City Information Modelling-Driven Urban Infrastructure Transformation for a Resilient City

Region	**Asia and the Pacific**
Award Scheme	**Shanghai Manual**
Themes	**Innovation** **Local Economic Development** **Regeneration**
Sustainable Development Goals	**Goal 4 - Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all** **Goal 5 - Achieve gender equality and empower all women and girls** **Goal 8 - Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all** **Goal 9 - Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation** **Goal 11 - Make cities and human settlements inclusive, safe, resilient and sustainable**

Summary

Guangzhou’s City Information Modelling (CIM) initiative represents a pioneering effort to integrate digital technologies into urban infrastructure to enhance resilience, sustainability and efficiency. As one of China’s largest and most climate-vulnerable megacities, Guangzhou adopted CIM as the foundation for its new-type urban infrastructure under the national pilot programme launched in 2020. The platform integrates real-time spatial, infrastructural and environmental data across 7,400 square kilometres, creating a unified digital twin of the city. Through smart upgrades in water, drainage, power and gas systems, the city has strengthened early warning, disaster response and infrastructure reliability. The platform supports 230 cross-departmental data services, improving coordination and saving millions in redundant costs. At the community level, smart neighbourhoods now offer connected healthcare and elderly support services, improving local resilience. Governed by comprehensive institutional frameworks and strong interdepartmental coordination, Guangzhou’s model demonstrates how digitalization can drive sustainable and resilient urban growth. It combines government leadership, open data collaboration and private sector innovation to build a replicable, scalable framework for resilient cities. As a result, Guangzhou has emerged as a national benchmark for digital urban transformation, illustrating how technology, governance and community engagement can converge to build adaptive, future-ready urban systems.

Background and Objective

As one of China’s most dynamic megacities, Guangzhou faces the combined challenges of rapid urbanization, population density and climate-related risks such as floods, typhoons and rising sea levels. By 2024, the city’s population exceeded 22 million, with over 7 million residents living in informal settlements. To enhance its capacity for sustainable, resilient development, Guangzhou was selected in 2020 as a national pilot city for new urban infrastructure construction. Guided by the Ministry of Housing and Urban-Rural Development, the city implemented a comprehensive framework to integrate City

Information Modelling (CIM), digital transformation and smart infrastructure systems to strengthen disaster prevention, emergency response and adaptive governance. Guangzhou's objective is to build a resilient, digitally integrated city through the fusion of CIM technology, intelligent infrastructure and urban governance. The initiative aims to improve disaster preparedness, optimize municipal services and strengthen interdepartmental data sharing. By developing a digital foundation for urban management, Guangzhou seeks to enhance efficiency, reduce vulnerability and promote high-quality urban development that aligns with national goals for modernization and climate adaptation.

Actions and Implementation

Guangzhou initiated its CIM platform in 2019, creating a unified 3D digital twin of the entire city covering 7,400 square kilometres. The system integrates multisource data including topography, infrastructure, meteorology and demographics, providing 230 shared data services across government departments. Smart infrastructure projects were implemented to upgrade water, drainage, power and gas systems. Examples include an intelligent water supply platform covering 1.7 million smart terminals, an IoT-based drainage network with over 6,800 monitoring points, and an advanced gas distribution platform tracking 5.4 million cylinders. The city also built a unified digital map of underground utilities and introduced smart communities and industrial parks to enhance disaster response at the neighbourhood level.

Outcomes and Impacts

Guangzhou's CIM platform has significantly improved data integration and resource management, saving over CNY 162 million in redundant surveying costs. Real-time monitoring and predictive analytics have enhanced urban resilience by strengthening early-warning systems and improving disaster response. Smart infrastructure systems have reduced energy loss, optimized water and gas management, and improved safety across sectors. At the community level, smart living environments and telehealth services have improved residents' well-being and access to essential services. The city's model now serves as a benchmark for digital transformation and resilience planning across China.

Sustainability and Scalability

The initiative's sustainability is underpinned by strong governance, legal frameworks and public-private partnerships. Institutional safeguards — such as the Guangzhou Digital Economy Promotion Regulations — ensure regulatory support, while the CIM-based "1+2+N" framework promotes standardization and long-term operation. The model is scalable and replicable, having already inspired other Chinese cities to adopt similar approaches. By combining government leadership with open data sharing and market participation, Guangzhou has created a sustainable framework that balances innovation, efficiency and resilience.

Gender and Social Inclusivity

While primarily focused on infrastructure and technology, the initiative incorporates inclusive design in community upgrades, particularly through smart healthcare and elderly care services. Pilot communities in Panyu District integrate telehealth monitoring and home-based alerts, improving accessibility for elderly and vulnerable populations. These measures contribute to equitable urban resilience and ensure that digital transformation benefits all social groups.

Innovative Initiative

Guangzhou’s approach pioneers the integration of CIM, BIM and IoT technologies into a comprehensive digital governance system. It institutionalizes life-cycle management for urban infrastructure, linking data-driven planning, construction and operation. The city’s open-source software framework and shared data interfaces promote interoperability, while smart grid and sensor networks enable predictive maintenance and real-time risk monitoring. This systemic innovation redefines how urban infrastructure can drive resilience through digital integration.

Resources devoted to delivery

The initiative is financed through municipal investment, national grants and industry partnerships. More than 70 departments collaborate through a joint conference mechanism chaired by the mayor, supported by technical guidelines and 17 CIM-related standards. Public-private cooperation with over 90 companies and research institutions strengthens technological capacity, while alliances between enterprises and universities ensure ongoing innovation and training.

Conclusion

Guangzhou’s CIM-driven transformation exemplifies a model for resilient urban development through integrated digital governance. By embedding smart infrastructure, real-time data systems and inclusive community design, the city has strengthened its capacity to manage risks, optimize services and adapt to climate challenges. The initiative demonstrates how large, complex urban systems can transition toward sustainable, data-driven resilience — offering a replicable blueprint for cities worldwide aiming to integrate digital technology with inclusive urban sustainability.