IoT in disaster management: Enhancing response and cutting costs

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IoT in disaster management: Enhancing response and cutting costs

Key Points

- IoT is emerging as a powerful tool in enhancing disaster management efforts by serving as an early warning system (EWS), a highly efficient emergency response mechanism, and a resilience enabler.
- The intensity, frequency, and severity of natural disasters and climate catastrophes are on the rise worldwide. ReliefWeb reports that there were around 240 disasters in 2023, 30% more than in 2022 or any prior year.
- This has led to an increased focus on preventative approaches to disaster management and increased investment in technologies that provide early warning, fast reaction, and effective disaster management mitigation.
- The natural disaster detection IoT market had an estimated market share worth US$ 600 million in 2023, and it is predicted to reach a global market valuation of US$ 18.5 billion by 2034, growing at a CAGR of 36.3% from 2024 to 2034.
- The market for IoT in disaster management is both growing and emerging. While established players such as IBM, Cisco, and Microsoft continue expanding their offerings and enhancing existing solutions, new entrants and startups are constantly innovating, contributing to market growth and the demand for more resilient and cost-efficient response systems.
- Emerging trends include artificial intelligence and machine learning for disaster prediction, rugged technology solutions (e.g. disaster response robots), wearable tech to improve responder safety, and drone-assisted rescue missions.
- Challenges include the cost of implementation, interoperability,

standardisation issues, cyber security, and the difficulties in managing the massive amounts of data generated by IoT devices during a natural disaster.

- However, overcoming these challenges creates opportunities for innovation and collaboration, paving the way for more robust, secure, and affordable IoT in disaster management solutions.

Want to invest in disaster management IoT without breaking the bank? Call us for cost-effective end-to-end solutions!

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In recent years, integrating Internet of Things (IoT) technology into disaster management strategies has proven to be a game-changer. IoT has emerged as a powerful tool in enhancing disaster management efforts, from rapid response to cost-effective solutions. While it may not prevent disasters from occurring, IoT in disaster management helps to mitigate the effects:

- It can serve as an early disaster detection mechanism.

- Provides environmental monitoring and victim aid.
- Identifies life-threatening hazards.
- Alerts authorities antonymously.
- Real-time data collection and analysis help authorities make prompt decisions during and after the disaster recovery period.
- No human interaction is needed in areas that are difficult or dangerous to access

With the intensity and frequency of natural disasters on the rise worldwide, many companies – especially those with global supply chains – are turning to IoT technologies to improve resilience. If you're looking for a solution for domestic or offshore purposes, call us for a quote. We have over a decade of developing environmental monitoring solutions for diverse and at-distance clients, and we have the in-house capabilities to bring your project in on budget and on time.

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This blog post explores various aspects of IoT in disaster management, from current IoT applications and market leaders to emerging trends and compelling benefits. Naturally, no game-changing innovation comes without its challenges, and we'll cover those too – highlighting the opportunities that might spark ideas in product innovation, especially in areas such as rugged technologies and rescue wearables.

Who are the market leaders in IoT for disaster management?

A post we published in 2022 on the unique benefits of IoT environment monitoring for natural disaster management highlighted the importance that technologies play in helping to predict, protect, respond

to and recover from weather-based catastrophes.

Several companies have taken the lead in developing cutting-edge IoT solutions tailored for disaster management. Market leaders such as IBM, Cisco (e.g. NERVs: network emergency response vehicles), and Microsoft Azure have pioneered the integration of sensors, communication devices, and data analytics to create comprehensive disaster response systems. Their networking and data management expertise has positioned them as front-runners in the rapidly evolving landscape of IoT-powered disaster management solutions.

On the entrepreneurial scene, an increasing number of startups are striving to develop innovative solutions and green technologies to help reduce the harmful impact of natural disasters.

Orora Tech: Founded in 2018, this German startup developed and sent into space 'nanosatellites' designed for the early detection and monitoring of wildfires.

Tractable: A UK-based company that provides assessment services after a natural disaster using AI technology to evaluate damages' monetary value accurately.

Tesselo: This Portuguese startup is still in the seed funding stages, but its disaster management solution uses AI analysis of satellite imagery to produce insights, e.g., risk analysis.

VanderSat: A Dutch company that provides satellite-based soil and water data that can be used to predict both floods and droughts. Their solutions also offer insights into the vulnerability of a region's food and water resources.

Drone Hopper: Madrid startup that developed an aerial drone capable of delivering 600 litres of water drop from the sky to extinguish wildfires. These heavy-duty drones have state-of-the-art stability systems and patented mist jet technology to ensure the water is delivered precisely where it needs to go.

The market for IoT in disaster management can, therefore, be characterised as both growing and emerging. While established players such as IBM, Cisco, and Microsoft continue expanding their offerings and enhancing existing solutions, new entrants such as the above startups constantly innovate, contributing to the market's emergence.

What's the market size of disaster management IoT?

The demand for IoT applications in disaster management is rising, driven by the urgency to create more resilient and efficient response systems. The market for IoT in natural disaster response has witnessed significant growth in recent years. According to a Future Market Insights report, the natural disaster detection IoT market had an estimated market share worth US$ 600 million in 2023, and it is predicted to reach a global market valuation of US$ 18.5 billion by 2034, growing at a CAGR of 36.3% from 2024 to 2034.

The growing frequency and intensity of natural disasters worldwide is a major factor propelling the significant and rapid growth of the disaster IoT Market: A ReliefWeb report in 2023 states that there

were around 240 climate-related disasters worldwide – 30% more than in 2022. It's estimated that at least 12,000 people lost their lives due to landslides, wildfires, and storms.

Additional factors contributing to market growth include:

- Increasing focus on preventative approaches to disaster management (e.g. early evacuation procedures).
- Governments and companies prioritising investments in IoT technologies to achieve early warning, fast reaction, and effective disaster management mitigation.
- The unique capability of IoT systems to detect disasters and enable dynamic risk modelling (e.g. systems that adapt to shifting environmental conditions).

Emerging Trends in IoT for Crisis Management

As technology evolves, so do the trends in IoT for crisis management. Edge computing, satellite technology, artificial intelligence, and machine learning are becoming integral components of early warning systems (EWS) that provide the first line of defence against natural disasters. Real-time data analytics and predictive modelling enable authorities to make informed decisions swiftly, improving the efficiency of resource allocation and reducing response times during critical situations.

Artificial Intelligence (AI) and Machine Learning (ML) for disaster prediction: By monitoring historical data of weather patterns and predicting what may happen, AI can foresee potential disasters. If done sufficiently ahead of time, this enables communities and businesses to take the appropriate action, whether that's building or reinforcing their defences or moving away from the area.

Japan is one of the world's most earthquake-prone countries and invests heavily in AI-driven earthquake forecasting applications (e.g., a neural network model to predict site-specific impacts) which show promise in trials. On the other side of the world, a team of researchers at the University of Texas in Austin trained an AI system on five years of seismic recordings and asked it to locate upcoming quakes in southwestern China based on current seismic activity. The algorithm successfully forecasted 14 earthquakes, each within about 320km of its actual epicentre, 70% of which occurred before they happened.

Rugged technology solutions for disaster management: Hardware (e.g. smartwatches, body cams) specifically designed to operate in challenging environmental conditions with extreme temperatures, water, dust, etc, are known as rugged devices. As an emergency response solution during natural disasters, these devices provide responders with real-time information, situation awareness, and communication capabilities to make informed decisions, provide assistance, and coordinate their efforts.

- Rugged tablets give responders a larger screen to access critical information and run specialised applications.

- 'Ruggedised' headsets and communication devices enable clear and reliable communication in chaotic environments.
- [Robots for disaster response](#) can navigate through hazardous terrain, reduce the need for human intervention, enhance the safety of emergency professionals, improve response times, and ultimately save lives.

Wearable tech for disaster response: The integration of [wearable devices in disaster relief](#) efforts offers substantial real-time advantages, namely improved responder safety, health monitoring, enhanced coordination and resource allocation, personalised features, location tracking, environmental monitoring, and seamless communication. Wearables are central to the work we do, so [call us for a free consultation](#) if this is a field you would like to explore.

Drone-assisted rescue missions are emerging as [crucial tools in disaster response](#). They can swiftly survey affected areas and provide real-time imagery and data that responders can use to assess damage, identify survivors, and plan rescue missions.

'Smart' construction technology and renewable energy are also being increasingly looked at for solutions to 'build back better' after a catastrophe. [Smart construction techniques](#) such as building information modelling (BIM), self-healing concrete, and IoT sensors installed at building sites enable predictive maintenance, improve durability and increase resistance.

In addition, by switching to renewable energy sources, rebuilt areas are less reliant on traditional power grids, which are very vulnerable to natural disasters. Lastly, countries such as Japan reduce their reliance on nuclear power and avoid further harmful impacts such as radiation leaks or hydrogen explosions.

The challenges and opportunities in using IoT for disaster management

While IoT brings many benefits, it also presents [challenges in disaster management](#), such as interoperability issues and the need for standardisation to ensure that devices with different communication protocols can communicate seamlessly. In addition:

- In large-scale disasters, implementing and managing a massive number of IoT devices can be a complex task to handle.
- Managing, researching, and making decisions based on the vast amount of data generated by IoT devices can be overwhelming.
- Security is susceptible to cyber attacks, resulting in data loss and software malfunction.
- In the case of earthquake and tsunami prediction technologies, rapid and cost-effective techniques are needed for more accurate seismic ground motion prediction.
- The overall cost of IoT devices – especially at the scale needed – needs to be reduced.

This is especially true for developing countries and regions often impacted the worst during natural disasters.

However, these challenges also create opportunities for innovation and collaboration. Overcoming these obstacles will pave the way for more robust and secure IoT solutions in disaster management.

Can IoT Provide Cost-Effective Solutions in Disaster Response?

One of the critical advantages of IoT in disaster response is its potential to offer cost-effective solutions – even if the initial setup costs are high. By optimising resource allocation, automating processes, and providing real-time data insights, IoT enables more efficient use of resources. This reduces response costs and enhances the overall effectiveness of disaster management strategies, leading to more resilient communities and an invaluable return on the investment made on IoT solutions.

IoT is shaping the future of crisis and natural disaster management

The integration of IoT in disaster management is a dynamic and evolving field with significant potential which will undoubtedly shape the future of crisis management. With technological advancements, we can expect smarter and more connected disaster response systems: improved communication, automated decision-making, and integration of emerging technologies such as AI-based earthquake prediction will play pivotal roles in creating more adaptive and efficient crisis management frameworks and more resilient communities.

If you want to play your part in ensuring a more sustainable future, get in touch with us. We can help you ideate, create, and propagate IoT solutions to do just that!

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FAQ's

Why is IoT important in disaster management?

IoT is crucial in disaster management as it enables real-time data collection, enhancing situational awareness for authorities. With connected sensors and devices, it helps streamline communication and facilitates quicker, more informed decision-making during emergencies, ultimately improving response times.

How does IoT enhance natural disaster response?

IoT enhances natural disaster response by providing real-time monitoring and early detection capabilities through sensors. This allows authorities to proactively assess risks, allocate resources efficiently, and implement timely evacuation measures, contributing to a more effective and adaptive disaster response strategy.

What are the emerging trends in IoT for crisis management?

Emerging trends in IoT for crisis management include the integration of edge computing, artificial intelligence, and machine learning. These technologies enable advanced data analytics and predictive modelling, enhancing the overall efficiency and responsiveness of disaster management systems.

When did the market for IoT in disaster management start to grow?

The market for IoT in disaster management started to grow significantly in recent years, driven by the increasing frequency and severity of natural disasters globally. The urgency to implement more resilient and efficient response systems has spurred the demand for IoT applications in disaster management.

Which companies are leading in IoT for disaster management?

Market leaders in IoT for disaster management include prominent companies such as IBM, Cisco, and Microsoft. Their expertise in networking, data analytics, and communication technologies positions them at the forefront of developing comprehensive and innovative disaster response solutions.

How is IoT shaping the future of crisis management?

IoT is shaping the future of crisis management by facilitating smarter and more connected response systems. Advancements in technology, such as improved communication, automated decision-making, and the integration of emerging technologies, are defining a more adaptive and efficient landscape for emergency response.

What challenges does IoT face in disaster management?

IoT in disaster management faces challenges such as security concerns, interoperability issues, and the need for standardisation. Overcoming these obstacles is crucial for ensuring the development of robust and secure IoT solutions that can effectively contribute to disaster response efforts.

Why is real-time data crucial in IoT for disaster management?

Real-time data in IoT for disaster management is crucial as it provides immediate insights into evolving situations. This enables authorities to make informed decisions promptly, improving resource allocation, response coordination, and overall effectiveness in managing and mitigating the impact of disasters.

How does IoT contribute to cost-effective disaster response?

IoT contributes to cost-effective disaster response by optimising resource allocation through real-time data analytics. Automation of processes, enhanced communication, and informed decision-making result in more efficient use of resources, reducing response costs while improving the overall effectiveness of disaster management strategies.

What role does IoT play in creating resilient communities?

IoT plays a pivotal role in creating resilient communities by enabling proactive monitoring and early detection of potential disasters. With timely and accurate data, authorities can implement preventive measures, streamline response efforts, and ultimately build communities that are better prepared to face and recover from various crises.

Who benefits from the integration of IoT in disaster management?

The integration of IoT in disaster management benefits various stakeholders, including emergency responders, local authorities, and the affected communities. By providing real-time data and improving response coordination, IoT enhances the overall effectiveness of disaster management efforts, leading to better outcomes for all involved parties.

What is the market size of IoT in natural disaster response?

The market size of IoT in natural disaster response is projected to reach substantial figures by the end of the decade. The increasing frequency and severity of natural disasters worldwide drive the demand for advanced technologies, positioning IoT as a significant and growing market within disaster management.

Why is early detection crucial in IoT for disaster management?

Early detection in IoT for disaster management is crucial as it allows authorities to initiate timely response measures. With connected sensors providing real-time data, early detection enhances the ability to assess risks, mobilise resources efficiently, and implement proactive strategies, ultimately minimising the impact of disasters.

How does IoT optimise resource allocation in disaster response?

IoT optimises resource allocation in disaster response by providing real-time insights into the evolving situation. With data-driven decision-making, authorities can allocate resources more efficiently, ensuring that aid reaches the areas most in need promptly. This optimisation not only improves response effectiveness but also contributes to overall cost savings.

What opportunities are there in using IoT for disaster management?

Using IoT for disaster management presents opportunities for innovation and collaboration. Overcoming challenges, such as security concerns and interoperability issues, opens the door to developing more robust and secure solutions. These opportunities foster advancements in technology, contributing to more effective and adaptive disaster management strategies.

How does IoT contribute to more adaptive crisis management frameworks?

IoT contributes to more adaptive crisis management frameworks by integrating technologies like edge computing and artificial intelligence. These advancements enable real-time data analytics and predictive modelling, enhancing the overall adaptability and responsiveness of crisis management systems to evolving situations.

What is the impact of IoT on decision-making in disaster response?

The impact of IoT on decision-making in disaster response is significant, providing authorities with immediate and accurate data. This empowers decision-makers to respond swiftly and effectively, improving coordination, resource allocation, and overall decision quality during critical situations.

Why is collaboration important in the development of IoT solutions for disaster management?

Collaboration is essential in the development of IoT solutions for disaster management to address

challenges and ensure comprehensive, interoperable systems. Bringing together expertise from various sectors fosters innovation and the creation of holistic solutions, ultimately contributing to more effective and collaborative disaster response efforts.

How can IoT be utilised to build more resilient communities?

IoT can be utilised to build more resilient communities by enabling early warning systems and proactive monitoring. With the integration of connected devices, authorities can gather real-time data to assess risks, implement preventive measures, and enhance community preparedness, creating a foundation for resilience in the face of disasters.
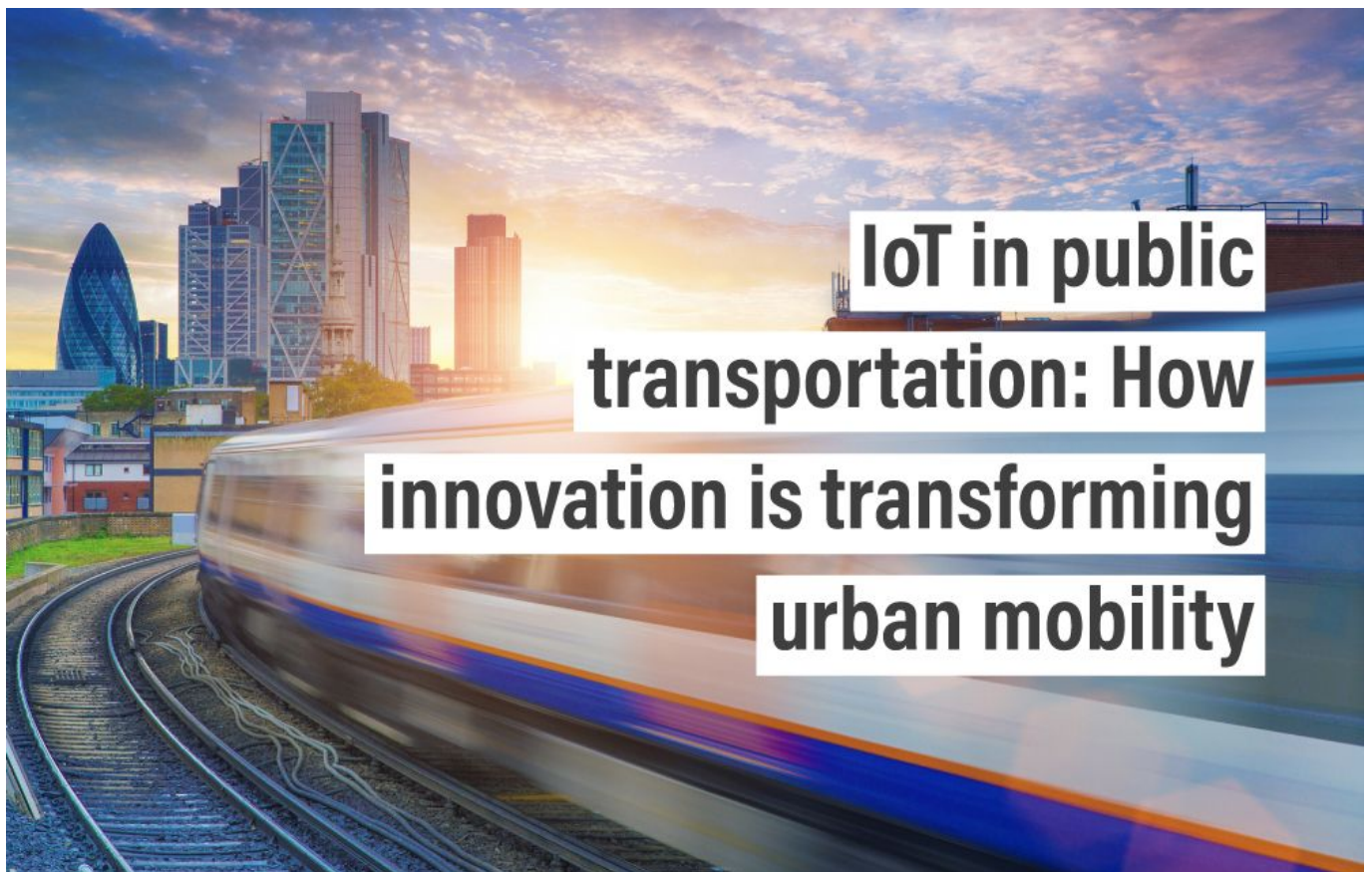
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