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Why warning systems fail—insights from severe floodings in Germany and Romania

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Abstract: While extreme weather events are becoming more frequent and intense on a global scale, Europe is the fastest warming continent. Heatwaves, wildfires, droughts, and floodings are among the key risks that European countries are facing every year at often unprecedented scales. At the same time, despite at least parts of Europe being among the wealthiest countries in the world, cases of failed warning communication are frequently observed in the context of such disasters, leading to unnecessary deaths. This presentation makes the case for two disasters: the 2021 floodings in Germany and the 2024 floodings in Romania. The two case studies exemplify different structural impediments to effective warning communication. Among the main learnings are improvements in risk message design and timing, communicating uncertainty, as well as better coordination between the actors involved in the warning communication process.

Keywords — disaster, climate change, warning systems, case study

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INTRODUCTION

Warning messages are a special form of risk and crisis communication that is published during or shortly before high-risk situations occur (Sellnow & Seeger, 2021). They contain not only an informative but also an instructional or persuasive element, indicating what people should do to protect themselves from imminent danger. Warning communication comes with a lot of responsibility for authorities but also other key communicators such as governments, community leaders or news media organizations because: "If incorrect, late, or communicated ineffectively, however, warnings can cause needless disruption to communities and businesses as well as reduce effectiveness of later warnings" (Sellnow & Seeger, 2021, p. 37).

Against this backdrop, it is crucial to constantly improve warning systems not only from a technological perspective but also from a communication perspective. This is even exacerbated by the fact that climate change leads to an increasing frequency and scale of extreme weather events. While this affects communities around the world, this paper focuses on Europe as the fastest warming continent that, among other disasters, has seen a series of severe floodings in recent years. It presents two case studies from different parts of Europe which were hit by severe floodings: Germany as a wealthy and highly industrialized country and Romania as an Eastern European developing country. The objective of the paper is to identify challenges to effective warning communication across different contexts and to derive learnings from these cases that are relevant to improving warnings in the event of extreme weathers.

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LITERATURE REVIEW

There is a substantial body of research on warning and emergency communication, most of it originating in the U.S., providing a variety of both theoretical and empirical insights. This literature review can only present some selected models and findings.

Firstly, there are several theoretical, evidence-based approaches that were designed to improve risk and crisis-related messaging. For instance, the Crisis and Emergency Risk Communication (CERC) model (Reynolds & Seeger, 2005) highlights the importance of timing, trust, and clear instructions in order to increase the likeliness for people to act on the risk message and demonstrate protective behavior. Another influential approach is the IDEA model (Sellnow et al., 2017) highlighting internalization, distribution, explanation, and action as key dimensions of effective risk communication, placing greater emphasis on the effective dissemination as well as comprehensibility.

While these and other approaches highlight different aspects of risk and crisis communication, there are some more general patterns. Hyvärinen and Vos (2016) elaborated several key characteristics for effective messaging in the context of a disaster based on a review of the state of research. According to the authors, communication in this context needs to be fast and accurate, transparent and honest, simple and clear, explanatory and empowering, as well as participatory and supportive. With regard to warning communication in particular, Bean et al. (2015) found that to be effective, it needs to entail the following information: the nature of the hazard, the location, specific guidance, timing, as well as the source of the warning.

However, a series of challenges and shortcomings in the implementation of disaster warning systems often undermine their effectiveness and reduce public compliance. These problems span technical, institutional, and communicative dimensions and persist across diverse geographical and socio-political contexts. Extant research points out that delayed alerts, ineffective dissemination, and low levels of trust in experts and authorities are among the most critical challenges to effective warning communication (Seeger, Sellnow, & Ulmer, 2003). Delays often result from unclear procedures or inadequate coordination between forecasting agencies and emergency management authorities. According to Lindell and Perry (2012), emergency alerts frequently fail to reach all segments of the population due to variations in access to communication channels, social vulnerability, and individual capacity to process and act upon warnings. Vulnerable groups—such as rural residents, older adults, individuals with disabilities, and those with limited access to digital infrastructure—are particularly at risk of being excluded from timely and actionable information. These disparities are often intensified by systemic issues such as limited outreach efforts and poor tailoring of messages. Also, public skepticism, shaped by previous false alarms or inconsistent messaging, can lead to message fatigue (Seo et al., 2021) and dangerous inaction in the face of real threats.

THE 2021 FLOODINGS IN GERMANY

On July 11, 2021, European Flood Awareness System issued a warning for West and Central Europe. So did the German Weather Service on the morning of July 13, with a more specific warning for the West of Germany. However, the impact of the heavy rainfalls that hit Germany on July 14 and 15, especially in the federal states of North Rhine-Westphalia and Rhineland-Palatinate, caught many by surprise. More than 180 people died, many of them in their own basement trying to protect their belongings; more than 800 people were injured. The damages amount to about 30 billion Euros in the two most heavily affected federal states alone. The floodings were one of the worst disasters in German postwar history, and—according to critical voices which emerged quickly after the disaster struck—it was exacerbated by a lack of concrete and timely warnings to people at risk.

In the wake of the disaster, there were many voices blaming the authorities and also public broadcasters for not issuing timely and clear warnings. In fact, the municipality that was most heavily affected with 69 casualties (Bad Neuenahr-Ahrweiler) had not issued any warning at all via the Modular Warning System (MoWaS), Germany's central warning infrastructure. It is operated by the Federal Office for Civil Protection and Disaster Assistance but, based on German disaster law, the responsibility to initiate local warnings as well as evacuations resides with the municipalities. To mention just a few further issues related to warning communication, several municipalities who use MoWaS did not use it correctly, leading to problems with warning dissemination; the majority of municipalities affected by the floodings did not leverage their social media channels to disseminate warnings; public broadcasters either did not receive official warnings via MoWaS or did not relay them; public broadcasters were more generally criticized for being slow on reporting the ongoing disaster and for offering little instructional information.

Against this backdrop, the results from an online survey conducted between August and October, 2021 in the two most affected federal states (n=1315) offer little surprise. 35% of the respondents reported not having received any warning. Among those who had received a warning, 85% did not expect a very severe flood, while 46% reported that they were unsure how to protect themselves (Thieken et al., 2023). Using content analysis, the study furthermore revealed a lack of clear instructions for protective measures in both official warnings and media reports.

These findings are supported and complemented by our own survey data (n=163) collected in December 2021 among flood victims from North Rhine-Westphalia and Rhineland-Palatinate. The questionnaire combined standardized and open-ended questions, allowing for both quantitative and qualitative analysis. The survey was mainly distributed via social media, e.g. Facebook groups where flooding victims connected, as well as Instagram and LinkedIn. Selected results show that only 15% of the respondents report having received warnings directly by the authorities (e.g. via warning apps) while 40%—clearly the largest share—indicated friends and family as sources of warnings, hinting at the significance of social capital for disaster resilience (figure 1). Via social media and news media, warnings were received by 17% and 26% of respondents respectively. 35% indicated "other" sources; among these respondents, 70% explicitly stated that they found out about the disaster all by themselves, i.e. they received no warning at all.

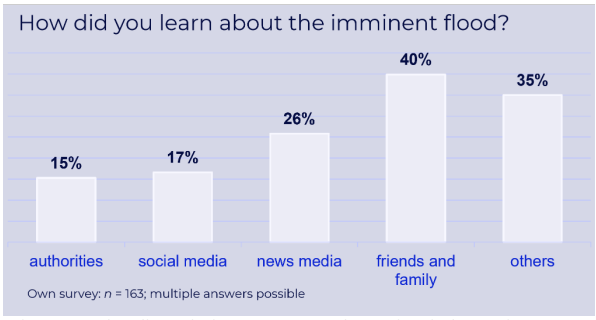

Figure 1: Flooding victims' sources of warning information.

Exemplary quotes from open-ended questions		
No warning received	*Unclear impact*	*Little sense of urgency*
"You only received information if you managed to get to the fire department. The village was partially cut off due to the loss of electricity [and] mobile communication."	"The media warned of the amount of rain but did not make it clear what the extent of it will be in detail."	"[The] warning app had already been warning of floods for a week. On the day of the disaster, the warning had not changed. It was thus assumed that this day would be just like any other (heavy rain)."

Table 1: Floodings victims' personal observations of disaster warnings.

The qualitative analysis of open-ended questions (table 1) supports these findings, indicating a lack of timely and clear warnings as well as a lack of effective instructional information, and provides further context. For instance, some respondents reported that they woke up in the middle of the night by the sound of neighbors knocking at their door or of water running into their house. Others reported they received last-minute information from firefighters on the ground. Both official warnings and media coverage seemed to create little sense of urgency among local populations, leaving them largely unprepared for the disaster. This was exacerbated by the fact that eventually electricity and mobile communications were cut off due to the flooding.

THE 2024 FLOODINGS IN ROMANIA

In mid-September 2024, Central Europe experienced significant floods caused by Storm Boris. This storm brought prolonged heavy rainfall that overwhelmed several countries' river systems and drainage infrastructures. In Romania, an unprecedented burst of clouds during the night of September 13–14, 2024, brought intense rainfall to central and northern Galați County and southern Vaslui County. According to Apele Române (The National Administration "Romanian Waters"), this event led to an enormous amount of rainfall within a few hours, with flood waves forming in minutes. In some regions, precipitation reached up to 170 liters per square meter. More precisely, it rained in 12 hours as much as it typically does in three months. The sudden and intense precipitation led to rivers and streams exceeding their capacity, resulting in widespread flooding. In Galați, low-lying areas near major waterways experienced rapid inundation, affecting residential communities, agriculture, and local industries. Similarly, in Vaslui, the flooding disrupted both urban and rural areas, with significant damage to infrastructure and farmlands. Emergency services reported that the volume of water was unusually high, causing roads to become impassable and complicating the rescue operation (IFRC, 2025). Large areas lacked sufficient flood barriers, retention basins, and reinforced embankments, making them highly vulnerable to the rapid accumulation of water. Drainage systems were overwhelmed, as they were not designed to handle such intense rainfall over a short period.

During the September 2024 floods in Romania, authorities issued multiple alerts through the national RO-ALERT system. According to the General Inspectorate for Emergency Situations (IGSU), 40 RO-ALERT messages were sent in response to severe weather events that affected several counties. However, reports mention that the timing of these alerts significantly influenced their effectiveness. In Galați County—one of the worst-hit regions—residents received the RO-ALERT messages around midnight, just before the floodwaters reached critical levels. This late notification left little time for evacuation or preparedness, particularly for vulnerable residents. A similar situation occurred in Bacău County, where an RO-ALERT message was sent at 4:30 a.m., warning of flash floods along two local rivers. Issuing such alerts during the early morning hours meant many people were caught off guard while asleep, limiting the warning's protective effect.

The Romanian case furthermore illustrates that in high-risk and vulnerable communities (e.g. the elderly, people with disabilities, or residents in rural areas), alerts are often ineffective if residents are not given the necessary support to evacuate safely, for instance when they lack access to transportation, face mobility challenges, or do not fully understand the risk due to limited health or literacy. Distrust of official communication, especially among vulnerable populations, as well as previous experiences where alerts repeatedly failed to materialize, act as another factor detrimental to the implementation of protective behaviors.

DISCUSSION & CONCLUSION

Taken together, these incidents indicate significant—and in part similar—shortcomings regarding disaster warnings in two European countries with different levels of economic development. Despite the fact that evidence-based best practices (see literature review) are available, these are often not implemented in practice. For instance, the CERC model highlights timing, the role of trust, and clear instructions while the IDEA model stresses effective dissemination and comprehensibility, among other factors, as key characteristics of effective communication in the event of a crisis. The two case studies show that the adherence with such basic requirements was low, regardless of the cultural context and economic status of the country.

However, there are also some more general challenges specifically linked to the characteristics of heavy rainfalls / floodings that need to be addressed: For instance, where exactly heavy rainfall will hit is often unclear until just a few hours before the event, reducing the level of alertness both on the side of authorities/media but also the population. We therefore recommend communicating transparently about the limitations of predicting local impact while instructing at-risk publics to be alert, follow official communication channels as well as news media closely and prepare for potentially required protective

measures. For instance, instructing local residents upfront to stay out of basements in case of a flooding probably would have saved lives during the disaster in Germany.

Furthermore, telling the population the expected amount of precipitation turned out to be insufficient as it says little about the local impact of heavy rainfalls. Combined with topographical data of a given area as well as interpretation and explanation by experts, however, warning messages could be designed in a way that carries greater value for at-risk publics. Another method to contextualize current threats and make them more tangible is by comparing them with past events that relate to previous experiences and by incorporating visual representations (e.g., indicating that floodwater is expected to reach the window level of a first-floor house). Explicitly stating that the current event is, for example, five times more severe than a previous one can significantly improve public understanding and engagement. Reversely, failing to communicate the potential impact to at-risk publics can lead to inaction and, consequently, to more harm.

Another key challenge in both cases is both warning and actively supporting the more vulnerable segments of the population, for instance the elderly and people with disabilities. Merely sending a timely warning is insufficient when, for instance, residents need support to evacuate safely.

Finally, the two case studies show that besides investing in modern warning technology (like Germany did with the introduction of cell broadcast as a new warning channel after the 2021 flooding), closer collaboration is needed between key actors such as authorities, community leaders, experts, and news media to improve warning communication practices, including warning procedures, effective dissemination as well as the message content itself. Future research should support this process by combining insights from a variety of disciplines, bridging research and practice.

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REFERENCES

[1] Sellnow, T.L. & Seeger, M.W. (2021). *Theorizing Crisis Communication*. Wiley Blackwell.

[2] Reynolds, B., & Seeger, M. W. (2005). Crisis and Emergency Risk Communication as an Integrative Model. *Journal of Health Communication, 10*(1), 43–55. https://doi.org/10.1080/10810730590904571

[3] Sellnow, D. & Lane, D. & Sellnow, T.L. & Littlefield, R. (2017). The IDEA Model as a Best Practice for Effective Instructional Risk and Crisis Communication. *Communication Studies, 68*(5). 1-16. https://doi.org/10.1080/10510974.2017.1375535

[4] Hyvärinen, J., & Vos, M. (2016). Communication Concerning Disasters and Pandemics: Coproducing Community Resilience and Crisis Response. In A. Schwarz, M. W. Seeger, & C. Auer (Eds.), Handbooks in communication and media. *The Handbook of International Crisis Communication Research* (pp. 96–107). Wiley Blackwell.

[5] Bean, H., Sutton, J., Liu, B.F., Madden, S., Wood M.M. & Mileti, D.S. (2015). The Study of Mobile Public Warning Messages: A Research Review and Agenda. *Review of Communication, 15*(1), 60-80. https://doi.org/10.1080/15358593.2015.1014402

[6] Seeger, M. W., Sellnow, T. and Ulmer, R. R. 2003. *Communication and organizational crisis*, Westport, CT: Praeger.

[7] Lindell, M. K., & Perry, R. W. (2012). The protective action decision model: Theoretical modifications and additional evidence. *Risk Analysis: An International Journal*, *32*(4), 616-632. https://doi.org/10.1111/j.1539-6924.2011.01647.x

[8] Seo, Y., Ravazzani, S., Jun, H., Jin, Y., Butera, A., Mazzei, A., & Reber, B. H. (2021). Unintended effects of risk communication: Impacts of message fatigue, risk tolerance, and trust in public health information on psychological reactance. *Journal of International Crisis and Risk Communication Research, 4*(3), 4. https://doi.org/10.30658/jicrcr.4.3.3

[9] Thieken, A.H., Bubeck, P., Heidenreich, A., von Keyserlingk, J., Dillenardt, L. & Otto, A. (2023). Performance of the flood warning system in Germany in July 2021 – insights from affected residents. *Natural Hazards and Earth System Sciences, 23*, 973–990. https://doi.org/10.5194/nhess-23-973-2023

[10] International Federation of Red Cross and Red Crescent Societies (IFRC). (2025, January 5). *Romania: Floods - DREF Operational Update (MDRRO006)*. ReliefWeb. https://reliefweb.int/report/romania/romania-floods-dref-operational-update-mdrro006