Original scientific paper DOI: 10.56461/iup_rlrc.2026.7.ch18

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EU APPROACHES TO REDUCING SECURITY RISKS IN CRISIS THROUGH DIGITAL TOOLS: THE CASE OF THE LIFEGRID PROJECT

Contemporary crises, including natural disasters and technological incidents, require integrated approaches to managing risks to population safety. Vulnerable groups and social care institutions are particularly exposed, making preparedness and resilience essential for protecting human life and ensuring continuity of services. This paper examines European Union approaches to crisis management through the LifeGRID project as a case study. It analyses how digital tools, early warning systems, and coordinated governance mechanisms support situational awareness, risk assessment, and emergency response, particularly in nursing homes and social welfare institutions. The paper also considers the legal and governance framework shaping the use of such tools, including data protection, fundamental rights, and accountability requirements. In addition, it highlights broader challenges related to digital exclusion, cybersecurity vulnerabilities, and fragmentation across Member States. The findings suggest that while digital tools enhance crisis response and coordination, their effectiveness depends on their integration within coherent legal frameworks, inclusive design, and robust institutional cooperation.

Keywords: EU law, security risks, crisis management, digital tools, civil protection, community resilience, vulnerable populations, early warning systems, LifeGRID project.

1. INTRODUCTION

Contemporary crises and emergency situations, including natural disasters, technological incidents, and complex security threats, increasingly challenge societies' capacity to ensure the safety and security of their populations. The growing frequency and complexity of such events, often characterized by interconnected and cascading risks, require a shift from traditional reactive approaches towards more integrated and resilience-oriented models of crisis management. In this context, particular attention must be given to vulnerable population groups, especially individuals dependent on social and healthcare services.

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Within the European Union, crisis management has evolved into a coordinated, multi-level system that integrates policy frameworks, operational mechanisms, and technological solutions. Digital transformation plays a key role in this process, enabling improved situational awareness, real-time communication, and more effective coordination among stakeholders across all phases of the disaster management cycle.

The aim of this paper is to analyse the European Union model for reducing security and safety risks in crisis through the use of digital tools. The analysis combines theoretical and institutional perspectives with a case study of the LifeGRID project, focusing on the integration of digital technologies, community engagement, and institutional coordination in strengthening disaster preparedness and resilience.

A particular contribution of this paper lies in its combined theoretical and practical perspective. In addition to analysing existing frameworks and models, the paper incorporates practical insights derived from the direct involvement of one of the authors in the implementation of the LifeGRID project. This approach enables a more comprehensive understanding of current practices and highlights potential models for addressing identified challenges in crisis management.

Methodologically, the paper is based on a review of relevant literature and policy documents, complemented by a qualitative analysis of the LifeGRID project. The paper is structured as follows: it first outlines the theoretical and EU policy framework, then examines the role of digital tools in crisis management, and finally presents the LifeGRID case study, including its structure, tools, governance model, and practical impact.

2. EU FRAMEWORK & THEORY

This section establishes the conceptual and institutional framework for analysing the role of digital tools in reducing security risks in crisis. It begins by outlining the key theoretical concepts underpinning contemporary risk and crisis management, with particular emphasis on risk, resilience, and the disaster management cycle. Building upon this theoretical foundation, the section then examines the European Union's approach to crisis management, focusing on its policy instruments, operational mechanisms, and coordination structures. Particular attention is given to the role of digital transformation, data governance, and interoperability in enhancing resilience, improving situational awareness, and enabling more effective and coordinated responses to complex and evolving crisis scenarios.

2.1. Theoretical Background

The concept of risk is a fundamental analytical category in the field of crisis and emergency management. According to the International Organization for Standardization (ISO), risk is defined as the effect of uncertainty on objectives (ISO, 2018, p. 1). A central concept in contemporary risk and crisis management theory is resilience. In international policy and academic discourse, resilience is generally understood as the capacity of a system, community, or society exposed to hazards to resist, absorb, accommodate, adapt to, and recover from their effects in a timely and efficient manner, while preserving essential structures and functions (UNDRR, 2015, p. 12). This understanding extends beyond the notion of recovery alone and includes the ability to adapt to evolving risk conditions and to transform in response to complex and uncertain environments. Such an approach is particularly relevant in the context

of contemporary crisis scenarios, where interconnected risks and cascading effects require flexible and adaptive response mechanisms.

Within this conceptual framework, crisis management is generally understood as a set of coordinated activities aimed at preventing, preparing for, responding to, and recovering from events that threaten the safety and security of populations (Alexander, 2002). It encompasses institutional arrangements, organizational processes, and operational measures designed to reduce the impact of crises and ensure the continuity of essential societal functions. Contemporary approaches to crisis management place increasing emphasis on proactive planning, inter-institutional coordination, and the integration of technological solutions into decision-making processes. The disaster management cycle provides a structured framework for addressing crises through four interrelated phases: mitigation, preparedness, response, and recovery. Mitigation includes measures aimed at reducing the likelihood or impact of hazards, such as risk assessments and risk reduction strategies. Preparedness involves planning, training, and the establishment of early warning systems to ensure an effective response. The response phase encompasses immediate actions taken during a crisis to protect lives and property, while recovery focuses on restoring normal conditions and strengthening future resilience through lessons learned. This phase-based approach is widely recognised in disaster management literature and practice, where the management of hazards is typically organized around mitigation, preparedness, response, and recovery activities (UNDRR, 2015; Coppola, 2011, pp. 9–10).

Within this framework, the concept of community resilience has gained particular importance. It can be understood as the capacity of local populations, institutions, and systems to anticipate, withstand, and recover from adverse events while maintaining essential functions (Cutter, Burton & Emrich, 2010, pp. 1–2). Community resilience is shaped by factors such as social cohesion, institutional preparedness, access to timely and reliable information, and the availability and accessibility of resources. In the context of vulnerable groups and social care institutions, resilience is closely linked to the level of staff preparedness, the existence of clearly defined procedures, and the degree of integration into broader emergency management systems.

In recent years, digital technologies have assumed an increasingly important role in strengthening resilience and enhancing risk management processes. They contribute to improved situational awareness, enable real-time communication, and support more informed and timely decision-making across all phases of the disaster management cycle. As such, digital tools represent a key enabling factor in the development of integrated and adaptive crisis management systems (UNDRR, 2015).

The presented theoretical framework indicates a clear shift from traditional, reactive approaches to crisis management towards more integrated, adaptive, and resilience-oriented models. The growing complexity of contemporary risks, characterised by interdependencies and cascading effects, requires not only effective institutional coordination but also the strategic use of digital technologies and the active involvement of communities. In this context, resilience emerges as a key concept linking risk management, crisis response, and long-term recovery, emphasising the importance of preparedness, flexibility, and continuous adaptation. Strengthening community resilience, together with enhancing digital capacities, is therefore essential for improving overall security and safety in modern crisis environments.

2.2. EU Security and Crisis Management Framework

The European Union has developed a comprehensive and multi-layered framework for crisis management aimed at enhancing the safety and security of its population through coordinated action, shared resources, and the integration of digital technologies. As outlined by the European Commission (European Commission, 2020b), this framework is grounded in a combination of policy instruments, operational mechanisms, and strategic initiatives designed to strengthen preparedness, response, and recovery capacities across Member States.

This section is structured in three parts: first, it examines the legal basis of EU action in crisis management; second, it analyses the legal framework governing digital tools, particularly data protection; and third, it explores the institutional and operational mechanisms through which these frameworks are implemented.

2.2.1. Legal Basis of EU Crisis Management

The legal basis for the European Union's action in the field of crisis management is rooted in the Treaty framework, which establishes a system of shared and supporting competences between the Union and its Member States. Unlike policy-driven areas where the Union exercises extensive harmonisation powers, crisis management—particularly in the field of civil protection—remains primarily within the competence of the Member States, with the Union playing a complementary and coordinating role.

A central provision in this regard is Article 196 of the Treaty on the Functioning of the European Union (TFEU), which explicitly provides the legal basis for Union action in civil protection. This provision empowers the Union to support and complement the efforts of Member States in preventing, preparing for, and responding to natural or man-made disasters. Importantly, Article 196 TFEU does not confer autonomous operational competences upon the Union but rather establishes a framework for coordination, cooperation, and capacity-building. This reflects the broader constitutional principle of subsidiarity, according to which the Union may act only insofar as the objectives of the proposed action cannot be sufficiently achieved by the Member States alone.

In addition to civil protection, other Treaty provisions contribute to the legal framework governing crisis management. Article 168 TFEU, which concerns public health, requires that a high level of human health protection be ensured in all Union policies and activities. This provision is particularly relevant in crisis involving health risks, including pandemics and emergencies affecting vulnerable populations. While Article 168 TFEU limits the extent of harmonisation in the field of public health, it nevertheless provides a legal basis for coordination, support measures, and the adoption of incentive-based actions at the Union level.

Furthermore, Article 114 TFEU, which enables the approximation of laws for the establishment and functioning of the internal market, has indirect relevance in the context of crisis management, particularly with regard to the regulation of digital infrastructures, data flows, and communication systems. Given the increasing reliance on digital tools in crisis response, this provision serves as an important legal basis for ensuring interoperability and the smooth functioning of cross-border systems within the Union.

Building upon these Treaty provisions, the EU has adopted binding secondary legislation that operationalises its role in crisis management. The most significant instrument in this regard is Decision No 1313/2013/EU on a Union Civil Protection Mechanism. This Decision establishes a comprehensive framework for disaster risk management, encompassing prevention, preparedness, and response. It facilitates cooperation among Member States, enables the pooling and deployment of resources, and supports coordinated assistance in crisis.

The Union Civil Protection Mechanism reflects a hybrid model of governance, combining elements of coordination, support, and operational facilitation. While the primary responsibility for disaster response remains with the Member States, the Mechanism enhances collective capacity by providing a structured system for information exchange, risk assessment, and resource mobilisation. Its legal design thus embodies a balance between national sovereignty and supranational coordination, consistent with the constitutional architecture of the Union.

At the same time, the legal framework governing EU crisis management reveals certain structural limitations. The Union's competences in this field remain largely supportive, which may constrain its ability to act independently in large-scale or rapidly evolving crises. Moreover, the fragmentation of legal bases across different policy areas—such as civil protection, public health, and the internal market—may complicate the development of fully integrated responses. These limitations underscore the importance of effective coordination mechanisms and highlight the need for continuous adaptation of the legal framework in response to emerging risks.

In addition to the general legal basis outlined above, the use of digital tools in crisis management is subject to specific regulatory frameworks, particularly EU data protection law.

The deployment of digital instruments such as the *Pflegeregister Wesermarsch* entails significant legal implications, particularly in relation to the processing of highly sensitive personal data, including health-related information. Within the European Union, such processing is governed by the General Data Protection Regulation (GDPR), which establishes a comprehensive and directly applicable legal framework aimed at safeguarding fundamental rights, notably the right to the protection of personal data as guaranteed under Article 8 of the Charter of Fundamental Rights of the European Union.

In the context of crisis and disaster management, the processing of personal data must comply with the foundational principles set out in Article 5 GDPR, including lawfulness, fairness and transparency, purpose limitation, data minimisation, accuracy, storage limitation, and integrity and confidentiality. The *Pflegeregister* involves the structured collection and processing of data relating to individuals' health status, care dependency, and reliance on electrically powered medical devices. Such information clearly falls within the scope of "special categories of personal data" pursuant to Article 9(1) GDPR, thereby triggering enhanced legal protection and stricter conditions for lawful processing.

As a general rule, the processing of such data is prohibited unless one of the exceptions under Article 9(2) GDPR applies. In emergency and crisis scenarios, several legal bases may be invoked. Article 9(2)(c) permits processing where necessary to protect the vital interests of the data subject or another natural person, particularly in situations where the data subject is incapable of giving consent. In addition, Article 9(2)(i) allows processing for reasons of public interest in the area of public health, including the management of serious cross-border threats to health. These provisions must be read in conjunction with Article 6(1)(e) GDPR, which provides a lawful basis where processing is necessary for the performance of a task carried out in the public interest or in the exercise of official authority.

However, reliance on these legal bases does not relieve data controllers of their obligation to implement appropriate and proportionate safeguards. Pursuant to Articles 24, 25, and 32 GDPR, controllers must ensure data protection by design and by default, as well as adopt adequate technical and organisational measures to guarantee a level of security appropriate to the risks involved. In the context of disaster management tools such as the *Pflegeregister*, this includes strict access controls, role-based authorisation, encryption, secure storage infrastructures, and clearly defined governance mechanisms regulating access to and use of personal data. The voluntary nature of registration contributes to transparency and trust, yet it does not in itself constitute a sufficient legal basis for processing under EU law.

From a broader constitutional perspective, the use of digital tools in crisis management necessitates a careful balancing between competing legal and societal imperatives. On the one hand, the effective protection of life and health requires rapid access to accurate and comprehensive data, enabling targeted and timely interventions. On the other hand, the processing of sensitive personal data entails significant risks for individual rights, particularly the rights to privacy and data protection. This tension must be resolved in accordance with the principle of proportionality, a fundamental principle of EU law, which requires that any interference with fundamental rights be necessary, appropriate, and proportionate to the legitimate objective pursued.

Critically, while the GDPR provides a sufficiently flexible legal framework to accommodate emergency situations, its application in practice may give rise to challenges, particularly in time-sensitive scenarios where the need for immediate action may conflict with procedural safeguards and accountability requirements. This raises broader questions regarding the operationalisation of data protection principles in crisis contexts, including the extent to which existing legal frameworks adequately reconcile the demands of rapid decision-making with the protection of fundamental rights.

Accordingly, digital tools such as the *Pflegeregister* represent both an opportunity and a legal challenge: they significantly enhance situational awareness, enable more efficient allocation of resources, and improve the protection of vulnerable populations, yet their legitimacy ultimately depends on strict compliance with EU data protection law and the effective implementation of safeguards. This underscores the necessity of embedding data protection considerations at the core of crisis management systems, ensuring that technological innovation remains aligned with the constitutional and normative foundations of the European Union.

Overall, the EU legal framework for crisis management is characterised by a multi-layered structure that combines Treaty-based competences with binding secondary legislation, as well as specific regulatory regimes governing digital tools, such as data protection law.

Building upon this legal foundation, the following subsection examines the institutional and operational mechanisms through which these legal principles are implemented in practice.

2.2.2. Institutional and Operational Framework

A central role in shaping EU crisis management policies is played by the European Commission, which acts as a key coordinating and executive body within the limits of the competences conferred by the Treaties. In this capacity, the Commission develops strategic frameworks and supports their implementation through a combination of legislative initiatives, financial instruments, and coordination mechanisms.

While policy documents, such as the European Commission's communication Shaping Europe's Digital Future (European Commission, 2020b), provide strategic orientation, their

legal significance remains primarily programmatic. Accordingly, their role must be understood in conjunction with binding legal instruments and operational mechanisms that structure crisis response within the Union.

At the operational level, the core instrument of EU crisis response is the Union Civil Protection Mechanism, established by Decision No 1313/2013/EU (European Parliament and Council, 2013). The Mechanism provides a structured framework for cooperation among Member States in the fields of disaster prevention, preparedness, and response. Its primary function is to facilitate coordinated assistance, enable the pooling and deployment of resources, and support rapid intervention in the event of natural or man-made disasters. Importantly, the Mechanism does not replace national competences but operates on the basis of coordination and support, reflecting the principle of subsidiarity.

The operational effectiveness of the Mechanism is ensured through the Emergency Response Coordination Centre (ERCC), which functions as the central hub for real-time monitoring, information exchange, and coordination of response activities (European Commission, 2023). The ERCC enhances situational awareness by integrating data from multiple sources and supports decision-making by enabling the rapid dissemination of information among Member States and EU institutions. In this regard, it represents a critical interface between legal frameworks and operational practice.

In addition to operational instruments, the EU has developed high-level coordination arrangements such as the Integrated Political Crisis Response (IPCR). The IPCR framework facilitates political coordination at the Union level, particularly in large-scale or complex crises requiring cross-sectoral responses. It enables the consolidation of situational reports, analytical inputs, and communication channels, thereby ensuring that decision-makers have access to timely and coherent information. This mechanism reflects the need for integrated governance structures capable of addressing the multi-dimensional nature of contemporary crises (Council of the European Union, 2022).

A defining feature of the EU crisis management framework is its increasing reliance on data, interoperability, and digital infrastructure. Effective crisis response depends on the ability to collect, process, and share information in real time across different institutions and jurisdictions. The EU actively promotes interoperability across Member States, enabling seamless data exchange and coordinated action, as reflected in its data and digital policy frameworks (European Commission, 2020a; European Commission, 2020b). Digital platforms and information systems thus play a central role in enhancing situational awareness, facilitating communication, and supporting evidence-based decision-making.

However, the growing reliance on digital technologies also raises structural and legal challenges. Differences in national data governance regimes, technological capacities, and institutional practices may hinder effective interoperability and limit the efficiency of cross-border coordination. Moreover, the integration of digital tools into crisis management processes must be reconciled with legal requirements relating to data protection, security, and accountability. These challenges highlight the need for a coherent and legally grounded approach to digitalisation within the EU crisis management framework.

Overall, the institutional and operational architecture of EU crisis management reflects a transition towards more integrated, data-driven, and coordinated systems. By combining legal instruments, institutional mechanisms, and digital technologies, the EU seeks to enhance both immediate response capacities and long-term resilience. Nevertheless, the effectiveness

of this framework ultimately depends on the extent to which coordination mechanisms, technological systems, and legal safeguards are aligned in practice.

Against this legal backdrop, the following subsection analyses how these principles are operationalised within the EU's institutional and coordination framework.

3. DIGITAL TOOLS AND INTEGRATED CRISIS MANAGEMENT APPROACH

Digital technologies have become a central component of contemporary crisis management systems, enabling more effective, coordinated, and adaptive responses to increasingly complex security and safety risks. Within the European Union framework, digital tools are not treated as isolated technical solutions but as integral elements of a broader, system-oriented approach to risk reduction, resilience building, and crisis response (European Commission, 2020b). In addition, EU-funded research and innovation initiatives have further highlighted the role of digital solutions in improving coordination, operational efficiency, and decision-making in crisis (European Commission, 2020c).

Digital tools in crisis management encompass a wide range of technologies, including early warning systems, real-time communication platforms, data management systems, and decision-support tools. Their primary function is to enhance situational awareness, facilitate the timely exchange of information, and support evidence-based decision-making across all phases of the disaster management cycle, in line with international disaster risk reduction frameworks (UNDRR, 2015). Recent studies indicate that digital transformation enables advanced capabilities such as real-time monitoring, data analysis, and integrated decision-support systems, which contribute to improving the efficiency and responsiveness of crisis management processes (Fischer-Preßler, Bonaretti & Bunker, 2024).

A key advantage of digital tools lies in their capacity to support the integration of different actors within the crisis management system. Through interoperable platforms and shared data environments, they enable cooperation between public authorities, emergency services, healthcare providers, and the population. This interconnected approach is particularly important in complex crisis scenarios, where multiple risks and cascading effects require coordinated and multi-sectoral responses. However, achieving effective interoperability remains a significant challenge, particularly in cross-border contexts, where differences in data standards, governance structures, and technological capacities may hinder seamless information exchange (Migliorini *et al.*, 2019). The European Union has addressed these challenges through policies promoting data sharing and interoperability, which aim to ensure efficient coordination and information flow across institutional and territorial boundaries (European Commission, 2020a).

The integration of digital tools into the disaster management cycle further strengthens their strategic value. In the mitigation and preparedness phases, digital technologies support risk assessment, hazard mapping, and early warning systems, allowing authorities and communities to anticipate and prepare for potential threats. During the response phase, real-time data and communication tools enable rapid decision-making, efficient resource allocation, and coordinated emergency operations. In the recovery phase, digital systems facilitate damage assessment, data analysis, and the monitoring of recovery processes, contributing to the improvement of future resilience and preparedness measures (UNDRR, 2015; Reuter & Kaufhold, 2018, pp. 41–45).

In addition to their operational functions, digital tools play a crucial role in empowering communities and enhancing their resilience. By providing access to timely and reliable information, they enable individuals to make informed decisions and actively participate in their own safety and preparedness. Digital platforms, including social media and interactive information systems, support public awareness, self-preparedness, and communication between authorities and citizens, particularly during crisis (Houston *et al*., 2015, pp. 3–6). This shift towards more inclusive and participatory crisis management reflects a broader transformation from centralised, top-down approaches to more integrated and community-oriented models, as emphasized in international disaster risk reduction frameworks (UNDRR, 2015). Furthermore, recent studies indicate that the digitalisation of public services can contribute to improved coordination, information sharing, and institutional responsiveness in complex crisis contexts (OECD, 2020; Dincă, Bărbuță & Dincă, 2025).

Within the European Union, the strategic use of digital technologies is closely linked to broader policy objectives related to digital transformation, data governance, and resilience. The development of interoperable systems, data-sharing mechanisms, and digital infrastructures forms the basis for more efficient and coordinated crisis management. EU initiatives in this field also emphasise the importance of integrated communication systems and cross-border coordination, which are essential for managing large-scale and transnational crises (European Commission, 2020a)**.** This approach supports the transition towards adaptive and data-driven crisis management models, capable of responding to rapidly evolving and interconnected risks.

In this context, digital tools act as a connecting element between theoretical frameworks and practical implementation. They operationalise key concepts such as resilience, coordination, and adaptability by translating them into concrete mechanisms and procedures. The following section examines how these principles are applied in practice through the example of the LifeGRID project, which represents an innovative model for integrating digital technologies, community engagement, and institutional coordination in disaster risk reduction.

4. CASE STUDY: LIFEGRID PROJECT – ENHANCING DISASTER PREPAREDNESS AND RESILIENCE IN WESERMARSCH

This section presents a case study of the LifeGRID project, examining its role in enhancing disaster preparedness and community resilience in the Wesermarsch district. The analysis is structured to reflect both the conceptual foundations and the practical implementation of the project within the broader context of EU crisis management approaches. It begins by outlining the concept and scope of the LifeGRID project, followed by an examination of the local context and underlying rationale for its development. The subsequent sections analyse the project's key objectives and organisational structure, with particular attention to its division into work packages.

Further analysis focuses on the main digital tools and operational innovations developed within the project, including their practical applications and impact on disaster management processes. In addition, the governance model and stakeholder collaboration framework are examined in order to highlight the institutional dimension of the project.

The section concludes with an assessment of the expected results and long-term impact of the LifeGRID project, followed by a synthesis of key findings in the concluding part of the case study.

4.1. Concept and Scope of the LifeGRID Project

The LifeGRID project represents an initiative aimed at improving disaster preparedness and resilience in the Wesermarsch district of Lower Saxony, Germany (Landkreis Wesermarsch, 2026b). Funded under the SifoLIFE programme, the project focuses on the needs of care-dependent populations, including elderly individuals and those reliant on electrically powered medical devices, by developing integrated solutions for emergency management in the context of flooding and power outages.

The project adopts an interdisciplinary approach, combining community engagement, digital tools, and disaster management systems. Its objective is to develop solutions that can support both local resilience and potential transferability to other regions facing similar risk profiles (LifeGRID, 2026).

This case study analyses the LifeGRID project's objectives, tools, and organisational structure, with particular emphasis on its contribution to disaster risk reduction and the strengthening of community resilience within the broader framework of EU crisis management approaches.

4.2. Project Context and Rationale

The Wesermarsch district is exposed to multiple disaster risks due to its geographical characteristics. Situated in northwestern Germany, between the North Sea and the Weser River, the area is particularly vulnerable to flooding caused by storm surges, heavy precipitation, and river overflow. Although the region is protected by an extensive system of dikes and flood control infrastructure, recent developments related to climate change and the increasing frequency of extreme weather events raise concerns regarding the long-term adequacy of these protective measures.

In addition to its geographical exposure, the district is characterised by a rapidly ageing population, a significant proportion of which depends on electrically powered medical devices. These include ventilators, dialysis machines, and oxygen concentrators, all of which require a stable electricity supply. In the event of power outages associated with flooding or severe weather conditions, individuals reliant on such devices face heightened health risks, including potentially life-threatening complications. These vulnerabilities are further exacerbated by limitations of the existing infrastructure in ensuring the continuity of medical care during emergency situations.

Within this context, the LifeGRID project is designed to address identified structural and operational gaps in disaster preparedness and response. The project focuses on the integration of technological solutions, emergency power systems, and targeted support for care-dependent populations. Its approach is based on the development of an integrated disaster management framework that combines preparedness measures, response capacities, and community-based resilience strategies. In particular, the project seeks to strengthen coordination among emergency services, healthcare providers, and the population, thereby contributing to improved disaster response and recovery capacities at the local level (Landkreis Wesermarsch, 2023).

4.3. Key Objectives of the LifeGRID Project

The LifeGRID project is structured around a set of interrelated objectives aimed at strengthening disaster preparedness and enhancing community resilience in the Wesermarsch district.

These objectives reflect both the specific vulnerabilities of the region and the broader principles of integrated crisis management. The key objectives of the project include:

1. The development and testing of evacuation and care concepts tailored to the needs of care-dependent individuals, with particular attention to those reliant on electrically powered medical devices.
2. The establishment of decentralised care units ("care islands") equipped with emergency power systems, intended to ensure the continuity of healthcare services during crisis.
3. The strengthening of community resilience through awareness-raising activities, training programmes, and the provision of emergency preparedness kits.
4. The improvement of data availability and situational awareness through the implementation of digital tools, such as the *Pflegeregister Wesermarsch*.
5. The enhancement of communication and coordination among local authorities, healthcare providers, and emergency services, with the aim of improving the efficiency of crisis response.
6. The promotion of transferability and scalability of the project's solutions, enabling their potential application in other regions facing similar risk conditions (Landkreis Wesermarsch, 2023).

4.4. Organisational Structure and Work Packages of the LifeGRID Project

The LifeGRID project is organised into six interrelated work packages (WPs), each addressing a specific dimension of disaster preparedness and resilience. This structured approach reflects an integrated model of crisis management, combining community engagement, healthcare preparedness, technological solutions, and institutional coordination. The division into work packages enables a systematic implementation of project activities while ensuring coherence between operational, social, and technological components (Landkreis Wesermarsch, 2023).

WP1: Population Resilience

This work package focuses on strengthening the preparedness of the general population through awareness-raising and capacity-building activities. It includes community-based programmes aimed at improving self-help capabilities, such as self-preparedness workshops, first aid training, and the distribution of emergency kits to households.

WP2: Resilience in Care Services

This component addresses the specific needs of care services, including both institutional and home-based care. It involves the training of caregivers, the development of emergency care plans, and the implementation of the Pflegeregister Wesermarsch, a digital tool designed to support the prioritisation of care-dependent individuals during crisis.

WP3: Disaster Management Resilience

This work package is oriented towards strengthening disaster management systems and operational capacities. It includes the provision of emergency power systems, the establishment

of evacuation centres, and the development of coordinated response strategies, with an emphasis on efficiency and rapid deployment during emergencies.

WP4: Monitoring and Evaluation

This component ensures the systematic assessment of project activities and outcomes. It includes resilience assessments, feedback mechanisms, and the development of monitoring tools aimed at supporting continuous improvement in disaster preparedness and response systems.

WP5: Dissemination and Knowledge Transfer

This work package focuses on the communication and transfer of project results and best practices. Key activities include the development of an interactive digital brochure, the organisation of workshops, and the publication of project findings, with the aim of facilitating replication in other regions.

WP6: Project Management and Coordination

This component is responsible for the overall coordination, monitoring, and administrative management of the project. It supports communication among stakeholders and ensures the effective implementation of project activities in accordance with defined timelines and resource allocations.

4.5. Key Tools and Innovative Approaches in Disaster Management

The LifeGRID project incorporates a range of digital tools and operational innovations aimed at enhancing disaster preparedness, response capacity, and community resilience in the Wesermarsch district. These tools address different dimensions of crisis management, including situational awareness, coordination, and the protection of vulnerable populations. The following sections analyse the most significant components of this approach.

a) Pflegeregister Wesermarsch (Care Register)

The Pflegeregister Wesermarsch represents a centralised digital system designed to identify and monitor care-dependent individuals who may be particularly vulnerable during crisis. As a key component of the LifeGRID project, the register supports more efficient and targeted disaster response by providing emergency services with access to relevant real-time data (Pflegeregister Wesermarsch, 2026).

The system enables voluntary registration through an online platform, where individuals or their caregivers can provide essential information, including medical conditions, care needs, and dependence on electrically powered medical devices. This data allows emergency responders to assess vulnerability levels and prioritize interventions accordingly (Pflegeregister Wesermarsch, 2026).

In evacuation scenarios, the register facilitates the prioritization of individuals with the highest level of care dependency, thereby reducing health risks and improving the effectiveness of response operations. At the same time, the system is designed in compliance with

data protection standards, ensuring secure handling of sensitive personal information and restricted access for authorised personnel only.

The integration of the *Pflegeregister* with local disaster management systems further enhances situational awareness and enables more informed decision-making during emergencies. Beyond immediate response, the tool contributes to long-term resilience by ensuring that care-dependent populations are systematically included in disaster preparedness planning (Pflegeregister Wesermarsch, 2026).

b) Interactive Digital Brochure

The interactive digital brochure developed within the LifeGRID project functions as a centralised, web-based platform for disseminating disaster preparedness information.1 It is designed to improve public awareness and facilitate access to relevant guidance in crisis (LifeGRID, 2026).

The platform provides real-time updates on evolving hazards, including flood warnings and evacuation orders, and enables direct communication between local authorities and the population. In addition, it incorporates interactive maps, search functions, and tailored preparedness checklists, allowing users to access location-specific information and adapt preparedness measures to their individual needs (LifeGRID, 2026).

A key feature of the platform is its accessibility and adaptability across multiple devices, ensuring that information remains available during emergencies. The inclusion of multimedia content and accessibility functions further enhances user engagement and inclusiveness.

From a broader perspective, the digital brochure contributes to strengthening community resilience by promoting self-preparedness and facilitating a more active role of citizens in disaster risk reduction. Its use of analytics also supports continuous improvement of the platform and its content.

c) Evacuation Centres as an Operational Innovation

In addition to digital tools, the LifeGRID project introduces an innovative approach to evacuation planning through the establishment of specialised evacuation centres.2 These centres are designed to provide temporary accommodation, medical support, and essential services for affected populations during emergencies (Berufsbildende Schulen Wesermarsch, 2026; Stadt Elsfleth, 2026).

Strategically located within existing infrastructure, such as educational institutions, the centres are equipped with sleeping areas, sanitary facilities, and medical units. Particular attention is given to vulnerable groups, including elderly individuals, children, and persons with disabilities, through the provision of specialised care areas and adapted facilities.

[1] This tool is currently under development as part of the project objectives within the Lifegrid project. The tender procedure is currently ongoing, and upon its completion, work will begin on the development of the tool, which will be in use starting from November 1, 2026.

[2] The methodology for the establishment and operation of evacuation centres is defined in internal project documentation that is not publicly available. Consequently, detailed operational procedures cannot be independently verified through accessible sources. Available public information primarily relates to the designated locations of evacuation centres within the Wesermarsch district. These locations are associated with existing public infrastructure adapted for emergency use.

A critical component of these centres is the integration of emergency power systems, ensuring the continued operation of medical devices and communication systems during power outages. In addition, the presence of medical and psychological support services contributes to addressing both physical and mental health needs during crisis.

The centres are also integrated into local communication systems, enabling real-time information sharing and coordination with emergency services. This contributes to more efficient management of evacuation processes and improves overall response effectiveness (Landkreis Wesermarsch, 2023).

4.5.1. Synthesis of Tools and Innovations

Taken together, the tools and approaches developed within the LifeGRID project illustrate an integrated model of disaster management that combines digital technologies, community engagement, and operational preparedness. The Pflegeregister enhances targeted response and protection of vulnerable populations, the digital brochure strengthens public awareness and communication, while the evacuation centres provide critical physical infrastructure for emergency response.

This combination of digital and organisational innovations contributes not only to improved short-term response capacities but also to the development of long-term resilience at the community level. The LifeGRID model therefore represents a transferable approach that may be applicable to other regions facing similar risk conditions (LifeGRID, 2026).

4.5.2. Practical Applications and Impact of LifeGRID Tools and Approaches

The tools and strategies developed within the LifeGRID project demonstrate significant practical applications for disaster management and contribute to strengthening community resilience at the local level. Their impact can be observed across several interrelated dimensions, including individual preparedness, continuity of care, operational efficiency, and community-level resilience.

First, the project contributes to the empowerment of individuals by promoting active participation in disaster preparedness. Through training programmes, awareness-raising activities, the distribution of emergency kits, and access to digital tools such as the interactive brochure, residents are better equipped to anticipate and respond to crisis. This reflects a shift from a purely institutional approach towards a more participatory model of risk management.

Second, the project enhances the resilience of care systems by addressing the specific needs of vulnerable populations. The implementation of the Pflegeregister, together with the establishment of decentralized care units, supports the continuity of medical and social care during emergencies. This is particularly relevant for individuals dependent on electrically powered medical devices, for whom disruptions in service may have critical consequences.

Third, the integration of digital tools contributes to more efficient and coordinated disaster response. The availability of real-time data and improved communication channels enables emergency services to prioritise interventions, allocate resources more effectively, and coordinate evacuation procedures with greater precision. This enhances the overall responsiveness of the disaster management system.

Finally, the combined effect of these measures contributes to strengthening community resilience. By integrating technological solutions with community engagement and institutional coordination, the LifeGRID project supports the development of adaptive capacities

at the local level. This integrated approach aligns with contemporary disaster risk reduction frameworks, which emphasise the importance of collaboration, preparedness, and the inclusion of vulnerable groups in crisis management processes (Landkreis Wesermarsch, 2023; LifeGRID, 2026).

4.6. Legal and Fundamental Rights Considerations

The deployment of digital tools within the LifeGRID project must be assessed in light of the protection of fundamental rights as guaranteed under the Charter of Fundamental Rights of the European Union. In particular, the processing of personal data engages the rights enshrined in Article 7 (respect for private and family life) and Article 8 (protection of personal data) of the Charter, both of which constitute core elements of the EU's constitutional framework.

The use of digital registries, such as the Pflegeregister, entails the collection and processing of sensitive personal data, thereby constituting an interference with these rights. Such interference may be justified where it pursues a legitimate objective of general interest—most notably the protection of life and health in emergency situations—and complies with the principle of proportionality. This requires that the measures adopted are suitable to achieve the intended objective, necessary in the absence of less restrictive alternatives, and proportionate stricto sensu, ensuring that the benefits of the measure outweigh its impact on fundamental rights. In this context, the existence of adequate safeguards—such as data minimisation, restricted access, and secure processing—is essential to ensure compliance with EU law.

Beyond data protection considerations, the implementation of digital tools in crisis management raises important issues of liability and accountability. The LifeGRID framework involves a multiplicity of actors, including local authorities, civil protection services, healthcare providers, and digital system operators, resulting in a complex governance structure in which the allocation of legal responsibility may not always be clearly defined.

From a legal perspective, challenges may arise in situations involving inaccurate, incomplete, or delayed data, which may adversely affect decision-making processes and the effectiveness of emergency response measures. Such scenarios raise questions concerning the attribution of responsibility between data controllers, system administrators, and competent public authorities, particularly where adverse outcomes result from reliance on digital systems.

Ensuring accountability in this context requires the establishment of clear and transparent governance frameworks, including the precise delineation of roles and responsibilities, the implementation of audit and monitoring mechanisms, and the availability of effective oversight structures. These elements are essential not only for compliance with legal standards but also for maintaining public trust in the use of digital technologies in high-risk and time-sensitive environments.

Ultimately, the integration of digital tools into crisis management systems, as exemplified by the LifeGRID project, highlights the need to balance operational effectiveness with the protection of fundamental rights. While such tools significantly enhance situational awareness and response capacity, their long-term legitimacy depends on their alignment with EU constitutional principles, particularly the protection of fundamental rights, legal certainty, and accountability.

Beyond legal and fundamental rights considerations, the deployment of digital tools in crisis management also raises broader systemic and technological risks. One important

concern relates to digital exclusion. Not all individuals, particularly elderly populations or those in rural or socio-economically disadvantaged areas, have equal access to digital technologies or the skills required to use them effectively. This may limit the reach and effectiveness of tools such as digital registries and online communication platforms, thereby creating disparities in access to emergency support.

Furthermore, the increasing reliance on digital systems introduces potential cybersecurity vulnerabilities. Crisis management platforms that process sensitive personal data may become targets for cyberattacks, data breaches, or system disruptions, which could compromise both data integrity and the effectiveness of emergency response measures. Ensuring robust cybersecurity frameworks is therefore essential for maintaining the reliability and resilience of such systems.

At the EU level, additional challenges arise from the fragmentation of legal, institutional, and technological frameworks across Member States. Differences in data governance practices, digital infrastructure, and administrative capacities may hinder interoperability and limit the effectiveness of cross-border coordination. This fragmentation poses a particular challenge for the development of fully integrated and harmonised crisis management systems within the Union.

These risks highlight that, while digital tools offer significant advantages in enhancing crisis response and resilience, their implementation must be accompanied by careful consideration of inclusiveness, security, and cross-border coherence.

4.7. Governance and Stakeholder Collaboration in the LifeGRID Project

The LifeGRID project is characterised by a multi-level governance structure involving a diverse set of stakeholders from the public, academic, and civil society sectors. This collaborative framework enables the integration of different forms of expertise and supports a coordinated approach to disaster preparedness and response.

The project is coordinated by Landkreis Wesermarsch, which acts as the central organising authority responsible for overall project management and strategic direction. It operates in cooperation with key institutional partners, including Jade Hochschule, the Deutsches Rotes Kreuz, and other regional organisations, each contributing specialized knowledge and operational capacities (Landkreis Wesermarsch, 2026a).

The governance structure is designed to facilitate coordination across institutional boundaries and to ensure the effective implementation of project activities. This includes the alignment of objectives, the sharing of information, and the joint development of solutions tailored to local risk conditions.

Stakeholder engagement plays a central role in the project's implementation. By involving local communities, emergency services, healthcare providers, and academic institutions, the LifeGRID project promotes a multi-sectoral and interdisciplinary approach to disaster management. Such an approach is consistent with contemporary models of crisis governance, which emphasise collaboration, knowledge exchange, and the inclusion of multiple actors in decision-making processes (LifeGRID, 2026)

4.8. Expected Results and Long-Term Impact

The LifeGRID project is expected to generate both short-term and long-term effects on disaster preparedness and community resilience in the Wesermarsch district. In the short term, the implementation of project measures is anticipated to improve operational capacities,

particularly in relation to evacuation planning, coordination among stakeholders, and the availability of emergency power solutions. These improvements contribute to a more structured and responsive disaster management system (Landkreis Wesermarsch, 2023).

In the long term, the project is expected to support the development of more resilient community structures by strengthening the integration of vulnerable populations into disaster preparedness frameworks and improving the continuity of care during crisis. In addition, the solutions developed within the project—particularly those based on digital tools and integrated coordination mechanisms—have the potential to be adapted and transferred to other regions facing similar risk conditions (LifeGRID, 2026).

4.9. Conclusion of the Case Study

The LifeGRID project illustrates an integrated approach to disaster preparedness and community resilience in the Wesermarsch district. By combining technological solutions, targeted support for care-dependent populations, and community-based preparedness measures, the project addresses multiple dimensions of contemporary crisis management.

The analysis of its tools, organisational structure, and governance model indicates that the project contributes to improving coordination, situational awareness, and the inclusion of vulnerable groups in disaster response systems. In this context, LifeGRID can be understood as an example of a locally implemented, yet potentially transferable model aligned with broader European approaches to disaster risk reduction.

5. CONCLUSION

This paper has examined the role of digital tools within the European Union's approach to reducing security and safety risks in crisis, with particular emphasis on their contribution to disaster preparedness and community resilience. The analysis has shown that contemporary EU crisis management is increasingly shaped by the interaction between technological innovation, legal frameworks, and multi-level governance structures.

From a legal standpoint, the deployment of digital tools takes place within a clearly defined, albeit fragmented, normative framework. Treaty provisions, in particular those relating to civil protection, public health, and the internal market, establish the basis for Union action, while secondary legislation and regulatory regimes—most notably the General Data Protection Regulation and the Charter of Fundamental Rights—set the substantive limits within which such tools may operate. This framework does not merely enable digitalisation but conditions it, requiring that efficiency gains in crisis response be balanced against the protection of fundamental rights and adherence to principles such as proportionality and legal certainty.

The LifeGRID project illustrates how these dynamics unfold in practice. Its integrated approach—combining digital registries, communication platforms, and organisational measures—demonstrates the potential of data-driven systems to improve situational awareness, prioritise vulnerable populations, and enhance coordination among stakeholders. At the same time, the case study underscores that the effectiveness of such tools depends less on technology alone than on their embedding within coherent governance structures and clearly defined operational frameworks.

At a more critical level, the analysis has highlighted a set of risks that accompany the increasing reliance on digital infrastructures in crisis management. These include challenges

related to the processing of sensitive personal data, the allocation of responsibility in complex multi-actor environments, and the need to ensure accountability and oversight. In addition, structural issues—such as unequal access to digital technologies, exposure to cybersecurity threats, and the persistent fragmentation of legal and institutional frameworks across Member States—may constrain both the inclusiveness and the overall effectiveness of digital crisis management systems.

Taken together, these findings suggest that digital tools should not be understood as standalone solutions, but as components of a broader socio-technical system in which legal, institutional, and technological elements are closely intertwined. Their successful implementation therefore requires not only innovation, but also careful design, regulatory alignment, and sustained coordination across different levels of governance.

In this context, the LifeGRID project may be seen as a useful point of reference for future initiatives, while also illustrating the conditions under which such models can function effectively and legitimately. Further research should examine how similar approaches perform across different national settings, particularly in relation to scalability, interoperability, and the long-term integration of legal safeguards in increasingly digitalised crisis management environments.

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