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# Informing the Population: Mobile Warning Apps

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***Abstract.*** *Catastrophes like the storms in Europe in spring 2016, but also terrorist attacks regularly not only lead to extensive monetary damage but also threaten human lives. In such situations, the population desires information about the status of damage and safe behaviours. Apps can address this potentially, but comparatively, record a low number of users. Based on Reuter et al. (2017), this article shows the importance of information in disaster situations and illustrates features from current mobile warning apps.*

## 1. Motivation

In recent years, there have been major disasters in various parts of Germany again and again. These were particularly often natural disasters such as storms and floods (Münchener Rückversicherungs-Gesellschaft, 2016). Their consequences show that the issue of disaster control is also relevant in Germany. Floods, storms or thereby resulting power failures can affect every person at any time. Moreover, the damage has been reinforced due to changing living conditions such as settlements on the coasts. Therefore, it is important to develop precautionary measures early. Here, the preparation of affected people especially matters. Since such catastrophes do not happen as frequently in Germany as in other countries, it is possible that the persons are not sufficiently acquainted with protective measures (Bundesverwaltungsamt, 2006). In case of a catastrophe, the consequences could be greater due to the insufficient experience than if preparations had previously been made. Another problem during a disaster is that the civil protection, for example, through the civil protection law by the federal states is obsolete and should be adjusted. In a disaster situation, many volunteer helpers are available (Kaufhold & Reuter, 2016). These must, however, be well-informed and coordinated to help as many affected persons as possible. Furthermore, early informing and warning of large parts of the population play an important role to make preparations as early as possible.

## 2. Informing the Population

Informing the population plays a significant role to get a grip on the disaster situation, especially in the phase immediately after the catastrophe. The government should take the lead in all the different places where citizens can obtain information – "not only in the actual physical management of the event but also in the information of the affected population" (Sulzberger & Glattbrugg, 2014), whereby private organizations can work supportively. However, they only contain a "partial overview of the happening and can therefore only give limited information". In general, the government should use its current information advantage for the protection of the population. This protection of the citizens is the primary goal, financial aspects or the good reputation are only in second place (Coombs, 2009). Even from the citizens' point of view, the responsibility for the protection of all lies with the government. Self-protection stagnates as past events are quickly displaced or forgotten (Menski & Gardemann, 2008). Only citizens, who often deal with crisis situations, protect themselves better (Bundesverwaltungsamt, 2006). Another problem is that the broad population is not familiar with existing concepts of risk communication (Helsloot & Beerens, 2009; Menski & Gardemann, 2008). Learning from past crisis situations may also help to avert future crises or its consequences and reactions (Coombs, 2009). Since there have not been so many bigger crisis situations in Germany yet, the learning behaviour can be classified as low.

Besides, in crisis situations, there is a growing information demand and coordination effort on the part of the population and therefore also on the part of the media (Kaufhold & Reuter, 2016). It is problematic that the information cannot be confirmed as quickly as the media demand and disseminate it. Possible subsequent events, as well as actions and speculations, also spread very quickly (Sulzberger & Glattbrugg, 2014). However, studies show that rapid information is more useful than risky (Coombs, 2014).

Therefore, it is important to provide the public with information from the official side as soon as possible before they spread their own speculations, misinformation or unnecessary fears. That is usually done via

the mass media. A positive side effect is that the trust in the emergency organizations is strengthened. Because immediately after the occurrence of a catastrophe the need for protection and security in the population is particularly high (Bollmann, 1992). If the population is not provided with information, this might lead to general uncertainty and the feeling of being left alone, especially in long-running crises (Reuter, 2014). As many people are scared and helpless, simple instructions are most suitable to take people to action. Information can be divided into basic plans and instructions, including best practices, for example. In this context, Coombs (2009) coins the term “instructing information”. That is information how the affected people can protect themselves.

Before an occurring crisis, it is mandatory to give a warning (Volgger et al., 2006). In the case of predictable crises, specific warnings must be sent via every possible channel to enable everyone to prepare themselves individually. That is of importance because the self-protection stagnates at a low level. For instance, the supply of food and drinking water in private households decreases because everything is constantly available in the supermarket. Especially in cities, the supplies are low (Menski & Gardemann, 2008) since there is no more scarcity. Information is important not only for preparation but also as sensitization for uncertain situations. It is crucial to create an awareness of possible crises so that citizens take precautionary measures (Geenen, 2009). Therefore, citizens need to be informed of current threats or dangers, as well as their probability of occurrence and possible consequences. Using such information, citizens have a vague idea of their behaviour in an emergency (Volgger et al., 2006).

During a crisis, the need for information in the population should always be covered, and a consistent and transparent informing of the affected people is required (Nilges et al., 2009). For the orientation of the population, the assumed duration of a crisis is one of the most valuable information.

If an exact time cannot be specified, an estimated time should be given so that citizens can rearrange themselves and adapt to the situation.

## 3. Warning Apps in Disaster Situations

A Red Cross study has dealt with the topic of how people in disaster situations use the possibilities of the Internet (Wade, 2012). According to this study, 55% of the respondents obtain information about emergencies online. However, only 20% use mobile applications to inform themselves. If no further investigations are done on this subject, and therefore no new developments arise, it seems highly improbable that this number will increase in the future. The information that is relevant to users is, particularly, weather conditions, weather warnings, and damage caused by disasters. Approximately 70% of users search for this. Another need of the persons is to inform others about their safety as well as finding out other people's current situation (Wade, 2012). When using mobile applications for crisis situations, a distinction must be made between whether the information is location-based or not (Vieweg et al., 2010). If this is the case, people can be supported to become aware of their current situation. For example, concrete information about the status can be given. Location-based information is dependent on GPS (Global Positioning System) or Internet access, although valuable information can still be obtained from a mobile application for crisis situations without location detection. For instance, mobile crisis applications often provide general information (for action) for specific situations and support the exchange with others. Thereby, users can exchange experiences, but also share new information with other people (Karl et al., 2015). In the following, three mobile applications are presented and it is discussed particularly how the apps can help in crisis situations.

**Katastrophen-Warnung (KATWARN)**

The core idea of KATWARN is to warn users in different emergency situations like „conflagrations, bomb finds or storms" (Köllen, 2015). The app's information is directly gathered from disaster control authorities, fire brigades or storm headquarters. These send concrete data via push messages to the app users. The information is location-based so that users are informed about near emergencies or crises. According to Köllen (2015), the goal of KATWARN is to „quickly clarify about the imminent danger and provide advice on the ideal behaviour".

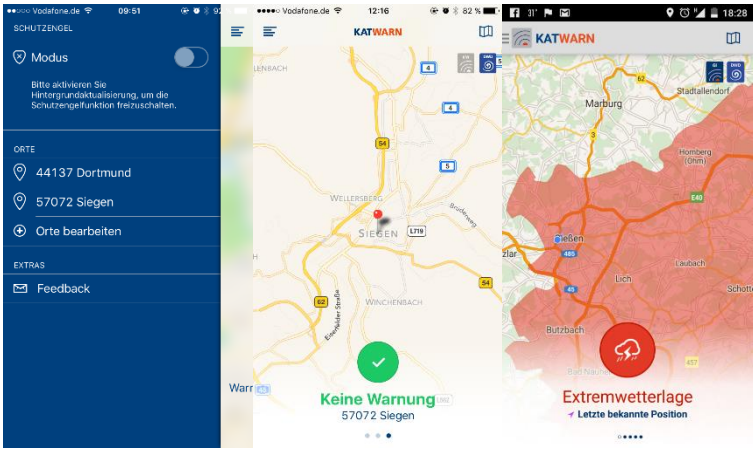


***Figure 1: KATWARN main menu (left), map view without warning (center) and with an extreme weather warning (right)***

In case of a relevant emergency, the user receives a push notification and, depending on the settings, an alarm sound or vibration is triggered. Each warning contains a short message with an overview of the sender of the message, the type of emergency, and the recommended behaviour in the current situation. The app allows to personalize warnings regarding your current position, e.g. via GPS, or predefined locations. Users may deactivate the GPS functionality, but the option to save up to seven areas allows the user to stay informed without location detection. The attribution of a place to a certain area is realized using postcodes or place marks. The warning may be shared, e.g. on social media, to inform further people about the emergency. Finally, the app contains a test alarm functionality, which triggers a fictional warning so that the user can test and customize the warning behaviour of KATWARN. For future versions, it is planned to establish a function that alerts emergency responders. That comprises the registration of personnel like doctors and paramedics to request to inform them and ask for their help during emergencies.

### Notfall-Informations- und Nachrichten-App (NINA)

NINA is an app which is supposed to warn against floods or other crises (BBK, 2015). The information is obtained from a modular warning system as well as from the *German Weather Service* and the *Waterway and Ship Management of the Federation*. The website of BBK (2015) summarizes the following functions of NINA: Warning, emergency contacts, emergency advice, data protection and additional functions. In the warnings section, all official warnings are enlisted as well as information regarding flood levels or storm warnings. These warnings may be visualized in a simple list view or in a map to illustrate the locality. The map view also allows a colour-coded and symbolic sorting of the entries. For instance, blue warnings indicate a warning from the modular warning system. The flood levels of rivers are illustrated as dots on the map. The user may receive warnings via push messages.

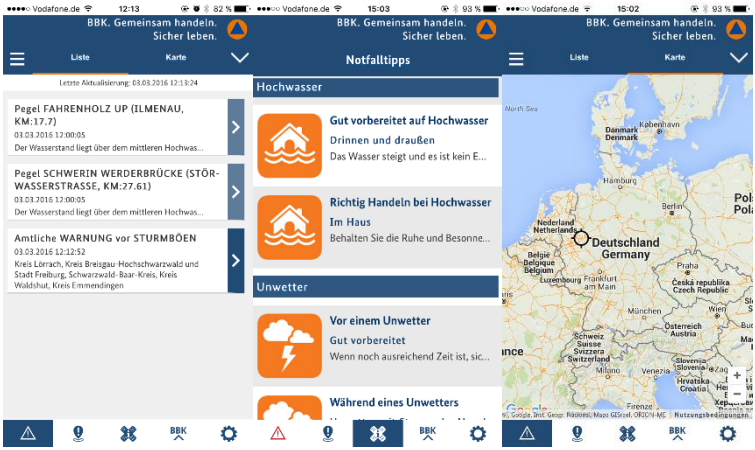


***Figure 2: NINA warning overview (left), emergency advice (center) and map view (right)***

The function for emergency contacts was designed to support users who are affected by an emergency. It allows to deposit various contacts that are informed quickly via e-mail or SMS in case of emergency. If the emergency is over or the user wants to state that he is

not affected, the implemented all-clear function may be used. Concerning general guidance and preparatory measures, a function with emergency tips is available. This general information is relevant before, during and after an emergency. Data protection is also an essential topic of the mobile app of BBK. Thus, the location and other information are directly queried from BBK and data is only processed on the system locally. Under the term of additional functions, BBK summarizes the geolocation and the offline mode of NINA. If the geolocation is activated via GPS, WLAN or other services, the user may receive location-based warnings. But NINA may also be used in offline mode. In this case, the user's last location with a connection is used. In summary, the main function of NINA is to „bridge the last mile to all people who are in a place of danger and who are not reachable via common warning messages like sirens or radio announcements" (Schwan, 2015).

**Federal Emergency Management Agency App (FEMA)**

FEMA is a mobile application of the U.S. Government Federal Emergency Management Agency (FEMA) (Goncalves et al., 2014). According to the website of the Department of Homeland Security (2015), the major function of the app is the provision of warnings from the national weather service. It allows to save up to five areas within the U.S. about which the user receives weather warnings. Another function is the *Disaster Reporter*. It allows users to upload pictures and enrich them with location indicators and a short message to share their current situation and exchange with other people (Goncalves et al., 2014). Moreover, personal security information may be saved and aggregated. Within an emergency box, the user can save a list of objects or different locations where users can meet, e.g. with their family, or how they communicate in emergencies.

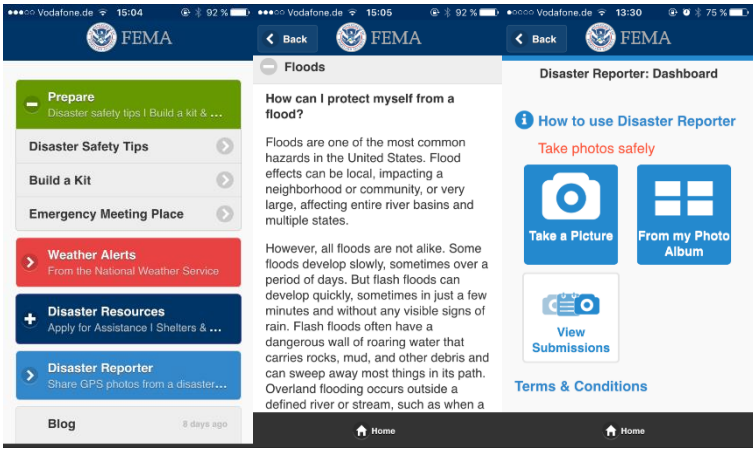


***Figure 3: FEMA main menu (left), emergency advice (center) and disaster reporter (right)***

For information during an emergency, the app contains a map which shows assembly points and how the user reaches them. Moreover, general security advice is enlisted about preparations for an emergency, correct behaviour during an emergency and the follow-up tasks. These tips are available for 20 different types of emergencies like floods, hurricanes or earthquakes. Lastly, the function of requesting help is enlisted. The app allows the users quick access to different support websites where users can ask for help (Department of Homeland Security, 2015).

## 4. Discussion

Requirements for warning apps comprise general information (e.g. information for action), location-relevant information (e.g. the estimated time of a blackout or contact addresses) and setting-specific information (e.g. for persons with special needs) (Reuter & Ludwig, 2013). Often mentioned prerequisites for the successful use of an app in crises are location detection to transmit location-specific information in real-time, tailorability, the display of emergency numbers, the facilitation of feedback and current contents (Karl et al., 2015). On behalf of

the users, within app reviews, the functionality and stability are criticized mainly (Kotthaus et al., 2016). The core functionalities of the presented warning apps are (1) area-based and (2) location-based warnings featuring a (3) warning map, (4) general disaster information, as well as capabilities for (5) information sharing and (6) disaster reporting.

| Features | KATWARN | NINA | FEMA |
|---|---|---|---|
| Area-based warnings | ✓ | ✓ | ✓ |
| Location-based warnings | ✓ | ✓ | × |
| Warning map | ✓ | ✓ | × |
| General disaster information | × | ✓ | ✓ |
| Information sharing | ✓ | ✓ | × |
| Disaster reporting | × | × | ✓ |

***Table 1: Core features of KATWARN, NINA and FEMA***

However, the motivation of citizens to inform themselves proactively seems to be low (Reuter & Ludwig, 2013). Reuter et al. (2017) examined user behaviour and motivation of citizens regarding crisis apps and concrete recommendations for the design of such apps, based on a comparison of KATWARN, NINA and FEMA. The quantitative study (n=1.034) revealed a low interest among citizens to install such an app. Most participants (71%) indicated that they never downloaded a smartphone app for emergencies or crises, 7% were not sure and only 16% said they did it (Reuter et al., 2017; Reuter & Spielhofer, 2016). Promoting the acceptance of and motivation of using disaster-purpose apps seems to be an important research topic to ensure the success and utility of these apps in terms of social resilience.

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