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Towards social resilience: A quantitative and qualitative survey on citizens' perception of social media in emergencies in Europe

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ABSTRACT

Social media is increasingly being used during emergencies. Most available studies are focused on how citizens and/or authorities use these technologies in concrete events. However, larger quantitative studies with significant results on attitudes, needs and future plans of citizens in such events are not available - especially such of a comparative nature related to emergency services. As part of the EU project 'EmerGent' this article presents the findings of a survey of 1034 citizens across 30 European countries conducted between February and June 2015 to explore citizens' attitudes towards the use of social media for private purposes and in emergency situations. The article briefly compares these findings with a second survey conducted with 761 emergency service staff across 32 European countries from September to December 2014. The aim of the overall study is to discuss citizens' attitudes towards social media in emergencies in order to derive challenges and opportunities for social resilience.

1. Introduction

A well-known definition sees social media as a "group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allows the creation and exchange of user-generated content" (Kaplan and Haenlein, 2010). In this context user-generated content refers to "the sum of all ways in which people make use of social media" and describes "the various forms of media content that are publicly available and created by end-users" (Kaplan and Haenlein, 2010). Currently the most common types of social media are Facebook with about 1.36 billion active users monthly, and the microblogging platform, Twitter, counting approximately 284 million active users monthly. YouTube (1 billion), WhatsApp (600 million), Google + (343 million), Instagram (300 million) and Tumblr (230 million) (Statista, 2015) also all have >100 million active users monthly and are widely distributed.

For at least one and a half decades social media has been used in emergencies: after 9/11, by way of example, wikis, created by ordinary citizens, were used to collect information about missing people (Palen and Liu, 2007). Subsequently, analysis of social media in disaster management, mainly in the USA, has become commonplace. Early studies included Murphy and Jennex (2006) who, following hurricane Katrina, looked at the use of PeopleFinder and ShelterFinder, and Palen and Liu (2007), who anticipated a future where ICT-supported public participation would become regarded as both normal and valuable. Fewer studies covering the situation in Europe exist (Reuter et al., 2012).

In recent years, the use of social media has increased substantially and at the same time the nature of that use has shifted towards a more collaborative model. Based on the broader definition of *resilience* as the "ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions" (United Nations, 2009), more specific terms with overlapping meanings emerged: *cooperative resilience* (Reuter et al., 2016a) as the ability to overcome crises of cooperation with the help of adaptability to modified realities by means of cooperation technology, or *social resilience* as the "capacity of social groups and communities to recover from, or respond positively to, crises" (Maguire and Hagan, 2007). Social media can be understood as a key element in the accomplishing of social resilience. However, although we have a developing body of research which analyses use case with regard to the use of social media during emergencies, there is less work which deals with attitudinal factors, especially with regard to the attitudes of citizens in such contexts.

In this article, then, we seek to explore the attitudes of European citizens towards the use of social media in emergency situations. Based on the analysis of related work (Section 2), we describe the methodology of our survey (Section 3) and present its quantitative as well as qualitative results (Section 4). Following this, the findings are compared to a previously published survey on emergency service staff

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attitudes towards social media. The conclusion discusses social resilience as it pertains to social media in emergencies (Section 5).

2. Related work

This section summarizes the literature on the use of social media in emergencies, outlining the main themes of discussion hitherto (Section 2.1). We will then highlight the authorities' (Section 2.2) and subsequently citizens' (Section 2.3) perception of social media. Finally, we will clarify the research gap this study aimed to address (Section 2.4).

2.1. Social media in emergencies

The use of social media in emergencies has become a research agenda of its own to such an extent that the term, "Crisis informatics" is now commonplace. It "views emergency response as an expanded social system where information is disseminated within and between official and public channels and entities. Crisis informatics wrestles with methodological concerns as it strives to develop new theory and support sociologically informed development of both ICT and policy" (Palen et al., 2009, p. 3). This trend was predicted some years ago: "the role held by members of the public in disasters […] is becoming more visible, active, and in possession of greater reach than ever seen before" (Palen and Liu, 2007). That is, the burgeoning research interest has been allied with a greater acceptance of social media use by those directly involved.

In the recent past, a number of studies have been published on social media in emergencies. Various special issues in international journals such as the *Transactions on Computer-Human Interaction* (Hiltz et al., 2011), *Computer Supported Cooperative Work* (Pipek et al., 2014) or *International Journal of Information Systems for Crisis Response and Management* (Reuter, 2015) as well as tracks at various conferences, such as *Information Systems for Crisis Response and Management* deal with this topic. Many studies focus on specific events such as the 2011 London riots (Denef et al., 2013), the 2012 hurricane Sandy (Hughes et al., 2014) or the 2013 European floods (Reuter et al., 2015a). These studies demonstrate the specific ways in which social media have responded to various crises.

The range of different emergency situations, and responses to them, has also produced attempts to categorize the use of social media: Reuter et al. (2012) distinguish between different scenarios of social media use in emergencies. They differentiate between two distinct groups, citizens (C) and authorities (A) (such as emergency services) and describe the resulting information flows in social media such as from authorities to citizens (A2C), from citizen to authorities (C2A) as well as the coordination of (voluntary) activities among citizens (C2C). Research regarding types of users active on social media began by identifying individual roles and proceeded with the development of role typologies. Hughes and Palen (2009) initially identified *information brokers* who collect information from different sources to help affected citizens. For Starbird and Palen (2011), the second step was to recognize the actions of *remote operators* as *digital volunteers* who progress from simple internet-based activities like retweeting or translating tweets to more complex ones, e.g. verifying or routing information. To further differentiate potential user roles, Reuter et al. (2013) suggest distinguishing between activities in the 'real' world as opposed to the 'virtual' world: real *emergent groups* (Stallings and Quarantelli, 1985), whose involvement usually takes the form of neighbourly help and work on-site, and virtual *digital volunteers* (Starbird and Palen, 2011), who originate from the internet and work mainly online. Another study suggests that (real) volunteer groups in emergencies will in the future be challenged to mature and improve according to these enhanced possibilities, so that "professional responders will begin to rely on data and products produced by digital volunteers" (Hughes and Tapia, 2015). Based on a timeline and qualitative analysis of information and help activities during the 2011 Super Outbreak, Reuter et al. (2013) suggest a classification of Twitter users in different roles: *helper*, *reporter*, *retweeter*, *repeater* and *reader*. Kaufhold and Reuter (2016) additionally suggested the role of the *moderator*.

Across various studies of emergencies and disaster events, numerous positive and negative aspects of social media have been identified. Citizens can handle those activities that are unlikely to be done by official emergency services, e.g. recovering lost pets (White et al., 2014). Other aspects include the sometimes "chaotic" or disorganized work of volunteers (Valecha et al., 2013), the need for quality assessment (Reuter et al., 2015b) as well as the possible increase of task complexity and uncertainty for emergency services (Perng et al., 2013). In the following, the results of larger surveys on authorities and citizens' perception on social media are described.

2.2. Surveys on authorities' perception of social media

Reuter et al. (2016b) analysed the state of the art and found that previous research has shown that "volunteered individual reports, especially pictures, are of particular value" to emergency services (see also Ludwig et al., 2015). However, at the same time, other studies have shown that not all emergency responders make use of such data during disasters given the difficulties of receiving and filtering particularly large amounts of data in emergencies (Hughes and Palen, 2012). There are a few quantitative studies which provide evidence on this question, although most are from North America:

Firstly, this includes a comparative study published by the American National Emergency Management Association (NEMA) containing the results of a survey conducted in 2012 among members of emergency services from all 50 Federal States of the US (San et al., 2013). Although the respondents indicated a positive attitude towards social media in general and valued its suitability for information dissemination, 75% of them highlighted the requirement of verifying citizen-generated content, and questioned its credibility. The study also revealed that 85% of US authorities already use social media.

Secondly, a survey of 241 US emergency managers at the county level in 2014 shows that only about half of these agencies use social media (Plotnick et al., 2015). Most of them do not have any formal policies to guide their use. Of those who do have formal policies, about one quarter actually forbid the use of social media.

Thirdly, with over 500 participants, the annual study of the International Association of Chiefs of Police (IACP) about law enforcement's use of social media to report on "the current state of practice and the issues agencies are facing in regard to social media" (International Association of Chiefs of Police, 2015). This found that, comparing the first (International Association of Chiefs of Police, 2010) and last surveys, the agencies' use of social media increased from 81% (77% Facebook, 37% Twitter, 16% YouTube) to 96% (94% Facebook, 71% Twitter, 40% YouTube) and the number of social media policies increased from 35% to 78%.

Finally, Reuter et al. (2016a,b) describe their findings of a survey conducted as part of the EU project 'EmerGent' with 761 emergency service staff across 32 European countries from September to December 2014. They found that the majority of emergency services had positive attitudes towards social media. Social media is more used to share information (44%) than to receive messages (19%). An increase in use is expected (74%), even more for organizations already using it. However there is a huge gap between rhetoric and reality; thus, while 66% of emergency service staff indicated social media can be used to obtain an overview of the situation and to raise situational awareness, in fact only 23% have often or sometimes used social media sites for this purpose.

2.3. Surveys on citizens' perception on social media

Very few quantitative studies have been conducted where citizens have been asked about their perception of using social media in

emergencies. Three in particular, however, are worth mentioning. This includes a comparative study with over 1000 participants conducted by the Canadian Red Cross (2012), which aimed to identify to what extent Canadian citizens use social media and mobile devices in crisis communication and what they expect from the emergency services both currently and in future. This study emphasizes the requirement of trained social media personnel and pointed to the credibility issues of citizen-generated content. It also, however, shows the benefits of reassurance for citizens, providing situational information and monitoring. Social media were seen as a support for existing channels, but not as a replacement for them. It is noteworthy that the Canadian Red Cross employs "trusted volunteers" to support official response via social media.

Secondly, the American Red Cross (2012) also studied citizens' use of social media during emergencies, with 1.017 online and 1.018 telephone survey respondents. According to the study, 12% of the general public, and respectively 22% of high school graduates, have used social media to share or obtain information during emergencies and disasters or in severe weather conditions. Users were most likely to seek information about weather, traffic, damage caused and information on how other people were coping. Beyond that, users shared not only weather information, safety reassurances and their feelings about the emergency but also their location, and eyewitness information. In terms of trustworthiness, friends, family, news media (or reporters) and local emergency officials were the most trusted sources, while unknown people in the general vicinity of the emergency were the least trusted.

Thirdly, Flizikowski et al. (2014) present a survey within Europe, conducted among citizens (317 respondents) and emergency services (130 respondents). The study focuses on the identification of user needs concerning crisis management with the support of social media and mobile devices. The main goal of the study was to identify the possibilities and challenges of social media integration into crisis response management. Generally, the participants had a positive attitude towards social media. During the study, both citizens and emergency services identified the same challenges, such as a lack of knowledge, personnel issues, uniform terms of use, credibility of citizen-generated content, and accessibility for older generations.

2.4. Research gap

Even though we know that many citizens use social media in emergencies, there is very little evidence exploring what proportion and types of citizens currently do so. Most existing quantitative studies focus on emergency services only or study the attitudes of citizens in North America only (American Red Cross, 2012; Canadian Red Cross, 2012). We still know relatively little about the situation in Europe, which might be very different. Flizikowski et al. (2014) did focus on Europe although the study is relatively small scale (based on 317 respondents), and is primarily dependent on open-ended qualitative questions. Our study sought, therefore, to add to existing knowledge by providing a combined analysis of qualitative and quantitative survey questions with 1.034 respondents across Europe both in respect of the present situation and in terms of perspectives for the future. In particular, we intended to shed light on how social media can be used to foster social resilience to deal with disasters.

3. Methodology

This section presents our methodology. It has been adopted from a related study (Reuter et al., 2016b), which focused on the attitudes of emergency service personnel only. We first present the survey design (Section 3.1), including questions, technical realization and channels of distribution. Then we present a characterization of our participants (Section 3.2), followed by a description of our quantitative (Section 3.3) and qualitative (Section 3.4) analysis design.

3.1. Survey design

The survey aimed to identify the attitudes of citizens towards the use of social media and was conducted as part of the EU funded project "EmerGent". It was designed with the aim of collecting a mixture of quantitative and qualitative evidence. In some parts, we aimed to gain statistical results, in some others we were interested in the reasons for answers. Therefore, quantitative as well as qualitative methods were used. The survey consisted of two parts (see Appendix A for details), as follows:

- Part I: Demographic details of survey participants (age, gender, country of origin, role, type of organization) to explore any differences in responses depending on the characteristics of participants.
- Part II: Attitudes towards social media especially in emergencies – a combination of closed questions (using Likert scales (Likert, 1932), asking participants to rate on a scale of 1 to 5 how much they agree with a series of statements) and open-ended questions.

We designed the survey based on a strategy aimed at triangulation. This methodological triangulation involved a combination of questions that focus on more qualitative aspects of citizens' intentions towards social media and their usage before, during and after an emergency at micro-level as well as more quantitative aspects to obtain a comprehensive picture of citizens' attitudes towards social media within emergencies at a macro-level.

In the beginning of February 2015, project partners sent out a link to the online survey in English, Polish, Italian, German and Slovenian to friends, colleagues, professional and social contacts as well as via their own social media channels and websites (snowball sample). This means that the sample of citizens responding to this survey cannot be assumed to be fully representative of citizens across Europe.

3.2. Characteristics of survey participants

The survey responses of 1.034 citizens (including 195 working or volunteering for an emergency service – excluded from the main analysis) were received from citizens across 30 countries, with the largest number of respondents coming from Poland (306), Slovenia (169), Germany (164), the United Kingdom (146), Italy (72), Greece (43) and Norway (39) (Q2) (Fig. 1). It has to be noted that the sample is not representative for each country or for the whole of Europe. Respondents included roughly equal proportions of women and men (Q3), and a broad selection of citizens from different age groups – although the largest proportion (33%) were aged 21–29 years old – only 4% were aged 60 or older (Q4) (Fig. 2). Around one-in-five (19%) of survey participants were working or volunteering for an emergency service (Q5) – these were excluded from the main findings reported on in this summary report as they were significantly more likely to use social media than other citizens and to express positive views about its use during emergencies.

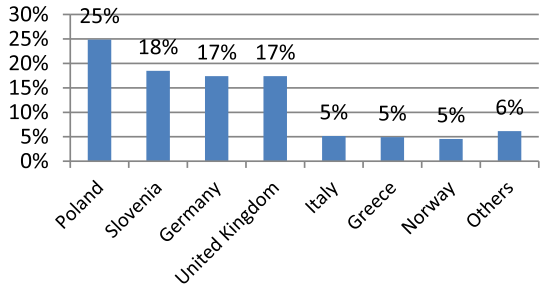


Fig. 1. Countries

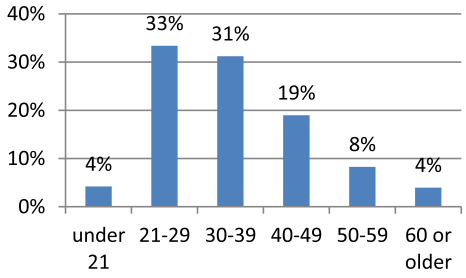


Fig. 2. Age.

3.3. Quantitative analysis

For the quantitative analysis, the survey data was extracted and analysed using SPSS, a software package for analysing quantitative data (IBM, 2014). Furthermore, Excel was used for qualitative coding. The analysis consisted of three key steps:

1. *Exploring basic frequencies* for each question and *using cross-tabulations* to explore any significant differences across different types of respondents.
2. *Factor-analysis of the 12 Likert scale questions* (see above) on participants' attitudes towards social media. To measure respondents' attitudes towards the use of social media for both private and organizational purposes, we used the statistical technique of factor analysis. Factor analysis is a technique used in research to identify groups or clusters of variables, which, taken together, represent an underlying construct or variable of interest in the study (Field, 2009). The analysis identified two factors: the first measured participants' use of social media in general, while the second measured their attitudes towards using social media in emergency situations. Both of these factors had high reliability with Cronbach alpha scores, used to indicate reliability of the scale, of $\alpha = 0.725$ and $\alpha = 0.774$ (Cronbach, 1951) respectively.
3. *One-way Analysis of Variance - ANOVA* (Field, 2009) was then used to measure any significant differences between the types of respondent in relation to these two factors.

3.4. Qualitative analysis

The analysis of our free-text survey questions was based on the inductive approach of *grounded theory* (Strauss, 1987). We used *open coding* associated with grounded theory to derive categories from the more qualitative free-text answers by careful reading and aggregating of categories.

The first step was to extract the entire dataset from the survey platform into an Excel (*.xls) output file. Accordingly, a second sheet was added which contained only the qualitative results including the response identifier and original language identifier. As the survey had been distributed all over Europe, responses made by citizens were in different languages and there was a need for translation. For each question, two columns for translation and categorization were added. Thereafter each response was read manually and translated into English, if required. The translation was performed by native speakers of the respective languages. Where possible, translations were performed by translation services, such as Google Translate and supplemented with dictionaries, if single words could not be translated automatically or the translations needed manual adjustment for better intelligibility. The need for translating the results might be highlighted as a limitation of the study, however we aimed to ask people from different countries in their language, to lower the barrier to participate in our study.

To be able to use the grounded theory-oriented method, the open-ended questions were coded openly and participants' statements were divided into categories. Each response was then assigned one or multiple categories to achieve a quick overview of the interesting and relevant topics. The previously acquired knowledge from the literature review and quantitative analysis was used to increase theoretical sensitivity. In the next section we only present those responses that show identifiably positive or negative perceptions of social media and its use by emergency services from an organizational as well as individual perspective. Each quotation is referenced with the participants' response identifier (e.g. EN146).

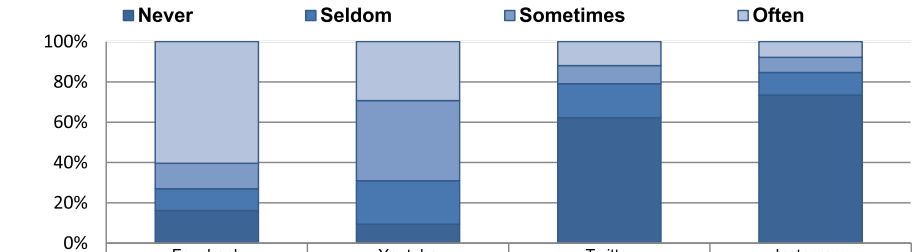
4. Empirical results

In the following sections we present the results of our survey. First we present results regarding personal attitudes towards the use of social media (Section 4.1). We then elaborate the results on searching information (Section 4.2), sharing information (Section 4.3), expectations from emergency services (Section 4.4), as well as open question responses on what would encourage increased social media use in future (Section 4.5). Finally we present results relating to participants' awareness of social media safety services (Section 4.6) and on their use of smartphone apps (4.7).

4.1. Use of social media (Q8–10)

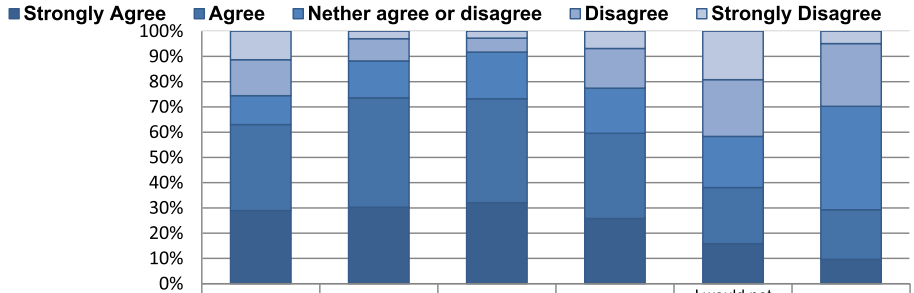
Initially, participants were asked about their use of social media in general (Fig. 3, Q8). The results show that most participants use Facebook on a regular basis (73% answered “often” or “sometimes”). Many participants also use YouTube at least sometimes (69%). However, the majority also stated that they never use Twitter (62%) or Instagram (73%).

Most participants agreed with the statement that they use social media very often in their private lives (63%) and that they have many



	Facebook	Youtube	Twitter	Instagram
Often	60%	29%	12%	8%
Sometimes	13%	40%	9%	8%
Seldom	11%	22%	17%	11%
Never	16%	9%	62%	73%

Fig. 3. Current use of social media (Q8).



	In my private life, I use social media very often	It is important for emergency services to use social media to keep in touch with the public during emergencies.	Most of my friends use social media to keep in touch.	I regularly post messages on social media such as Twitter, Facebook or Instagram.	I would not trust a message posted on social media during an emergency unless it came from an official source such as the police or fire-service.	Emergency Services should not trust information on Social Media.
Strongly Disagree	11%	3%	3%	7%	19%	5%
Disagree	14%	9%	6%	16%	22%	25%
Nether agree or disagree	11%	15%	18%	18%	20%	41%
Agree	34%	43%	41%	34%	22%	20%
Strongly Agree	29%	30%	32%	26%	16%	10%

Fig. 4. Attitude towards social media (Q9).

friends using social media to keep in touch (73%). 60% of the participants also stated that they regularly post messages on social media. While 73% of the participants thought, that it is important for emergency services to use social media, 38% remarked that they would not trust messages on social media, apart from those from official sources. Moreover, about one third (30%) answered that emergency services should not trust information on social media (Fig. 4, Q9).

When asked, which communication channels they have used to get information about an emergency, most participants indicated that they had used TV (86%) and online news (80%), followed by local radio (54%) and social media (42%). Furthermore, a smaller proportion of participants said that they had used online sites (31%) and mobile apps and text messages (22%). Only few people specified that they used other channels or none of them (Fig. 5).

There are significant differences in the general use of social media among different groups of citizens – young people ($F(5, 813) = 11.530$, $p < 0.001$) and women ($F(1, 813) = 26.527$, $p < 0.001$) are far more likely to use it than other citizens. Overall, 13% of citizens currently do not use a smartphone – this rises to 29% of those aged 50 or above. The level of social media use decreased with the age of participants in an almost linear fashion. Women displayed a significantly more positive attitude towards the use of social media during emergencies – similarly, citizens with children under the age of 18 had a more positive attitude towards this.

4.2. Searching information (Q14–16 + 21)

When asked whether they have used social media to find out information in an emergency, 43% of the people said they had used social media for this purpose, while a similar proportion (49%) reported that they had not (Fig. 6).

Of those who had looked for information on social media relating to an emergency, most participants reported that they had looked for information about the weather (78%), road or traffic conditions (70%) or damage caused by an event (63%). Many participants also reported that they had used social media in the past to look for eyewitness videos or photographs (60%). Some also used it to find out the location or status of friends or family (41%) and information about how others were coping with the disaster (38%). Only a third (33%), said that they had looked for information about "what to do to keep yourself safe" (Fig. 7).

More than half (58%) of participants indicated that it was either quite or very likely that they would use social media in the future to look for information. In contrast, just under a quarter (23%) thought it was unlikely they would do so (Fig. 8).

We furthermore asked participants questions about the possible reasons for using social media as an information source. As can be seen in Figs. 9, 54% of citizens thought that information provided on social media sites during emergencies is more accessible than information provided via more traditional media channels such as TV, radio or

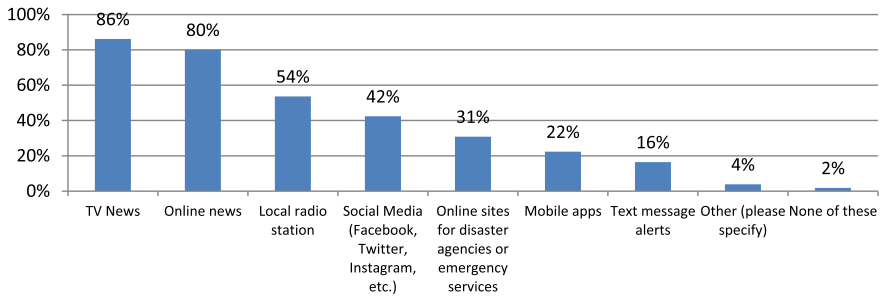


Fig. 5. Current communication channels in use (Q10).

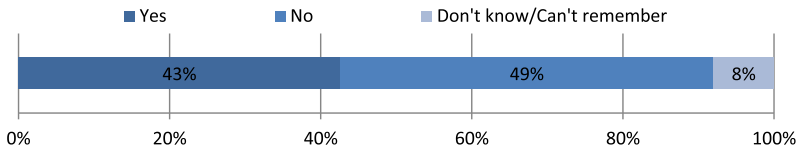


Fig. 6. Current use of social media for information gathering in emergency situations (Q14).

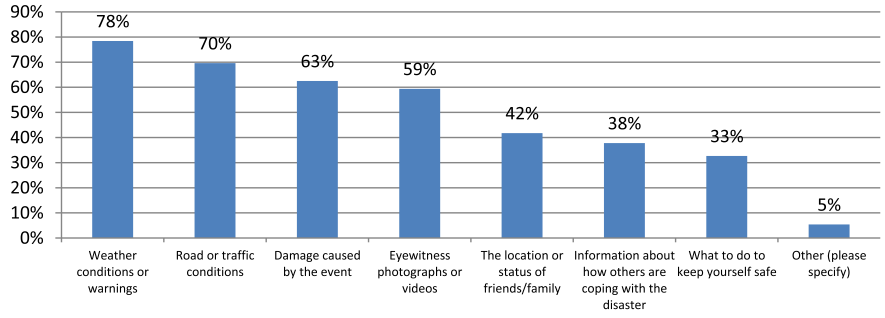


Fig. 7. Current use of social media for information gathering in emergency situations (Q15).

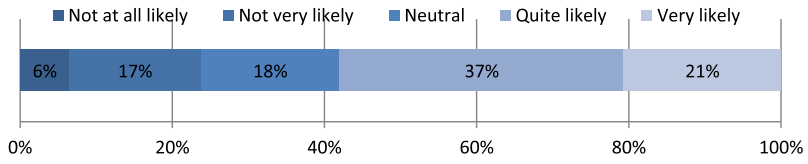


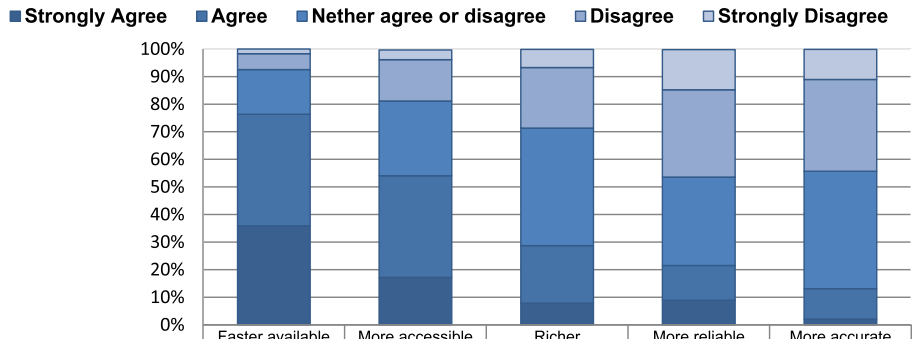
Fig. 8. Future use of social media for information gathering in emergency situations (Q16).

media websites. Similarly, 77% indicated that information provided on social media is made available faster during emergencies than via traditional media channels. However, only 13% contended that information provided on social media is more accurate than information provided via traditional media channels – in contrast, almost half (44%) disagreed with this statement.

4.3. Information sharing (Q17–19)

While, as indicated above, about 50% of participants had never looked for information on social media as a result of an emergency, the proportion of those who had never shared information was considerably higher (67%). However, 27% stated that they had shared information about emergencies in social media – this is likely to include sharing information with other citizens as well as with emergency services or authorities (C2A) (Fig. 10, Q17). Women were significantly more likely ($\chi^2(1) = 17.926$, $p < 0.001$) to have done so (33%) than men (only 20% had done so).

Of those who had shared information on social media, this was most likely to have involved information on weather conditions or warnings (66%), road or traffic conditions (64%) or uploaded eyewitness photographs (53%) (Fig. 10). In contrast, only 22% had shared an



	Faster available	More accessible	Richer	More reliable	More accurate
Strongly Disagree	2%	3%	7%	15%	11%
Disagree	6%	15%	22%	32%	33%
Nether agree or disagree	16%	27%	43%	32%	43%
Agree	40%	37%	21%	13%	11%
Strongly Agree	36%	17%	8%	9%	2%

Fig. 9. Attitude towards social media as information source (Q21).

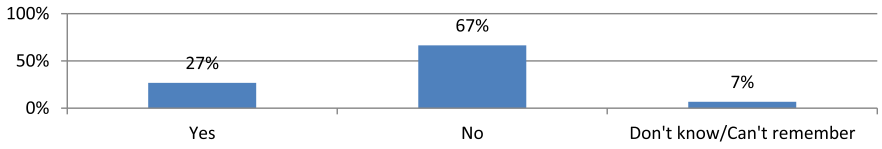


Fig. 10. Current use of social media for sharing information regarding emergency situations (Q17).

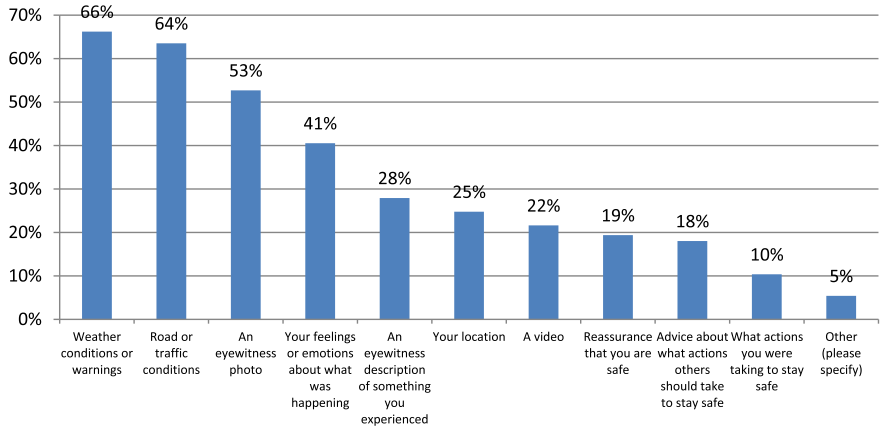


Fig. 11. Current use of social media for sharing information regarding emergency situations (Q18).

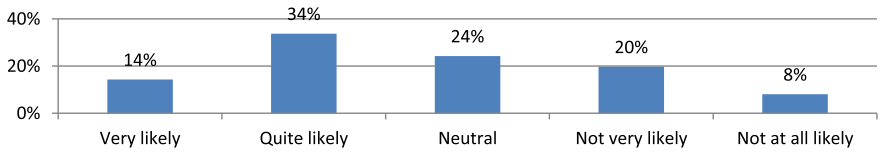


Fig. 12. Future use of social media for sharing information regarding emergency situations (Q19).

eyewitness video on social media. A complete overview is given in Fig. 11.

Asked whether they might be inclined to use social media in future to share information with others, 48% of the participants said that they thought it was likely they would do so; in contrast, as can be seen in Figs. 12, 28% indicated it was unlikely.

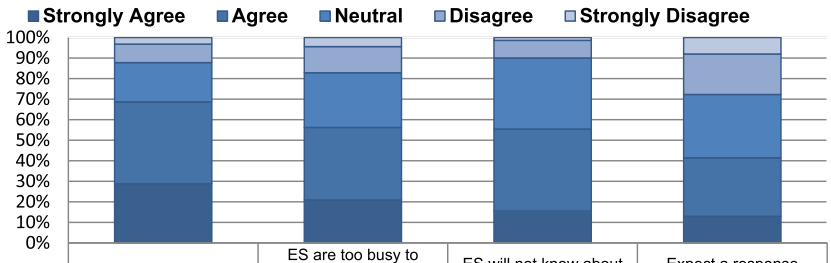
4.4. Expectations from emergency services (Q22)

The survey also included a series of questions exploring citizens' expectations of how emergency response organizations would or should react to a citizen posting a request for help or information on their social media site. It showed that 41% of citizens would expect a response within an hour if they posted such a request, while 69% agreed that emergency services should regularly monitor their social media sites to be able to respond promptly to such a request. In contrast, 56% of participants thought that emergency services were too busy during an emergency to monitor social media (Fig. 13).

4.5. Encouraging citizens to use social media more widely in future (Q20)

The survey contained an open question, asking participants what would make them more likely to use social media to share information with others in future to which 485 participants provided at least one response. The answers indicated that the main ways of encouraging such more widespread use of social media in emergencies included:

- The need for a clearer purpose for sharing information, in particular that emergency services would definitely make use of such information (185 responses fell into this category): *"If I had something to tell them that I thought was relevant." (EN05); "To know in what ways it might be helpful. To be more aware of how the emergency services would use this information" (EN10).*
- More confidence in the quality and data security of information shared on social media (157 responses): *"Impossible to say, there's so much guff on social media sites that you'd never could be 100% that a disaster is truly a disaster as opposed to 'banter'." (EN112); "Including organizations (firefighters, police, civil protection) into social networks with beneficial up to date information, regular publishing on their web sites, also during peace times, when there are no natural or other accidents"* (SL95, translated)
- The provision of improved or more user-friendly applications to share and access such information (64 responses): *"Something very easy to use and already integrated in the apps I currently use" (EN08); "Validating Information. Performant selecting algorithms. Geo referenced data supply." (EN146)*
- Better guidelines and encouragement from authorities on the best ways of sharing information during emergencies (27 responses): *"Didn't know where to look for information and advice. Felt the authorities should at least have had advice on the front of their websites." (EN34); "Change in form, now social media is used for any other purpose. The state would have to announce a new form of transmission of such information." (PL71, translated).* Unsurprisingly there are some guidelines for emergencies available, which have emerged from the recent EU projects ISAR+ (Simão et al., 2015) and COSMIC (Helsloot et al., 2015). However, there



	ES should monitor SM	ES are too busy to monitor SM during emergencies	ES will not know about requests	Expect a response within an hour
Strongly Disagree	3%	4%	1%	8%
Disagree	9%	13%	9%	20%
Neutral	19%	27%	35%	31%
Agree	40%	35%	40%	28%
Strongly Agree	29%	21%	15%	13%

Fig. 13. Perceived social media integration of emergency services (Q22).

is little or no evidence to suggest that awareness of such guidelines is particularly high among citizens across Europe.

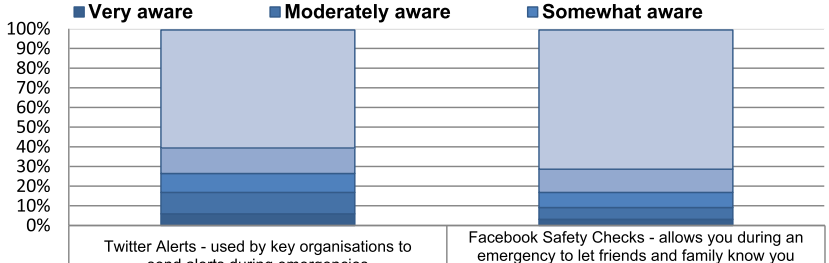
Other participants (98 responses) made comments which did not fall into specific categories. This included answers like "Nothing" (45 responses), or "I don't use social media (for this purpose)" (22 responses) as well as "I don't know" (21 responses).

4.6. Awareness about social media safety services (Q23)

There is generally low awareness among citizens of existing social media safety services provided on Twitter and Facebook – thus, only 6% of citizens said they were 'very aware' of Twitter Alerts, while only 3% were very aware of Facebook Safety Checks (Fig. 14). However, awareness of Twitter Alerts is considerably higher among those using Twitter on a regular basis – 32% of citizen who say they use Twitter 'often' are aware of this service. This contrasts with only 4% of regular Facebook users (that use it 'often') who say they are aware of Facebook Safety Checks.

4.7. Use of emergency smartphone apps (Q11–13)

The majority of participants (71%) reported that they had never downloaded a smartphone app for emergencies or disasters, while 22% said that they had done so (Q11). 208 people answered the open question what kind of apps they had downloaded (Q12). The most popular apps were Warning apps (49 mentions), followed by Weather apps (28 mentions) and First Aid apps (16 mentions). Moreover, several people named Emergency Call apps (14 mentions), News apps (11 mentions) and Earthquake apps (10 mentions) (Table 1). Apropos of the



	Twitter Alerts - used by key organisations to send alerts during emergencies	Facebook Safety Checks - allows you during an emergency to let friends and family know you and friends are safe
Not at all aware	60%	71%
Slightly aware	13%	12%
Somewhat aware	10%	8%
Moderately aware	11%	6%
Very aware	6%	3%

Fig. 14. Knowledge about social media services (Q23).

Table 1
App-categories and the frequencies of mentions (Q12).

App-categories	Mentions	App-categories	Mentions	App-categories	Mentions
Warning app	49	Traffic (Jam) app	8	Twitter app	4
Weather app	28	Location app	5	Safety app	4
First aid app	16	Red cross app	5	Breakdown app	3
Emergency call app	14	Maps app	5	Fire app	3
News app	11	Lifesaver app	5	Flashlight app	3
Earthquake app	10	Hazardous material app	4	Others	15

separate apps in the different countries, the app *Regionalny System Ostrzegania* (RSO), which is named 21 times by Polish people, is eye-catching. Furthermore, German survey participants mentioned *Katwarn* 13 times. Both apps are warning apps developed by the government and are open to the whole population. No other apps were named by more than five respondents.

While only a relatively small proportion of participants had previously downloaded an app, most (60%) thought that it was either very or quite likely that they would download an app to share information with, or receive information from, emergency services in an appropriate situation. Only 21% stated that it was not likely they would do so (Q13) (Fig. 15).

5. Discussion and conclusion

Recently "the role held by members of the public in disasters […] is becoming more visible, active, and in possession of greater reach than ever seen before" (Palen and Liu, 2007). Social media has enabled many of these possibilities and may foster social resilience. Many studies are available that cover the use of social media during specific events, but some large studies also try to focus on citizens' perception (American Red Cross, 2012; Canadian Red Cross, 2012). However, it is doubtful whether findings from America can be assumed to be transferable to Europe. Only one study was found which sheds some light on the comparative situation in Europe, as discussed above, but it included only a relatively small number of respondents (Flizikowski et al., 2014). This article has therefore sought to provide recent evidence of how European citizens are disposed towards the use of social media in emergencies.

Fig. 16 summarizes some of the main results and points to selected facts.

This study has shown that many citizens across Europe are already using social media to share and look for information during emergencies and that they expect their usage to increase in future. In particular, around a quarter (27%) of citizens said that they had used social media for information sharing (Fact 1 in Fig. 16, Q17) and 43% had used it to look for information during an emergency. The most popular shared topics were weather conditions or warnings (66%) and road or traffic conditions (64%) (Fig. 16: Fact 3). Furthermore, the survey suggests that citizens expected to increase their use of social media for such purposes in future. This includes 48% of participants who thought it was likely that they would share emergency information on social media platforms in future (Fig. 16: Fact 7) and 58% who thought that they would use social media to look for information. The main positive reasons for using social media as an information source included that it was seen as faster (76%) and more accessible (54%) than conventional media. The levels of use of social media was considerably higher than found in previous studies, including a study in the USA in 2012 (American Red Cross, 2012) which found that 12% of the general public and 22% of high school graduates had used social media to share or obtain information during emergencies and disasters. The types of information shared and looked for most frequently, however, (weather, traffic, damage caused and information on how other people were coping) were very similar.

The survey also showed that use of social media for private purposes and in emergencies was not uniform demographically and that particular types of citizens are more likely to do so than others. This means that younger citizens and women are significantly more likely to use social media both to look for and share information, while men and those aged 50 or above are significantly less likely to use social media for this purpose (Fig. 16: Facts 2 and 4). As the results of the survey showed, this was exacerbated by the fact that almost a third (29%) of those aged 50 or above do not use a smartphone which is a necessary prerequisite for using social media while not at home. The implications of this is that while social media use is widespread and increasing, some groups are in danger of being excluded from any support, advice or instructions provided via social media before, during or after emergencies from emergency services or other citizens. This could mean that those most vulnerable in an emergency – older or disabled citizens – may be least likely to benefit from an increased use of social media by emergency services.

The study revealed that citizens' awareness of Twitter Alerts and Facebook Safety Checks was generally low – about 56% have never heard of at least one of them (Fig. 16: Fact 5). Sixty percent of participants were not at all aware of Twitter Alerts, and 68% were not at all aware of Facebook Safety Checks. Likewise, 71% have never downloaded a smartphone app for emergencies – in contrast, most participants (60%) indicated it was likely that they would download an app in future for an information exchange with emergency services in an appropriate situation. It seems that the general awareness of such tools depends on the frequency of emergencies someone is confronted with – something other studies also suggest (Reuter, 2014a). In other cases it is likely that such tools are just used if they are integrated in daily used media, such as Facebook.

The current study has also shown that accompanying many citizens' increased use of social media in emergencies is a growing expectation for emergency services to communicate with citizens via social media and to make use of information shared by citizens via social media. Thus, the majority (69%) of citizens agreed that emergency services should regularly monitor their social media sites, and 41% expected a response within an hour (Fig. 16: Fact 6). This is higher than in the Canadian study where 63% of participants thought that emergency responders should be prepared to respond to calls for help posted on social media. This could be explained by the fact that the Canadian study was conducted over three years ago and could suggest that our study reflects an increased awareness among citizens of social media and how it can be used during emergencies – with greater demands made to emergency services to use and be responsive to social media in disaster situations. However, a recent survey conducted in the same project (Reuter et al., 2016b) has shown that even though many emergency services sometimes use social media to share information with the public, only very few often make use of data on social media during emergencies. This reality was reflected in citizens' responses, as part of which 56% thought that emergency services were currently too busy during an emergency to respond to a request for help or information. Furthermore, many of those responding to an open-ended question asking participants to explain what would encourage them to share information via social media said that this depended on a clearer purpose for sharing information, in particular that emergency services would definitely make use of such information. This suggests that citizens' perception of the behaviour of emergency services does not match their expectations of how they would like them to behave in relation to social media.

The before mentioned gap between citizens' perception and emergency services behaviour means that the potential of social media aiding

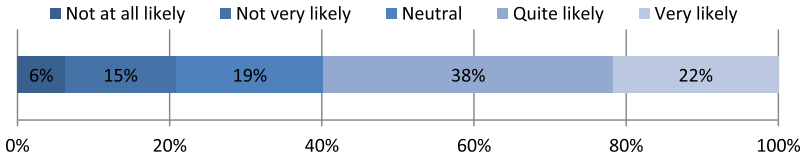


Fig. 15. Future use of apps for information exchange in emergency situations (Q13).

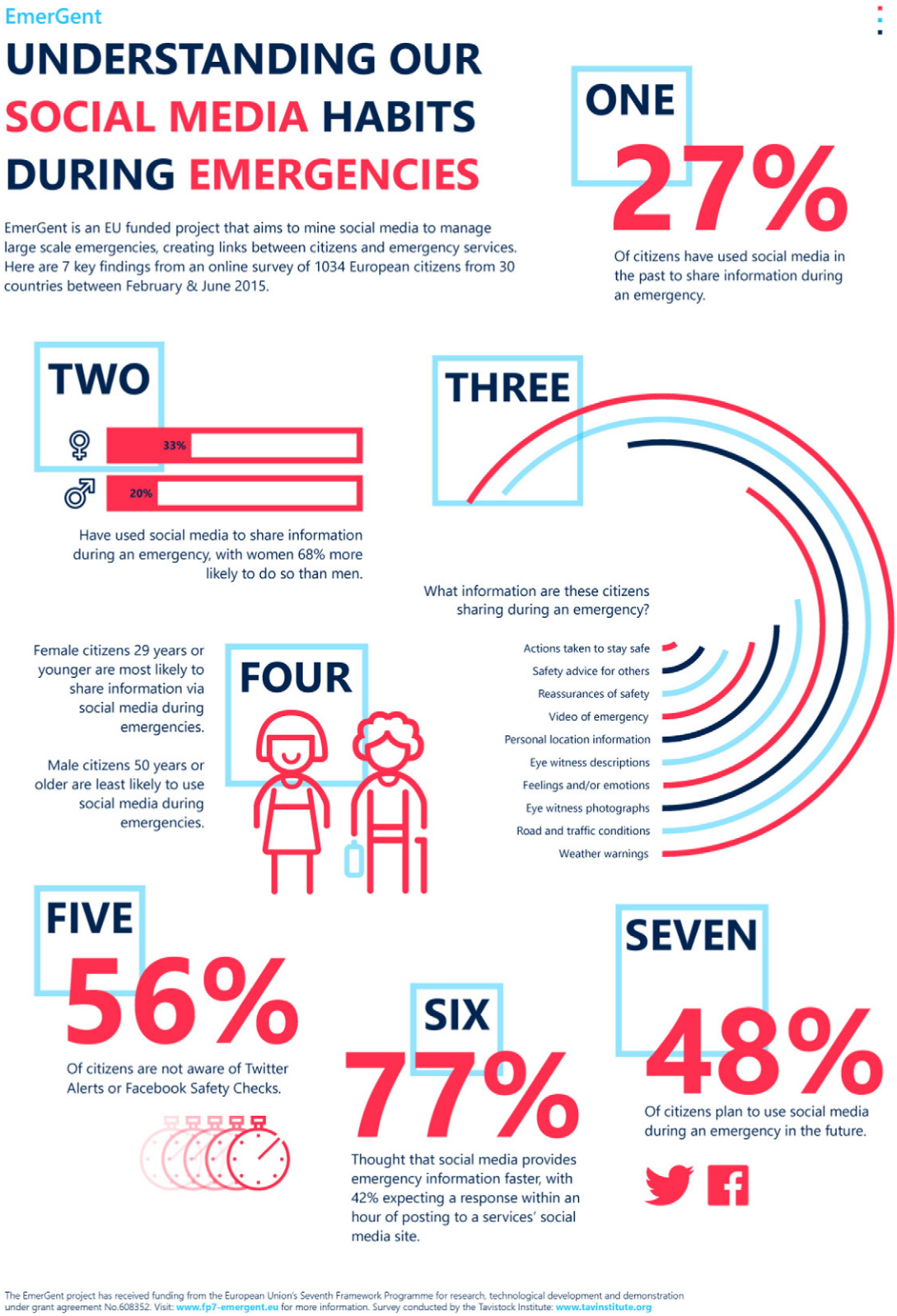


Fig. 16. Infographic of Selected Survey Results (designed by our project partner OCC).

the social resilience of citizens during emergencies is not yet fully realized (Boin et al., 2010; Maguire and Hagan, 2007) and that both emergency services and citizens need further support and encouragement to find ways of using social media more effectively and cooperatively. If supported in this way, such a concept of resilience could be seen as linking with other related concepts of *resistance* (to prevent damages), *recovery* (to fix damages quickly) and *creativity* (to learn from losses and improve the system in future). Thus, the emergence of so called *emergent citizen groups* (Stallings and Quarantelli, 1985) is today often initiated by social media, based on the activities of *digital volunteers* (Starbird and Palen, 2011). Technologies supporting collaboration not just within a planned frame, but that allow emergent collaboration,

the "need for spontaneous collaboration in novel and changing structures", such as ad hoc participation, are needed (Reuter, 2014b, p. ix). This would suggest that increasing cooperation could increase social resilience via a complex web of (collaborating) actors in social media, which is in line with the results on *cooperative resilience* and cooperation technologies (Reuter et al. 2016a). One contribution of this article is to outline the perception of citizen in Europe, which is a necessary prerequisite for approaches addressing the issue.

The survey has also revealed that citizens were more likely to use Facebook (73%) and YouTube (69%) rather than Twitter (21%) for private purposes. This is of particular interest given the fact that many international studies on the role and use of social media in emergencies rely on the analysis of Twitter only, as it is more accessible for research purposes (Kaufhold and Reuter, 2016). It means though that a lot of citizen activity on social media during emergencies remains underresearched. This has been one of the limitations of the current study – that we have not explored differences in the use of different types of social media platforms during emergencies. It is hoped that future studies will fill this gap. It is also worth noting that almost all participants of the Canadian Red Cross (2012) study were Facebook users (97%). This might suggest that our sample was more representative of the whole population, including older people who on average use social media much less. Furthermore, about three quarters of the respondents are from the countries Poland, Slovenia, Germany and the United Kingdom. Therefore we cannot necessarily draw conclusions for the whole of Europe. A representative study among selected countries in Europe might help to fill this gap. However, the answers did not differ by country a lot. The participants from Slovenia use Facebook more often (91% "very often") than survey participants overall (60%); and in the UK, Twitter is used more often (30% "very often") compared with survey participants overall (12%, Q8). Furthermore most people in Germany said that they used the local radio as an information channel during an emergency (81%) while the average reported use across the whole sample was 54% (Q10). Otherwise, there were no significant differences between countries or the number of responses from countries was too small to make any valid comparisons.

Finally, our study identified very similar barriers to the increased use of social media as found in the only other study of citizens' attitudes in Europe (Flizikowski et al., 2014). The previous study found that both citizens and emergency services identified the same challenges, such as a lack of knowledge, personnel issues, uniform terms of use, credibility of citizen-generated content, and accessibility for older generations. In comparison, our study mainly identified 'mistrust' as well as the perceived lack of a clear purpose for using social media in emergencies These points can be addressed if citizens gain awareness that the value of the information being provided fits their expectations and needs.

Acknowledgements

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Appendix A. Survey description and questions.

Welcome, the following questions will take only about 5–10 min to answer. We thank you in advance for your participation.

For the completion of the questionnaire it is mandatory to answer all questions, unless the question specifies otherwise.

- Q1: *Please indicate that you agree to participate in this survey: (Yes (I agree), No (I do not wish to participate))
- Q2: *What is your age? (under 21, 21–29, 30–39, 40–49, 50–59, 60 or older)
- Q3: *What gender are you? (Male, female, other)
- Q4: *In what country do you currently live? (Australia, Austria, Belgium, Bosnia & Herzegovina, Bulgaria, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Iceland, Italy, Latvia, Lithuania, Luxembourg, Macedonia, Malta, Moldova, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdome, USA, Other (please specify))
- Q5: *Do you currently work or volunteer for an emergency service, such as the police, fire service or a medical service? (Yes, no, other (please specify))
- Q6: *Do you have any children under the age of 18? (Yes, no)
- Q7: *What type of mobile telephone do you PRIMARLY use? (Regular cell/mobile phone (not a smartphone), android (e.g. Samsung S5, HTC One, Google Nexus 5, …), iPhone, Blackberry/RIM, Windows mobile (e.g. Nokia Lumia 530, 820 or 930, HTC window), I don't have a mobile phone, other (please specify))
- Q8: *To what extend do you currently use the following types of social media to share or look for information? (Often, sometimes, seldom, never)
  - Facebook
  - Twitter
  - Instagram
  - YouTube
- Q9: *Please indicate how strongly you agree or disagree with the following statements (Strongly Agree, agree, nether agree or disagree, disagree, strongly disagree)
  - In my private life, I use social media very often
  - It is important for emergency services to use social media to keep in touch with the public during emergencies.
  - Most of my friends use social media to keep in touch.
  - I regularly post messages on social media such as Twitter, Facebook or Instagram.
  - I would not trust a message posted on social media during an emergency unless it came from an official source such as the police or fire-service.
  - Emergency services should not trust information on social media.
- Q10: *Which of the following communication channels have you ever used to get information about an emergency, such as a power cut, severe weather, flood or earthquake? (TV News, local radio station, online news, mobile apps, social media (Facebook, Twitter, Instagram, etc.), text message alerts, online sites for disaster agencies or emergency services, none of the these, other (please specify))
- Q11: *Have you ever downloaded a smartphone app that could help in a disaster or emergency? (Yes, no, don't know/not sure)
- Q12: *What kind of app did you download and for what purpose?
- Q13: *How likely is it that you would download an app in future to use on a smartphone to share information with, or receive information from, emergency services as a result of an emergency such as an accident, power cut, severe weather, flood or earthquake? (Very likely, quite likely, neutral, not very likely, not at all likely)
- Q14: *Have you ever used social media such as Facebook, Twitter, Instagram, etc. to find out information as a result of an emergency such as an accident, power cut, severe weather, flood or earthquake? (Yes, no, don't know/not sure)
- Q15: *What kind of information were you looking for? (Weather conditions or warnings, road or traffic conditions, damage caused by the event, the location or status of friends/family, information about how others are coping with the disaster, eyewitness photographs or videos, what to do to keep yourself safe, other (please specify))
- Q16: *How likely are you to use social media in future to look for information as a result of an emergency such as an accident, power cut, severe weather, flood or earthquake? (Very likely, quite likely, neutral, not very likely, not at all likely)
- Q17: *Have you ever used social media to share information as a

result of an emergency such as an accident, power cut, severe weather, flood or earthquake? (Yes, no, don't know/not sure)
- Q18: *What types of information did you share? (Weather conditions or warnings, road or traffic conditions, reassurance that you are safe, your feelings or emotions about what was happening, your location, what actions you were taking to stay safe, an eyewitness description of something you experienced, advice about what actions others should take to stay safe, an eyewitness photo, a video, other (please specify))
- Q19: *How likely are you to use social media in future to share information with others during or after an accident or emergency? (Very likely, quite likely, neutral, not very likely, not at all likely)
- Q20: *What would make you (even) more likely to use social media for this purpose in future?
- Q21: *Some people prefer now to look for information via social media rather than via TV, radio or traditional websites for the following reasons (Strongly agree, agree, nether agree or disagree, disagree, strongly disagree)
  - The information via social media is available faster
  - The information via social media is more accurate
  - The information via social media is more accessible
  - The information via social media is more reliable
  - The information via social media is richer
- Q22: *Imagine that you posted an urgent request for help or information on a social media site of a local emergency response organization, such as your local police, coastguard, fire or medical emergency service. To what extent do you agree with the following statements (Strongly agree, agree, nether agree or disagree, disagree, strongly disagree)
  - Emergency services should regularly monitor their social media so they can promptly respond to such a request.
  - It is very likely that the emergency service will not know about this request.
  - I would expect to get a response from them within an hour.
  - Emergency services are too busy to monitor social media during an emergency.
- Q23: *To what extent are you aware or have you heard of the following services provided via social media? (Very aware, moderately aware, somewhat aware, slightly aware, not at all aware)
  - Twitter alerts - used by key organizations to send alerts during emergencies
  - Facebook safety checks - allows you during an emergency to let friends and family know you and friends are safe
- Q24: *Is there anything else you want to mention with regard to the use of social media before, during or after an emergency?
- Q25: *Thank you very much for your help in completing this survey! The findings will be made available on our project website (click here to access the website). Please provide an email address if you would like to receive a link to the summary findings from this research when they are available.
- Q26: *Would you be willing to take part in a similar survey in future? (Yes, no)

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