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THE ROLE OF COMMUNICATION IN CRISIS MANAGEMENT – A CASE STUDY OF THE SEPTEMBER 2024 FLOODS IN POLAND

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Abstract.
This article examines crisis communication at the municipal and district levels during the September 2024 floods in south-western Poland. The research niche of this article is the analysis of crisis communication in Polish local government structures on the basis of a recent extreme flood event, with particular emphasis on organisational resilience, information continuity and the practical use of ICT tools. The purpose of the research was to identify and evaluate the key aspects of communication in the crisis management process and to indicate the elements that require further improvement. The research question was: How did crisis communication affect the effectiveness of flood crisis management in Poland in 2024, and what organisational, legal and technological improvements are necessary to increase the resilience of communication to disruptions? The hypothesis assumed that increasing the effectiveness of crisis communication during flood events requires the simultaneous implementation of integrated ICT solutions for monitoring and distributing hydrometeorological data, decentralisation of warnings to the municipal level, and solutions ensuring continuity and interoperability of communications. The study employed literature review, analysis and synthesis, scientific inference, and qualitative in-depth telephone interviews based on five open-ended questions conducted with 17 representatives of municipal and district crisis management units in flood-affected areas of southern Poland. The findings indicate that effective crisis communication requires greater computerisation, integration of data sources, improved resistance to disinformation, continuity of operation, and more decentralised warning mechanisms. The hypothesis was positively verified..
Keywords:
crisis communication; crisis management; flood; civil protection; communication resilience

Introduction

Communication plays a key role in crisis management, as it forms the basis for effective coordination of activities between all participants in the process – from public administration bodies and emergency services to the media and the public. The efficient flow of information enables rapid response to threats and crises, accurate operational decisions and minimisation of the effects of events. Proper communication also helps to build public trust, reduces misinformation and panic, and allows for the effective communication of recommendations and warnings.

Due to the role that communication plays in the crisis management process, the aim of this study was to identify and evaluate key aspects of communication in the crisis management process, as well as to indicate elements requiring further improvement in the crisis management process.

The following research question was posed: How did crisis communication affect the effectiveness of flood crisis management in Poland in 2024, and what organisational, legal and technological improvements are necessary to increase the resilience of communication to disruptions? The hypothesis was as follows: increasing the effectiveness of crisis communication during flood events requires the simultaneous implementation of: integrated ICT solutions for monitoring and distributing hydrometeorological data, decentralisation of warnings to the municipal level, and solutions ensuring continuity and interoperability of communications.

The study employed both theoretical and empirical methods. The theoretical component involved a review and secondary analysis of scientific literature on communication and the use of ICT in crisis management. Empirical research was carried out using qualitative in-depth telephone interviews with 17 respondents representing district and municipal crisis management centres in flood-affected areas of southern Poland between 12 November and 5 December 2024. The interviews, based on five open-ended questions, explored issues of communication, disinformation, and information security, and the collected data were analysed thematically. The main limitation of the study was the potential subjectivity of responses, influenced by emotional and situational factors following the flood event. A detailed description of the research is presented in the section "Methods".

Literature review

The process of knowledge management in a crisis situation can take place on two levels, through: methods of improving quality and appropriately selected technology (Wiśniewski 2015). In a crisis management system, the Internet and information technologies facilitate the integration of numerous dispersed entities (Ogórek and Zaskórski 2018), including improving the flow of information, which

is one of the main determinants of the effectiveness of this system (Abgarowicz et al. 2015). The integration of modern technologies increases situational awareness, data collection efficiency and coordination between entities involved in the crisis management process (Marciniak et al. 2023). The role of information and communication technologies (ICT) in political crisis management is considered crucial. Technologies also support public communication, information analysis and decision-making, which can help to reduce losses and casualties (Pashentsev and Kolotaev 2025). An example of an effective technological tool is the new SFMI (Sentinel-2-based Flood Mapping Index) developed to detect, and map flooded areas using satellite imagery. SFMI is also used to monitor water bodies such as marshes and rivers (Farhadi et al. 2025). Another useful technology is the mobile platform used for crowdsourcing. By engaging users in submitting photos, descriptions and locations of hazards, this application can be used to collect important information about floods. Citizen participation in providing information increases the accuracy and timeliness of flood data, which leads to increased safety (Frigerio et al. 2018). The integration of institutional and non-institutional data, such as crowdsourced data, also improves the quality and completeness of information on adverse events, such as hydrometeorological phenomena (Bedrina et al. 2012). In turn, a technology called 'FASTER' (First Responder Advanced Technologies for Safe and Efficient Emergency Response) improves the safety and efficiency of rapid response services in emergency situations by introducing smart clothing and devices, AR (Augmented Reality) glasses that display relevant information in the rescuer's field of vision, such as terrain maps, unmanned aerial vehicles, data analysis platforms and enabling communication in difficult conditions. Thanks to this implementation, efficient real-time information exchange takes place, which contributes to increasing the effectiveness of rescue operations, improving coordination, increasing situational awareness and the safety of rescuers who were the first to arrive at the scene (Łachacz 2022). Nowadays, it is becoming increasingly important to form modern subunits equipped with specialised military and civilian personnel trained to operate and maintain advanced military technologies (Jałowiec and Spychalski 2025). Another example of the computerisation of crisis management processes is new technologies that allow spatial data to be combined with climate forecasts, enabling the creation of dynamic fire risk maps. This solution provides ongoing monitoring of changes in fire risk, taking into account atmospheric and environmental conditions (Perello et al. 2024). Beyond the areas of flooding, fires and the safety of emergency services personnel, new technologies can also be used in the event of earthquake hazards, for example the Rapid Early Warning System (REWS) in Romania. This system is robust, simple, inexpensive and quickly transmits information, including warning signals, enabling services to take immediate protective action (Ionescu and Marmureanu 2006). In turn, the TECuidamos system can adapt information and evacuation instructions to the individual location and needs of the user. Its aim is

to increase the effectiveness and safety of rescue operations. It provides up-to-date information on the location of evacuees and the progress of the evacuation, thereby increasing the effectiveness of rescue operations (López-Caudana et al. 2022). New technologies are also used for systematic collection, storage and processing of data on flood damage. Their development requires knowledge in the fields of ICT, geomatics, engineering, urban planning and economics. The data collected relates to various aspects of flooding, such as risk, damage, exposure and vulnerability (Molinari et al. 2014). The introduction of technology into the crisis management process, for example in the establishment of alarm systems in cities, can be considered part of the modernisation of cities, known as 'smart cities' (SCs) (Moch 2025). Despite their shortcomings, residents of such cities have access to the highest level of services in terms of modern infrastructure, healthcare and digital technologies (Waisová 2022).

Supporting decision-making in crisis situations with new technologies during many events and a significant degree of difficulty is considered important (Tabaczniuk 2014). The use of IT systems that integrate resources in the crisis management process makes it possible to reduce the disproportion between the costs of measures that should be taken to ensure security and the budgetary resources planned for their implementation (Rysz 2017). The internet and information technologies bring new opportunities, but they can also generate new threats. In order to prevent these threats from materialising, appropriate safeguards must be put in place (Ogórek and Zaskórski 2018), and privacy and information security must be respected, as crisis resilience management (CRM) can collect significant amounts of personal data, including data on human behaviour (Lee et al. 2022). Effective elimination of threats, rapid response and removal of the effects of incidents will be possible if the structures responsible for critical infrastructure are kept in full readiness (Jagusiak and Kaczmarek 2023). In addition, the public sector is moving towards complex, hybrid forms of management. Public accounting should be flexible, reflective and consider new interdependencies between entities, citizens and technology (Grossi and Argento 2022), which also applies to the crisis management system so important in the first half of the 21st century.

Social media plays a significant role in crisis management systems, being described as an integral part of information processes in local and national activities (Purohit et al. 2025). Social media, mobile applications and GIS (Geographic Information Systems) improve the efficiency, flexibility and speed of response of humanitarian organisations during a crisis. Their use is viewed positively, although it carries certain risks, such as unequal access to communication infrastructure for those in need, especially in remote areas, including a lack of adequate infrastructure and limited staff competence in the use of digital technologies (Chari and Novukela 2023). The effectiveness of AI (Artificial Intelligence) implementation depends on investment in digital education, internet infrastructure and training programmes for employees (Mukherjee 2022). Investing in education and training

for decision-makers, emergency services personnel and local communities is essential to effectively use new technologies in risk management (Thiebes and Winkhardt-Enz 2023), including within the crisis management system.

Methods

This publication uses theoretical and empirical methods. The former involved a review of the literature on communication and the use of information and communication technologies (ICT) in crisis management and crisis situations. The study used a secondary analysis method, including analysis and synthesis of scientific literature and the results of previous studies. Scientific reasoning was used to formulate conclusions.

Empirical research was conducted using qualitative methods in the form of in-depth telephone interviews. Each respondent was asked five identical open-ended questions in accordance with the research scenario developed.

The questions directly concerned the issue of communication, as well as disinformation, the dissemination of false information, and unauthorised disclosure of information as disruptions to communication. During the interviews, no leading questions were used, which ensured that respondents could speak freely. Responses were recorded in real time, and participants were informed that the study was completely anonymous. The interviews were conducted between 12 November 2024 and 5 December 2024 in the following municipalities: Czechowice-Dziedzice, Krapkowice, Głuchołazy, Prudnik, Stronie Śląskie, Lądek-Zdrój, Kłodzko, Bardo, Jelenia Góra, Nysa, Lewin Brzeski and the District Crisis Management Centres in Bielsko-Biała, Jelenia Góra, Nysa, Prudnik, Kłodzko, Ząbkowice Śląskie, Lwówek Śląski and Brzeg. These are areas affected by flooding. Questions were sent to 20 entities, i.e. 8 district crisis management centres (PCZK) and 12 municipal or commune departments responsible for crisis management, with one of the municipal/commune departments ultimately failing to respond. It should be noted that the number of respondents was 17, as one person was selected from each of the above-mentioned departments (offices)/PCZK, with the same person working in two places in two cases. The participants in the study therefore acted as respondents and were selected on the basis of their employment in a managerial position. The sampling strategy consisted of selecting offices and PCZKs located in areas flooded as a result of the flood that took place in September 2024. One representative was selected from each of the above units. Thematic analysis was used to present the research results. The respondents' answers were divided into four thematic parts (reflected in the 'Results' section), with the respondents' answers to questions one and two placed in part one, as they concerned the improvement of the crisis management system. Part one was then divided into three thematic groups of responses relating to three

response contexts. Each of the three groups was divided into several thematic strands. This division was intended to systematise the results and make the article more transparent. The research was limited by the subjectivity of the respondents' answers and the possibility of them responding under the influence of emotions, the possible loss of loved ones, property, and other problems caused by the flood. It should be emphasised that the study was conducted immediately after the event, which made it possible to obtain reliable and up-to-date empirical data.

Results

Part I. Respondents' answers to the questions: 'What would you improve in crisis management communication during the floods in September 2024? What legal or practical solutions would you introduce to improve this?' were presented collectively and divided into the following three groups.

Group I. Respondents' answers relating to communication in the crisis management process in the context of civil protection:

1) Applications and information systems

Some respondents pointed to the possibility of using dedicated mobile applications as a way of improving communication in a crisis situation. The dependence of the applications on the Internet was identified as a weakness of this solution. The respondents emphasised the need to develop a single, integrated information system that would collect and provide access to key information provided by the Institute of Meteorology and Water Management and the State Water Management Authority. The system should provide complete and reliable information enabling the civilian population to take informed action and anticipate potential threats.

2) Government Centre for Security alerts

Respondents recommended implementing an early warning system in the form of messages sent to mobile phones, simultaneously by all mobile network operators, before a crisis situation occurs, to people in potentially endangered areas. Practice shows that there are significant time differences in the delivery of warnings, reaching up to thirty minutes, which in the case of dynamic and violent events (e.g. a water tank failure resulting in flooding of a town) can significantly affect the safety of the civilian population.

3) School education

Respondents emphasised the need to include issues related to communication in crisis situations and crises in school curricula. In their opinion, educational content should be expanded to include elements such as knowledge about potential threats, ways to prepare for their occurrence, including adequate protection of property, preparation of evacuation equipment and selection of a safe shelter.

4) Educating the public about voice signals in emergency situations

Respondents indicated that an important aspect of effective communication in a crisis situation is education in recognising warning signals, such as warning sirens. Next, recommendations concerned the implementation of crisis management elements into the curriculum in the context of various events such as floods, fires, hurricanes or war. According to the respondents, educating children and a nationwide campaign in the public media are effective tools for reaching the population. The respondents pointed to the lack of sufficient financial resources to carry out educational activities on a larger scale.

Group II. Respondents' answers relating to communication in the crisis management process in the area of state infrastructure:

Speaker system based on new technologies

Respondents pointed to the need to install a loudspeaker system (including the ability to broadcast voice messages) in every locality. Importantly, in the opinion of the respondents, the population does not have the knowledge to recognise alarm signals. Such signals can only be associated with war or fire, which may cause panic and inappropriate behaviour among the population.

Respondents indicated that during the floods in September 2024, fire brigade and police officers travelling by car broadcast voice messages. In addition, warnings were communicated by 'people from the municipalities' who visited individual households and appealed for evacuation. The respondents described this as time-consuming and preventing them from concentrating on other activities. The main reasons for the system's inefficiency were considered to be insufficient funding for the units responsible for its maintenance and the high costs of purchasing, installing and upgrading public address equipment.

2) Radio communication system

In the opinion of the respondents, it is reasonable to create a radio communication system or a dedicated communication channel on separate GSM network bands, intended exclusively for persons responsible for crisis and emergency management.

3) Information boards

Respondents suggested installing information boards in high-traffic areas to indicate flooded areas. The aim of this solution is to communicate to the population which areas are safe and to indicate the direction of evacuation.

As one respondent pointed out:

'And this was extremely surprising for us, because we did not anticipate that in towns where there are no major or minor watercourses, such enormous damage could be caused by rainfall. It was a new crisis situation in this respect'.

Group III. Respondents' answers relating to communication in the crisis management process, in the area of public services and national security management entities:

1) Information provided by the Institute of Meteorology and Water Management (IMGW)

Respondents indicated that IMGW forecasts should be communicated at the district and even municipal levels, rather than in the form of general announcements covering larger areas.

2) Team meetings

Respondents pointed to the need for regular meetings and training sessions organised by those responsible for crisis management. During these meetings, information and experiences are exchanged and good practices are shared. Once a crisis situation has passed, proposals for improving the crisis management system should be discussed.

3) Dedicated communication channel

Respondents proposed the creation of a single dedicated communication channel for all services involved in crisis management. It was noted that, in their opinion, formations such as the military and the police have their own communication channels that are not accessible to those directly coordinating crisis response activities.

4) Dedicated electronic information transmission system

The respondents recommend creating a dedicated electronic system to provide information on the state of Polish waters, including dams. In addition, they pointed to the need to install electronic sensors on water reservoirs, which would enable continuous monitoring of water conditions and the transmission of key data on the hydrological situation.

As one respondent pointed out, just before the flood wave arrived, the power failure caused telephones to stop working, cutting off communication with the population. There was no access to information on water levels and dam strength for three hours and forty-five minutes. When the water overflowed the dam, the public administration employees coordinating the crisis response had no key information about this fact. Subsequently, more towns were flooded, and no alerts or information were communicated.

According to respondents, dedicated electronic systems should also collect and transmit information on cloud cover measurements and forecast precipitation amounts. The systems should be supported by artificial intelligence solutions, including advanced analytical algorithms that would enable rapid estimation of water levels and prediction of potential impacts and possible losses.

5) Unmanned aerial vehicles

Respondents suggested using unmanned aerial vehicles (drones) to monitor areas at risk, including dams, embankments, and flooded areas. The use of this type of technology could enable a faster response to a dynamically changing situation and increase public safety.

6) Duty continuity system

Respondents pointed out that many emergencies occur on weekends, i.e. non-working days, when officials are not usually on duty. It is therefore important to introduce a duty system and technical solutions enabling calls from office landlines to be redirected to the mobile phone numbers of employees on duty. It is also important for authorities to provide the civilian population with up-to-date contact numbers to which urgent and dangerous incidents can be reported.

7) Creation of a special unit dedicated to crisis events

The respondents expressed their belief that in the event of disasters and cataclysms, crisis management should be taken over by experienced employees, the military or other services. One of the respondents proposed the creation of a single special unit with nationwide coverage, which would have the appropriate powers and equipment to coordinate crisis situations.

8) Cooperation between public administration and the private sector

Respondents emphasised that assistance and cooperation between public administration representatives and gas, electricity and Internet providers is of great importance in communication. These companies should therefore be adequately prepared for the emergence of a crisis situation.

9) Loss of significance of the crisis after its effects have been brought under control

The respondents pointed out that, with the passage of time, the issue of flooding is gradually losing its significance, and the attention of state institutions is focusing on other areas of public activity.

Part II In response to the question: 'During the flood that took place in September 2024, were there any instances of misinformation or the dissemination of false information? If so, please provide examples,' respondents replied as follows.

Some respondents pointed out that it is important for government officials to communicate threats in a reliable and accurate manner. Assurances that there is no risk, communicated in a situation where it actually exists, weaken the vigilance of the population and the services. As a consequence, this leads to a failure to take preventive measures.

An example of misinformation provided by respondents was a case in which a resident (not a representative of the public administration) disseminated false information about the condition of a dam and its subsequent destruction, citing independent readings taken using an unmanned aerial system.

Respondents pointed to misinformation on social media, where private individuals posted comments or shared false information and unverified data. At the same time, social media was presented by respondents as a useful tool for public administration representatives to quickly inform the public about important flood-related issues.

Part III. Respondents were asked whether, during the floods in September 2024, there were any incidents involving unauthorised disclosure of information, as a result of which data was transferred to unauthorised entities. Respondents replied that no such situations had occurred.

Part IV. When asked: 'Do residents of flooded areas complain about irregularities in communication and coordination of tasks between citizens, public institutions and representatives of services, inspections and guards? If so, please give examples,' respondents replied as follows.

Respondents assessed the communication and coordination of tasks between citizens, institutions and representatives of services, inspections and guards positively. During the research, respondents pointed to irregularities in communication in the context of problems related to cash payments, loss assessment and the slow action of officials.

Respondents emphasised that crisis teams had been set up, comprising representatives of the army, the guard, the police, veterinary services, municipal companies, etc. Officials were assigned 24-hour shifts, performed additional work, and were equipped with mobile phones that were made available to the public, although in the opinion of residents, access to them was often difficult due to the large number of simultaneous calls.

Discussion

The computerisation of crisis management processes is a key assumption for building an effective and modern crisis management system. It is important to develop and implement specialised mobile applications for communication in crisis situations, which could be used by both the civilian population and the services responsible for crisis response. Mobile applications and information and communication technologies are an important element of international crisis practices (Tan et al. 2017). In addition to applications, it seems necessary to develop an integrated information system that enables precise monitoring and transmission of water level data. This system should provide residents with reliable and understandable information, allowing them to independently assess the degree of danger and take appropriate measures to protect life, health and property.

The application and related information systems should also be able to function in conditions of limited Internet access, which would increase their reliability in crisis situations. The implementation of such technological solutions is part of a broader strategy to increase the safety of the civilian population in the face of natural hazards around the world, as exemplified by the Copernicus Emergency Management

Service (CEMS) operating within the European Union, which integrates satellite data, hydrological models and flood forecasting systems (Alfieri 2013).

The system for warning the civilian population about threats and emergency situations should be decentralised and based on the activities of the municipal administration. Transmitting alerts from the municipal level would enable a faster response and more precise identification of the area affected by the hazard, which would significantly increase the effectiveness of crisis communication and the adequacy of protective measures taken. Foreign literature emphasises that the effectiveness of warnings increases with the spatial precision of the message and its adaptation to local conditions (Kuligowski and Doermann 2018).

The crisis management process should be supported by new technologies, such as unmanned aerial vehicles, which can be used to monitor areas at risk of flooding or flooded areas. There is no doubt that advanced technological systems employed in the monitoring and recording of crisis situations, enable the acquisition of higher-resolution and more durable visual data. These materials may be transmitted in real time to crisis management centres, thereby supporting ongoing assessment and coordination of response measures. Consequently, the broader availability of modern technologies and the systematic collection of up-to-date data enhance the effectiveness of managing the protection of human life and health in emergency contexts. This increased efficiency applies both to operational rescue activities and to procedural actions related to the formal documentation of incidents (Jaszczur and Łukasik 2021).

It is necessary to implement warning systems that enable the broadcasting of voice messages in every locality.

Alarm systems equipped with sound devices (e.g. loudspeakers) can perform a multi-tasking function — in addition to warning of hazards, they can be used to convey other important administrative messages. Regular use of this type of communication can have a positive impact on the level of public trust and residents' sense of security by familiarising them with the form of communication and increasing its effectiveness. In addition, the ongoing broadcasting of messages enables continuous monitoring of the efficiency of warning systems.

In order to improve administrative communication during a crisis, it is recommended to implement a system of segregating the telephone numbers of public administration employees, depending on the type of cases reported. It should be noted that the problem of overloading public administration communication channels in crisis situations is widely analysed in Anglo-Saxon literature and is one of the key factors limiting the efficiency of institutional response (Kapucu 2006).

The principles of effective communication in a crisis situation should be taught at school. Programmes should include, among other things, knowledge about warning signals, early warning systems, basic procedures for behaviour in the event of a crisis

situation, e.g. a flood, and issues related to the risks arising from the dissemination of unconfirmed or unverified information about crisis events.

The state authorities should conduct a permanent, nationwide social campaign aimed at disseminating knowledge about the proper behaviour of the population during floods and other crises.

Conclusions

The working hypothesis presented in the introduction has been positively verified.

The research has shown that crisis management processes should be subject to continuous improvement in terms of computerisation, which may contribute to increasing the effectiveness of actions and ensuring public safety. The implementation of this project requires close cooperation between representatives of public administration, the scientific community, IT specialists and security experts.

An effective warning and crisis management system should be based on decentralisation, modern technologies, efficient institutional cooperation and continuous public education. Only integrated actions involving local government, services, critical infrastructure operators and informed citizens can ensure rapid response, limit losses and realistically increase public safety in the face of contemporary threats.

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