UK Government Centres of Expertise
Green Cities, Infrastructure and Energy

LEARNING SERIES

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Green Cities, Infrastructure and Energy Programme (GCIEP)

# Artificial intelligence in sustainable cities and infrastructure: Opportunities, risks and challenges

This GCIEP learning session explored the transformative potential of artificial intelligence (AI) across sustainable urban development, infrastructure and energy. It brought together experts and practitioners to examine current applications, opportunities and challenges in leveraging AI for cities and infrastructure projects. The session highlighted how AI has reached a pivotal moment of accessibility and widespread adoption, fundamentally changing approaches to planning, implementation and management of cities and infrastructure.

## Key learning points and recommendations

- **Significant economic transformation is underway,** with companies that integrate AI into their operating models reporting three times the revenue per worker compared to traditional approaches.[1] The demand for AI skills has increased exponentially since 2022, such that professionals with AI capabilities have seen significant wage premiums; while at the same time, traditional job displacement remains limited.
- **Voice automation represents a breakthrough moment for AI accessibility,** being particularly beneficial for users in low- and middle-income countries (LMICs) where literacy levels vary. Agentic AI systems can provide sophisticated public services through voice interaction, dramatically reducing costs whilst improving service delivery for diverse populations including those with disabilities or limited digital literacy.
- **Data availability and quality remain fundamental challenges for effective AI implementation.** Success depends heavily on establishing frameworks for secure data sharing between public and private sectors, with government intervention needed to create incentives for collaboration whilst protecting privacy and commercial interests.
- **Infrastructure project management can benefit enormously from AI applications.** For example, predictive analytics is enabling early identification of cost overruns and schedule delays. Hong Kong's experience demonstrates how machine learning models can achieve high accuracy in forecasting project outcomes using relatively basic financial data, supporting better resource allocation.
- **Energy sector transformation requires coordinated AI deployment** – across generation, storage, transmission and distribution systems. The complexity of modern urban infrastructure necessitates AI-driven coordination to manage interconnected systems effectively, which includes innovations from smart grids to electric vehicle charging networks.
- **Public engagement and democratic participation can be enhanced through AI tools.** These can enable large-scale consultation whilst adapting questioning based on individual responses. This technology offers particular value for infrastructure projects requiring extensive community input.

[1] The Fearless Future: 2025 Global AI Jobs Barometer (PwC)

## Setting the scene: AI reaches mainstream adoption

Zlatina Loudjeva, PwC Partner and GCIEP Programme Director, opened the session by presenting evidence that AI has reached its "mobile phone moment" where the technology has become widely accessible, reliable and transformative. PwC analysis of nearly one billion job advertisements across 24 OECD countries reveals exponential growth in demand for AI skills since 2022, driven primarily by advances in voice-enabled AI that removes barriers for users regardless of technical expertise or literacy levels. The economic impact is proving substantial, with early adopters achieving significant productivity gains. Countries implementing AI rapidly are recording notable improvements in economic performance, whilst individual professionals with AI skills command premium salaries. This creates potential for both economic advancement and increased inequality, particularly relevant for LMIC contexts where digital divides may be amplified.

## Technology policy and sociotechnical considerations

Ben Hawes, independent consultant and former UK government AI policy advisor, emphasised the importance of bringing a wide range of public stakeholders along in AI implementation. Drawing from 12 years of urban technology experience, he highlighted how technical capability gaps, particularly within local government, have historically limited smart city implementations. Successful AI deployment requires addressing fundamental infrastructure challenges including skills development, procurement capabilities and public engagement frameworks. The emergence of responsible AI guidelines and public participation tools demonstrates growing recognition that automation must preserve accountability, transparency and democratic involvement in public service delivery. Examples include Cities Coalition for Digital Rights and the Ada Lovelace Institute's work to ensure the public's voice is heard.

## Predictive analytics for infrastructure projects

Andreas Leed from Oxford Global Projects presented a case study from Hong Kong's Development Bureau, where machine learning models predict project cost and schedule performance with remarkable accuracy. Using data from 849 completed projects representing £45 billion in construction spending, gradient boosting models achieved 91% accuracy in predicting cost overruns and 88% accuracy for schedule delays. The system has been credited with generating £6 billion in savings by enabling early risk management interventions in problematic projects. This demonstrates how AI can address resource constraints in project oversight, allowing authorities to focus attention where it is most needed, whilst improving overall project outcomes.

## Energy system coordination and optimisation

Kojo Apeagyei from the UK's Energy Systems Catapult outlined AI's role in managing increasingly complex urban infrastructure systems. As renewable energy integration, electric vehicle adoption and distributed renewable energy generation create coordination challenges, AI provides essential capabilities for forecasting, optimisation and system management.[2] A critical foundation involves establishing data sharing frameworks that enable effective AI deployment whilst protecting commercial interests. Ofgem's work on presumptive data openness and digital asset catalogues provides a model for creating the regulatory environment necessary for AI-enhanced energy systems.

### Insights from the audience discussion

- Partnership strategies should identify capability gaps first rather than simply seeking willing collaborators, with particular attention to local government technical capacity and Commonwealth countries similarities offering potential collaboration frameworks.
- Infrastructure financing cycles present significant opportunities for AI acceleration, from project preparation through to approval processes, although fundamental constraints like debt levels and country risk remain beyond technological solutions.

[2] Energy Data Taskforce: A Strategy for a Modern Digitalised Energy System

The UK Government's Centre of Expertise in Green Cities, Infrastructure and Energy responds to the impacts of climate change and poverty by accelerating the delivery of sustainable cities and resilient infrastructure

GCIEP is a demand-driven initiative supporting sustainable green cities and climate-resilient infrastructure in lower-income countries. As the flagship programme of the UK's Green Cities, Infrastructure and Energy Centre of Expertise, GCIEP supports the UK Government's mission to accelerate investment in infrastructure and urban development that is responsible, reliable, inclusive, low-carbon and climate-resilient.

GCIEP is implemented by an alliance of private sector delivery partners led by PwC and including Adam Smith International, Mott MacDonald, MDY Legal and Engineers Against Poverty.

Further expertise is provided by eight delivery partners: British Geological Survey, BSI, Connected Places Catapult, Crossrail International, Ofgem, Ordnance Survey, National Infrastructure and Service Transformation Authority, and Transport for London.

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