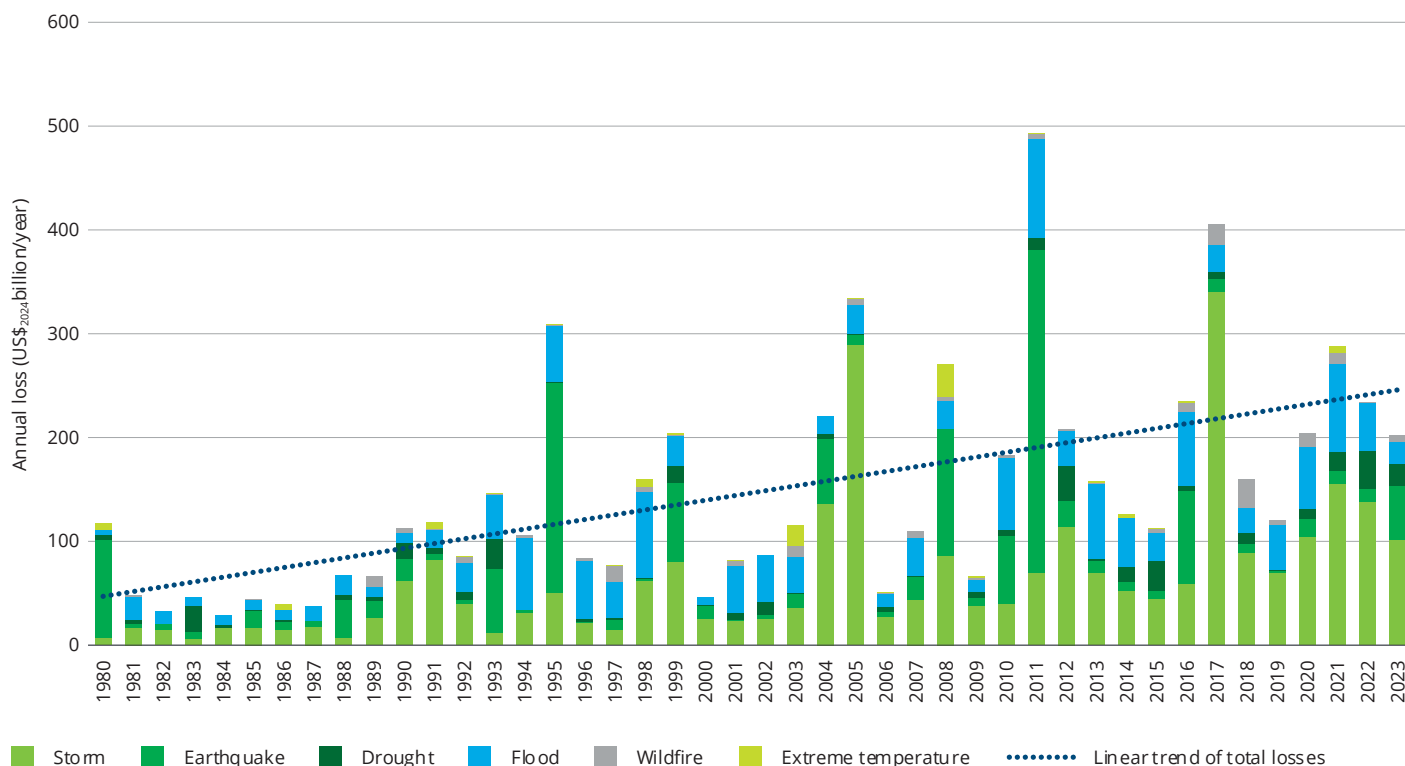# Deloitte.

Transforming real estate for a sustainable future
AI for infrastructure resilience

Infrastructure serves as the backbone of communities and society and can shape how we live, work, and move. Essential services like energy, water, healthcare, sanitation, and transportation rely on infrastructure to support human well-being and economic resilience. When infrastructure thrives, societies can flourish. However, with growing populations and economic development, infrastructure systems should evolve to meet rising demands.

Rising risks to infrastructure

Natural disasters alone are projected to cause approximately US$460 billion in average annual losses to infrastructure globally by 2050, a dramatic increase compared to the US$200 billion annual average globally over the last 15 years . As natural hazards such as storms, floods, and wildfires become more frequent and intense, resilient infrastructure—capable of absorbing shocks, recovering quickly, and adapting to changing conditions—is important for protecting lives, maintaining essential services, and enabling economic growth.

Historical losses due to natural disasters (including acute shocks and chronic stresses)

The role of AI in helping to build resilient infrastructure

Leaders have an opportunity to enhance infrastructure resilience by investing in and applying artificial intelligence (AI) at scale–doing so could help prevent approximately 15% of annual direct damage costs, representing approximately US$70 billion in potential savings annually.

The integration of AI into infrastructure resilience strategies offers transformative solutions across three stages: planning, response, and recovery. During the planning phase, AI-driven tools like machine learning can analyze risk data, simulate scenarios, and identify preventative measures, such as flood-resistant designs or fire-resistant materials. In the response phase, AI-powered early-warning systems and real-time monitoring enable faster detection of hazards and help guide emergency responses. For recovery, AI can help prioritize repairs using predictive damage assessments and optimize resource allocation, accelerating the restoration of services and minimizing economic disruption.

Real-world applications of AI in infrastructure

Several examples highlight the effectiveness of AI-enhanced resilience solutions:

- **Digital twins:** In Lisbon, digital twins were used to simulate future flood risks and develop an appropriate drainage plan—projected to prevent up to 20 floods over the next century, saving more than US$100 million in damage over this period.

- **Predictive maintenance:** In Poland, the municipal water supply and sewerage company of Wroclaw, in collaboration with Deloitte Poland, used AI-powered predictive maintenance to analyze factors like pipe age, material, and environmental stressors to help modernize aging water infrastructure and predict potential failures with up to 90% accuracy.

- **Post-disaster recovery:** In the US, an inspection tool created by Deloitte Consulting LLP–OptoAI–uses photogrammetry and AI models to help reduce the time required to repair roofs post-disaster by 15%-30%.

Challenges to AI adoption in infrastructure

Despite its potential, the widespread implementation of AI-enabled resilience can face some significant barriers:

- **Technological limitations:** Effective AI solutions require high-quality, varying datasets, but data availability and accuracy remain a concern.

- **Financial constraints:** Upfront investment costs and uncertain short-term returns can deter adoption.

- **Regulatory uncertainty:** Evolving AI-specific frameworks, cybersecurity, and privacy concerns slow progress.

- **Institutional inertia:** Resistance to new technologies and ways of working can hinder momentum.

- **Lack of a skilled workforcewith experience in AI:** This talent gap can make it difficult to design, implement, and maintain AI systems effectively. Coordinated action across stakeholders

Building resilient infrastructure can require collaboration across infrastructure operators, technology companies, financial institutions, insurers, engineering firms, and policymakers:

- **Infrastructure owners and operators**: Should look to embed AI across planning, design, and operations to unlock efficiency gains and enhance resilience. Early investments in pilot projects and AI-ready systems can enable continuous improvement and scalability.

- **Financial institutions:** Innovative financing tools like resilience bonds can bridge funding gaps for AI solutions. Internally, AI can enhance risk assessments, credit underwriting, and investment processes.

- **Insurers:** Insurers can help incentivize AI for resilience adoption by offering premium reductions for AI-enabled systems and developing products tailored to AI-enhanced infrastructure.

- **Technology companies:** As the innovation engine, tech firms can integrate AI with complementary technologies like IoT and digital twins, which can be important for enhancing and improving AI solutions.

- **Architecture and engineering firms:** These firms play a key role in embedding AI tools during the planning and design phases to create smarter, more resilient infrastructure systems.

- **Policymakers:** Governments help enable AI adoption by setting standards, offering economic support schemes, and modernizing legacy infrastructure. They can also help drive cross-sector collaboration and long-term planning.

- **Real estate:** Real estate developers, investors, and managers should prioritize adopting AI, both in new developments and existing properties. Doing so could help reduce operating costs, improve resilience and help mitigate losses to asset value from natural disasters.

A smarter, safer future

Coordinated action across stakeholders can help create infrastructure systems prepared for the challenges of a changing world. By integrating AI across the phases of resilience, societies can build a safer, smarter, and more resilient future.

Reference: This article is based on insights from Deloitte Global's AI for Infrastructure Resilience 2025. For more information, read the full report from the Deloitte Center for Sustainable Progress.

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Endnotes:

1. Deloitte, "AI for infrastructure resilience", June 2025

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