

Types of Life Threats and Modern Methods of Preventing Them: Digital Technologies

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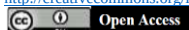
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ABSTRACT

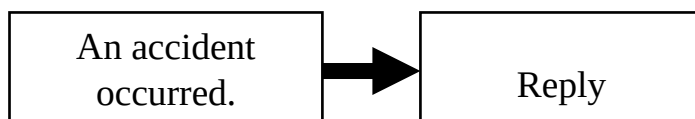
This article analyzes the main types of natural, technological, biological, environmental, transportation, fire, and social hazards that pose threats to human life and health, as well as modern methods for their prevention. The main objective of the study is to identify the scientific and methodological foundations for transitioning from traditional approaches to life hazard management toward a digital, predictive, and integrated management model. The study is based on a scoping review approach and examines the application of artificial intelligence (AI), machine learning (ML), deep learning (DL), the Internet of Things (IoT), Big Data, geographic information systems (GIS), Digital Twins, and multi-hazard early warning systems in the contemporary scientific literature.

Introduction

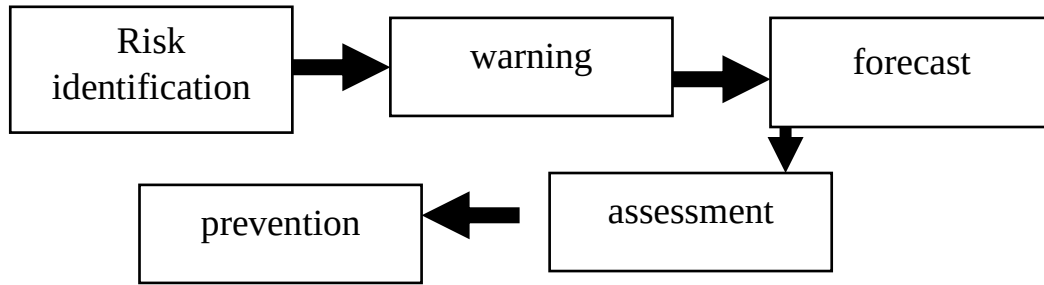
Protecting human life and health is one of the important directions of modern state management. Along with urbanization, population growth, climate change, industrialization, expansion of transport flows and development of digital infrastructures, the nature of the risks facing society is also becoming more complex.

Life risks are not limited to natural disasters. Along with earthquakes, mudslides, floods, landslides and extreme weather events, fires, industrial accidents, transport accidents, gas leaks, accidents in power grids, biological hazards and social risks also pose a direct threat to human life.

The modern scientific approach to risk management focuses on



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This approach is also reflected in the United Nations Framework Convention on Disaster Risk Reduction. Multi-hazard early warning systems aim to manage multiple hazards through a single monitoring and warning mechanism. In recent years, the role of artificial intelligence in emergency management has increased significantly.

A study published in 2025 systematically examined the application of AI technologies in the four main stages of an early warning system: hazard awareness, forecasting, warning dissemination and response preparation. In this context, the implementation of digital technologies in the management of life-threatening hazards is not only a technical issue, but also an organizational and managerial one.

Purpose and objectives of the study: The main purpose of the study is to systematize the main types of life risks and identify the capabilities of modern digital technologies in their prevention based on a scoping review.

To achieve this goal, the following tasks were set: (Figure 1)

(Figure 1)



Life risks can be divided into the following groups.

1- table

Type of risk	Main features	Modern prevention method
Natural	Earthquake, flood, landslide	Sensor, GIS, AI forecasting
Technogenic	Explosion, gas leak, industrial accident	IoT, sensor, automatic monitoring
Biological	Epidemic, infectious disease	Big Data, epidemiological monitoring
Ecological	Air and water pollution	IoT sensors, GIS

This classification indicates the need to manage risks not separately, but as a multi-hazard system.

Modern methods of preventing natural hazards Although it is impossible to completely eliminate natural hazards, their impact on human life and the economy can be significantly reduced.

There are three main technological directions for this:

Monitoring Data is collected through sensors, meteorological stations, satellites, drones and video cameras.

Forecasting The collected data is analyzed using mathematical models and AI algorithms.

Early warning Automatically sends a message to the population and responsible services when the likelihood of a hazard increases. Scientific literature shows that AI technologies are also strengthening forecasting and data-based management in flood risk management.

The role of artificial intelligence in identifying life-threatening threats. Artificial intelligence is one of the most promising technologies in modern security systems. AI systems can identify patterns in large amounts of data and assess the likelihood of a threat occurring.

For example: *Camera → AI → event detection → risk level calculation → alert.*

The 2025 scientific review notes that the use of AI technologies in early warning systems is expanding rapidly, but that AI systems must be used in conjunction with human oversight, transparency, and accountability.

The 2026 study also noted the importance of managing algorithmic errors and false positives in AI-based risk assessment. That is, the technology alone is not enough; its results must be verified by human expertise and control mechanisms. Internet of Things (IoT) technology is an important element of security monitoring. In an IoT system, various sensors are interconnected:

Sensor → Internet → Data server → AI analysis → Decision → Alert.

For example, if the gas concentration exceeds a certain threshold, the sensor sends information to a central platform. The system assesses the level of danger and automatically sends an alarm to the relevant authorities.

The main advantage of this approach is the ability to detect the danger using technical means before a person notices it. As a result, the area of the neighborhood is divided into risk zones. (Table 2)

Table 2

№	Color types	Risk levels
1	Green zone	low risk
2	Yellow zone	medium risk
3	Orange zone	high risk

4	Red zone	very high risk
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Such a map can help determine where resources should be directed before an emergency occurs.

Early warning systems

Early warning systems are of particular importance in modern security management. According to the definition of the UNDRR (United Nations Office for Disaster Risk Reduction), an effective early warning system should cover the entire chain from hazard identification to appropriate actions of the population. Multi-hazard systems allow monitoring of different hazards simultaneously.

Evacuation, rescue and other measures are carried out. Therefore, the effectiveness of a warning system depends not only on technology, but also on the understanding of the population and how it responds to the warning. Scientific reviews have shown that different formats of warnings affect the correct understanding of the message by citizens. Raqamli texnologiyalarning qiyosiy tahlili.

Table 3

Technology	Main task	Advantage	Limitation
AI	Forecasting and Detection	Rapid analysis	Depends on the quality of the information
IoT	Monitoring	Real-time data	Sensor cost
360° camera	Area Monitoring	Large area coverage	A privacy issue
GIS	Hazard Mapping	Area analysis	It requires quality information
Big Data	Big Data Analysis	Integrates multiple sources	Technical infrastructure is necessary
Digital Twin	Virtual Modeling	Scenario testing	Requires a complex model
Mobile alert	Informing the public	Fast	Depends on the network

The results of the study show that the modern concept of life risk management is technologically moving into three main stages.

Stage One: *Reactive management* is a management model that prioritizes responding to the consequences of an emergency situation rather than preventing it, with the main focus on quickly identifying the incident, mobilizing forces and resources, limiting the scope of damage, and restoring life activities.

Second stage: *Monitoring-based management* is a system of continuous monitoring of hazardous processes and events, determining their dynamics, analyzing the collected data, and forming operational management decisions aimed at reducing and preventing risks based on the results of this analysis.

Third stage: *Predictive management* is a modern management approach aimed at making preventive management decisions based on the systematic analysis of current and historical data, identifying trends in the development of risk factors, and predicting possible future risks and emergencies.

And so:

Reactive model: Event → Detection → Response

Monitoring model: Monitoring → Detection → Response

Predictive model: Data → AI analysis → Forecast → Alert → Prevention

Future security systems are expected to be based on the third model. However, it is wrong to view AI technology as an absolutely reliable decision-maker. Studies from 2025–2026 have shown problems in AI systems such as overreliance on automation, reduced human control, accountability, algorithmic errors, and data bias.

Therefore, the most optimal model is:

AI + human expert + automated monitoring + precise management protocol

should consist of a combination of. Based on the analysis conducted, the following model is proposed: (Table 4)

Table 4

№	Stages	Main directions and tools
1	Data collection	-360° cameras; -IoT sensors; -meteorological data; -transport data; -population appeals; -emergency statistics.
2	Data integration	Collect, store, and process all data on a single digital platform
3	Analysis based on AI (Artificial Intelligence).	-Artificial intelligence: -identifies risk; -calculates risk probability; -evaluates risk level; -rates areas.
4	Mapping in GIS	Digital mapping of hazardous areas; marking of hazard zones; hazard map.
5	Early warning	Automatic notification to relevant services and residents when a threat is detected; use of sirens, SMS, mobile applications and other communication channels
6	Decision making and management	-evacuation; -rescue; -traffic management; -medical assistance; -fire safety

An important feature of this model is that the system operates as a closed control loop. That is, the system not only identifies risks, but also evaluates the results of the measures taken and uses them to improve future forecasts.

The following scientific innovations can be formulated for this research area:

1. It is proposed to combine natural, man-made, biological, transport and social hazards into a single multi-hazard digital model for assessing life risks.

2. An integrated risk monitoring mechanism based on the integration of 360° video surveillance, IoT sensors and GIS data based on artificial intelligence is proposed.
3. A concept for forming an AI-based dynamic risk rating that takes into account the probability and severity of the risk has been developed.
4. A concept for a digital risk map that monitors the neighborhood area in real time and automatically updates the risk level has been proposed.
5. An early warning management model that automates the process from risk identification to warning the population has been proposed.

CONCLUSION

The results of the study show that in modern conditions, the prevention of life-threatening risks should not be limited to responding to emergencies alone. The risk management system should become an integrated digital system that includes continuous monitoring, forecasting, early warning and preventive measures.

Artificial intelligence, IoT, GIS, Big Data, and 360° video surveillance technologies are creating new opportunities for real-time detection and assessment of life-threatening risks. Scientific research confirms the potential of AI technologies in natural disaster forecasting, early warning, evacuation planning, and resource allocation.

At the same time, when implementing digital technologies, it is necessary to take into account data quality, algorithm accuracy, human control, information security, and citizen privacy protection.

The “360° camera + IoT + GIS + Big Data + AI + early warning” model proposed on the basis of the research can be considered as a promising scientific and practical direction for the digital transformation of civil protection at the neighborhood level.

In future research, it is advisable to develop the mathematical apparatus of this model, create an algorithm for calculating the probability of danger, conduct a pilot project in a real neighborhood, and evaluate the effectiveness of the model based on experimental data.

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