, Nugroho 2011, Chartfield and Brajawidagda 2013).

Social networking sites have a competitive edge as the information can be spread within a matter of seconds. Son *et al.* (2019) and Shaw *et al.* (2013) show that the latest updates on water levels in flood-ravaged areas were reported on Twitter

When the emergency strikes, social networking sites are used to disseminate information about injured or missing persons, electricity blackouts, situational updates on transportation problems, closed roads, and regions affected by fire (Sutton *et al.* 2008b). Social media was used to mobilize citizens to volunteer help (Palen and Hughes 2018).

Social networking sites have also launched disaster response mechanisms. Facebook provides several features that can help during a disaster, e.g. the safety check feature can be used to mark the user safe when a calamity strikes, the 'give or find help' feature helps to connect people to help with the distribution of resources such as food, supplies and shelter, the 'raise money' feature can be used to organize fundraising, and the 'get information' feature integrates disaster-related information from a variety of sources to help keep the public informed at the time of crisis (<https://www.facebook.com/about/crisisresponse/>). Facebook also launched Disaster Maps to facilitate recovery from contingencies. Serrano *et al.* (2017) investigated the use of social networking sites by emergency services. The results of their study show that emergency services believe in the usefulness of social media in increasing situational awareness and keeping in touch with the public. Furthermore, they agree that the public can facilitate crisis response by providing eyewitness accounts (especially photographs or footage of the incident). In the recovery stage of the disaster management cycle, social networking sites are used to disseminate information about civilians in need and regions affected by the calamity. They are also used to collect donations, distribute help and organize self-help communities.

Despite the potential of social-mediated crisis response, studies point to a number of risks related to the use of social media. During disasters, there is a lack of up-to-date reliable information. A great number of disaster-related posts and tweets are published, but they are frequently chaotic, redundant, inconsistent (Kaewkitipong *et al.* 2012) and unreliable (Reuter *et al.* 2015, Serrano *et al.* 2017). Therefore, information reliability, false rumours and disinformation can be problematic. However, some studies prove that disinformation or misinformation is prevented by the collective intelligence of citizens who validate online communication (Vieweg *et al.* 2008b) (e.g. by using retweets and reporting fake news or abuse). As Bird *et al.* (2012, pp. 30–31) claim "[w]hile rumours were common at the heights of the disaster, respondents reported that the moderators of the Facebook pages were prompted to confirm information and provide official sources when available" Another misuse of online crisis communication results from the fact that users might unintentionally provide wrong information, e.g. if tweets are sent from a computer, the location of the user profile may not be correct (Reuter *et al.* 2012). Emergency services may be overwhelmed with the amount of digital data. Finally, the number of citizens volunteering their help may cause serious problems with coordination. Civilian involvement might increase the complexity of tasks, add to the uncertainty of the emergency, and build up pressure for emergency services if volunteers become endangered (Perng *et al.* 2012).

Methodology

The aim of this article is to discuss the role of social media platforms, Facebook and Twitter, during the floods that took place in Poland in May 2019. Heavy rains and storms led to severe flooding in parts of eastern and southern Poland in May 2019, which caused considerable damage. More than 8,000 hectares of land was left underwater, 4,000 residents and 5,000 animals were evacuated (Turner 2019). The flood was

accompanied by tornadoes that caused damage to buildings. The highest flood warning level was issued. Emergency services (including fire brigades, the army, and Territorial Defence Forces) were deployed to coordinate and execute crisis management activities in order to protect and support local communities. The following research questions guided the study: (1) How were social networking sites, Facebook and Twitter, used by different actors during the 2019 floods in Poland? (2) To what extent were social networking sites used during the 2019 floods in Poland? The study employed social media analytic tools to carry out a retrospective analysis of social media data published on Facebook and Twitter in the period from 1 March to 10 June. Over this time period, 10,755 Facebook posts and 7,709 tweets were collected and analyzed qualitatively and quantitatively. An initial 10% of the sample from different stages of the emergency was coded to identify themes and sub-themes, which were later used as categories. Next, the entire corpus was coded. Furthermore, sentiment analysis was carried out.

Results

The corpus of the study consists of 10,755 Facebook posts and 7,709 tweets. Figures 3 and 4 below show the volume of mentions and social media reach for Facebook (Figure 2) and Twitter (Figure 3).



Fig. 3. Volume of mentions and social media reach for Facebook



Fig. 4. Volume of mentions and social media reach for Twitter

Facebook witnessed a spike in reach 3 times in the period when the study was conducted. The first spike took place from April 2-4 (a sharp reaction to the climate change report published by the Ministry of Environment, and next on April 23-29 (torrential rain, flash floods, fierce wind and fires sweeping through Poland) and the final rise in reach started on May 21 when the flood hit a large part of Poland. The results of the study clearly show that 58% of posts and tweets with the flood keyword or hashtag were not directly related to the emergency. Most posts not related to the flood keyword were produced by non-commercial institutions or individual users who used the popular keyword to either upgrade their content or spam the discussion (these posts could frequently be categorized as political). Other unrelated posts included information about floods that hit other areas worldwide, advertisements for insurance and cleaning products making use of a popular hashtag to boost digital marketing.

For this reason, the corpus was brought to 2586 Facebook posts and tweets that referred to the flood emergency in Poland.

First, the actor producing flood-related content was established. Next, the topic and sentiment of flood-related posts was examined. Figures 5 and 6 include the results obtained from the analysis.

Actor	Distribution	Topic
emergency services (such as the fire service, Territorial Defence Forces)	2.9%	weather alerts and situational updates
Authorities (local, regional and state-level)	6.3%	weather alerts & offering help
mass media local and national; public and private	1%	sharing information
individual users	75%	connecting and sharing experience, venting about politics
institutions and other actors	15.6%	general comments, situational updates, political comments

Fig. 5 Actors involved in flood-related discussion on Facebook and Twitter

Sentiment	Distribution
Neutral	48.9%
Positive	2.1%
Compassion towards animals	4.2%
Compassion - other	0.9%
Negative: fear or threat	1.6%
Political negative	12.5%
Other topic negative	31%

Fig. 6 Sentiment analysis of flood-related discussion on Facebook and Twitter

As can be seen in Fig. 5, emergency services published 2.9% of the posts; authorities 1%; mass media 1%; institutions 15.6%, and individual users 75%. The content of flood-related posts was categorized as political (44.3%), which can be further divided into negative sentiment (29% of the corpus) and neutral (15%). The vast number of political posts can be explained by the fact that the floods occurred at the time when the election campaign to the European Parliament was in full swing. Even though politicians shut down their campaigns during the emergency, the flood easily became a politicized issue.

A quarter of the comments were news and situational updates broadcast mainly by mass media outlets and authorities. The weather occurred in 9.3% of posts whereas 22.1% of messages included general comments. Individual users mainly recorded flood damage. The main purpose of posting these comments was to connect with other users, share the experience of the disaster as well as to express political views and opinions. The authorities' messages first alerted civilians to weather conditions and second, gave information regarding the help on offer to those harmed by the flood. Finally, the emergency services used social networking sites to broadcast weather alerts and situational updates. Fire service and Territorial Defence Forces were the most active emergency services in online crisis communication.

The corpus consisting of text posts and tweets was analyzed for the sentiment (see Fig. 6.). The data was categorized into positive, negative and neutral (objective) sentiments. Most flood-related posts (48.9%) were neutral. Positive sentiment posts comprised 2.1% of the sample. These posts mostly acknowledged the work of emergency services, institutions, and individuals helping to perform successful rescue operation. Next, there were 5.2% of posts expressing compassion, mostly in connection with the fate of animals affected by the flood. A great number of posts and tweets commented on the problem of flooded animal shelters. Due to prolonged inundation, animal shelters were damaged and social media users organized online donations and help in evacuating animals. Many posts criticized dog owners who evacuated from flood-ravaged households leaving their chained dogs behind. Other messages expressing compassion extended sympathy for the people affected by the floods. Social media was used to collect donations and organize support for flood victims e.g. residents of a homeless shelter that was damaged during the emergency.

The results of the study show that 43.5% of online comments related to the flood had a negative sentiment. Some of these messages (1.6%) expressed fear or threat. These messages commented on the disastrous consequences of climate change and urbanisation that impose a heavy burden on the environment. Finally, 4 out of 10 posts and tweets were categorized as strongly negative, which sheds light on the problem of hate speech in online conversations.

Conclusions

With the use of social networking sites on the rise, studying the correlation between social media use and disaster management is becoming important. Based on a review of the literature and the results of this study, it can be concluded that social networking sites can be used to assist emergency services, authorities and individual users during every stage of the emergency management cycle. In the mitigation phase, social media can be used to educate civilians about various risks, facilitate the exchange of knowledge and expertise, develop informal bonds and measure public sentiment in order to prevent a PR crisis. In the preparedness phase, social media is used to broadcast alerts and other information in order to increase situational awareness and prepare for the emergency. In the response phase, it is important to spread up-to-date emergency-related information, trace victims and relatives, and draw up disaster maps. Furthermore, users mobilize and coordinate help and provide eyewitness information. Finally, at the recovery stage, information and support are easily delivered and self-help communities are organized.

The present study aimed to investigate the role of two social networking sites, Facebook and Twitter, during the floods that took place in Poland in May 2019. The study showed that both Facebook and Twitter are used during emergencies by various actors: emergency services, authorities, mass media outlets, individual users and organizations.

Online communication serves different purposes: emergency services use it to broadcast weather alerts and situational updates; authorities communicate weather alerts and offer assistance; mass media outlets share up-to-date information; individual users connect and share the experience of the disaster as well as express political views; organizations spread general comments, situational updates and political comments. Despite several drawbacks, such as chaotic spread of messages, their unreliability and the politicization of the newsfeed, it may be concluded that social networking sites complement mainstream media in disaster management. Social media provides a platform that can be used to facilitate crisis management and, therefore, to help mitigate the loss of lives and infrastructure. Therefore, it should be incorporated as an additional communication channel during emergencies.

The study sheds light on an important implication, namely politicization of online crisis communication. Politicization of media reporting of disasters has two main causes. First, there is a tendency to focus on accountability and blame attribution for ineffective emergency management ([Boin 2009](#), [t Hart 2014](#), [Merry 2014](#)). In crisis situations people ask the question “Why?” and in this, climate accountability becomes a common topic of public debate with politicians willing to point to the forbearance of their political opponents. On the other hand, calamities are used to promote particular political agendas ([Rosenthal 1998](#), [Potrifiev 2006](#)). Politicians and opinion leaders tend to take advantage of the increased media attention to push their own or their parties’ agenda forward. However, further research is needed to analyze the effects of politicization of crisis online communication.

References

Hart, P., 2014. Managing crises long term: the challenges of preparedness and response. In: Boston, Jonathan, J. Wanna, V. Lipski, and J. Pritchard, eds. *Managing Risks, Responding to Crises and Building Resilience*, Canberra: ANU Press, 167–188.

Aldehoff, L., Dankenbring, M., and Reuter, C., 2019. Renouncing Privacy for Crisis Management? CoRe Paper-Privacy Risk Management in. In: Z. Franco, J.J. González, and J.H. Canós, eds. *Privacy Risk Management in Critical Infrastructures*. Valencia, p. 1184–1197.

Bhuvana, N. and Arul Aram, I., 2019. Facebook and Whatsapp as disaster management tools during the Chennai (India) floods of 2015. *International Journal of Disaster Risk Reduction*, 39. <https://doi.org/10.1016/j.ijdr.2019.101135>.

Bielawski, R. and Grenda, B., 2019. *Wybrane zagadnienia cyberbezpieczeństwa narodowego*. Wrocław: Exante.

Bird, D., Ling, M., and Haynes, K., 2012. The use of social media during the Queensland and Victorian floods. *Australian Journal of Emergency Management*, 27 (1), 27–33.

Boin, A., 2009. The new world of crises and crisis management: Implications for policymaking and research. *Review of Policy Research*.

Castells, M., 2002. *The Internet Galaxy: Reflections on the Internet, Business and Society*. New York.

Chartfield, A.T. and Brajawidagda, U., 2013. Twitter early tsunami warning system: A case study in Indonesia's natural disaster management. In: *Proceedings of the 46th Hawaii International Conference on System Sciences. Hawaii: IEEE Computer Society*, 2050–2060.

Dijk, J. van, 2006. *The network society. Social aspects of new media*. London: Sage Publications.

Domalewska, D., 2016. Immigration, stereotypes, and social security: The portrayal of migrant groups in public discourse. *Security and Defence Quarterly*, 4 (13), 15–31. <https://doi.org/10.35467/sdq/103231>.

Domalewska, D., 2017. Approaches to studying across culturally contrasting groups: Implications for Security Education, 3 (16), 3–19. <https://doi.org/10.35467/sdq/103181>.

Gawlik-Kobylińska, M. and Maciejewski, P., 2019. New Technologies in Education for Security and Safety. In: *Proceedings of the 2019 8th International Conference on Educational and Information Technology. ACM*, 198–202.

Górnikiwicz, M. and Szczurek, T., 2017. Determinanty kształtowania bezpieczeństwa wewnętrznego. In: E. Ślachcińska, ed. *Prognozowanie międzynarodowych stosunków wojskowych na podstawie uwarunkowań społeczno-kulturowych*. Poznań: Wydawnictwo Wyższej Szkoły Bankowej, 103–113.

Gryz, J. and Kitler, W., 2007. *System reagowania kryzysowego*. Toruń: Wydawnictwo Adam Marszałek.

Ichiguchi, T., 2011. Robust and usable media for communication in a disaster. *The Quarterly Review*, 41 (4), 44–55.

Kaewkitipong, L., Chen, C., and Ractham, P., 2012. Lessons learned from the use of social media in combating a crisis: A case study of 2011 Thailand flooding disaster. In: *Thirty Third International Conference on Information Systems*. Orlando.

Latonero, M. and Shklovski, I., 2011. Emergency Management, Twitter, and Social Media Evangelism. *International Journal of Information Systems for Crisis Response and Management*, 3 (4), 1–16.

Lewandowski, P. and Bieniek, J., 2019. *Administracja porządku publicznego i bezpieczeństwo społeczności lokalnych*. Warszawa: Akademia Sztuki Wojennej.

Marszałek, M., Sobolewski, G., and Majchrzak, D., 2013. *Zarządzanie kryzysowe w ujęciu narodowym i międzynarodowym*. Warszawa: Wydawnictwo Akademii Obrony Narodowej.

Meijer, A.J. and Torenvlied, R., 2016. Social Media and the New Organization of Government Communications. *The American Review of Public Administration*, 46 (2), 143–161.

Merry, M.K., 2014. Framing environmental disaster : environmental advocacy and the Deepwater Horizon oil spill. Routledge.

Nugroho, Y., 2011. *Citizens in @ction: Collaboration, participatory democracy and freedom of information - Mapping contemporary civic activism and the use of new social media in Indonesia*. Manchester & Jakarta.

Palen, L. and Hughes, A.L., 2018. Social Media in Disaster Communication. In: H. Rodriguez, W. Donner, and J.E. Trainor, eds. *Handbook of Disaster Research*. Cham: Springer International Publishing, 497–518.

Perng, S.-Y., Büscher, M., Wood, L., Halvorsrud, R., Stiso, M., Ramirez, L., and Al-Akkad, A., 2012. Peripheral response: Microblogging during the 22/7/2011 Norway attacks. In: L. Rothkrantz, J. Ristvej, and Z. Franco, eds. *Proceedings of the 9th International Conference on Information Systems for Crisis Response and Management (ISCRAM)*. Brussels, 1–11.

Potriyev, B.N., 2006. Disaster and Crisis Management in Transitional Societies: Commonalities and Peculiarities. In: H. Rodriguez, E. Quarantelli, and R. Dynes, eds. *Handbook of Disaster Research*. New York: Springer, 368–404.

Reuter, C., Ludwig, T., Friberg, T., Pratzler-Wanczura, S., and Gizikis, A., 2015. Social Media and Emergency Services? *International Journal of Information Systems for Crisis Response and Management*, 7 (2), 36–58.

Reuter, C., Marx, A., and Pipek, V., 2012. Crisis Management 2.0: Towards a Systematization of Social Software Use in Crisis Situations. *International Journal of Information Systems for Crisis Response and Management*, 4 (1).

Rosenthal, U., 1998. Future Disasters, Future Definitions. In: E.L. Quarantelli, ed. *What Is A Disaster?* London and New York: Routledge, 146–159.

Sandman, P.M., 1993. *Responding to community outrage: Strategies for effective risk communication*. Fairfax, VA: American Industrial Hygiene Association.

Schmidt, A., Wolbers, J., Ferguson, J., and Boersma, K., 2018. Are you Ready2Help? Conceptualizing the management of online and onsite volunteer convergence. *Journal of Contingencies and Crisis Management*, 26 (3), 338–349.

Serrano, C.C., Spielhofer, T., Cullen, J., and Reuter, C., 2017. Impact of Social media on citizens and emergency services [online]. Available from: https://www.researchgate.net/publication/328461851_Impact_of_Social_media_on_citizens_and_emergency_services [Accessed 17 May 2019].

Shaw, F., Burgess, J., Crawford, K., and Bruns, A., 2013. Sharing news, making sense, saying thanks: Patterns of talk on twitter during the Queensland floods. *Australian Journal of Communication*, 40 (1), 23–39.

Soboń, A., 2019. *Proobronność Rzeczypospolitej Polskiej. Teraźniejszość i przyszłość*. Warsaw: Akademia Sztuki Wojennej.

Son, J., Lee, H.K., Jin, S., and Lee, J., 2019. Content features of tweets for effective communication during disasters: A media synchronicity theory perspective. *International Journal of Information Management*, 45, 56–68.

Sutton, J., Palen, L., and Shklovski, I., 2008a. *Backchannels on the Front Lines: Emergent Uses of Social Media in the 2007 Southern California Wildfires*.

Sutton, J., Palen, L., and Shklovski, I., 2008b. Backchannels on the front lines: Emergent uses of social media in the 2007 Southern California wildfires. In: F. Fiedrich and B. Van de Walle, eds. *Creating advanced systems for inter-organizational information sharing and collaboration. Proceedings of the 5th International Conference on Information Systems for Crisis Response and Management (ISCRAM)*. Washington DC, 624–632.

Świerszcz, K., 2016. Integralne wychowanie na rzecz integralnego bezpieczeństwa - jako naglące wyzwanie współczesnych czasów. In: Z. Trejnis and M. Marciniak, eds. *Obronność państwa. Uwarunkowania oraz organizacja bezpieczeństwa i obronności*. Toruń: Adam Marszałek, 158–193.

Turner, R., 2019. Poland battles rising flood waters [online]. Available from: <https://www.dw.com/en/poland-battles-rising-flood-waters/a-5602866> [Accessed 15 Jun 2019].

Urych, I., 2019. *Potencjał obronny klas wojskowych Teoretyczno-empiryczne aspekty kształcenia obronnego*. Warsaw: Akademia Pomorska.

Ustawa z dnia 26 kwietnia 2007r. o zarządzaniu kryzysowym, 2007.

Vieweg, S., Palen, L., Liu, S., Hughes, A., Sutton, J., Vieweg, S., Palen, L., Liu, S.B., Hughes, A.L., and Sutton, J., 2008a. Collective Intelligence in Disaster: An Examination of the Phenomenon in the Aftermath of the 2007 Virginia Tech Shooting. In: *Proceedings of the 5th International ISCRAM Conference*. Washington DC.

Vieweg, S., Palen, L., Liu, S., Hughes, A., Sutton, J., Vieweg, S., Palen, L., Liu, S.B., Hughes, A.L., and Sutton, J., 2008b. *Collective Intelligence in Disaster: An Examination of the Phenomenon in the Aftermath of the 2007 Virginia Tech Shooting*.

Żakowska, M. and Domalewska, D., 2019. Factors determining Polish parliamentarians' tweets on migration. *Czech Journal of Political Science*, 3, 200–216. DOI: [10.5817/PC2019-3-200](https://doi.org/10.5817/PC2019-3-200).