

Digital technology revitalizing the millennium-old city

Region	Asia and the Pacific
Award Scheme	Shanghai Manual
Themes	Data-Driven Process and Management Regeneration Rehabilitation Others
Sustainable Development Goals	Goal 11 - Make cities and human settlements inclusive, safe, resilient and sustainable

Summary

Suzhou’s Gusu District home to UNESCO-listed classical gardens and a dense fabric of canals, alleys and timber houses faced fragmented heritage data, complex property rights, an ageing population and mounting maintenance risks. To reconcile conservation with revitalization, the district built a district-wide City Information Model (CIM) and Digital Twin of the Ancient City. A multi-year “cellular dissection” survey combined laser scanning, drones, oral histories and archival digitization to catalogue 19 categories of protected assets and over 95% of households. The resulting platform integrates 3-cm-resolution 3D models, IoT monitoring and cross-department data sharing (planning, culture, housing, emergency). It underpins millimetre-level maintenance of gardens and wooden structures, early-warning for tilt, subsidence and fire, and scenario simulations to test renewal options. Opening standardized datasets through the Suzhou Big Data Exchange catalysed investment and social participation: 121 historic houses were revitalized into boutique hotels, creative offices and museums; AR/VR, night-time light shows and remote 720° tours diversified cultural experiences and income. Residents co-produce knowledge and report risks via mobile tools, strengthening stewardship and identity. Suzhou’s approach demonstrates how unified standards, open platforms and people-centred tech can safeguard authenticity while unlocking inclusive cultural economies offering a replicable blueprint for historic cities balancing protection, livelihoods and sustainable growth.

Background and Objective

Founded over 2,500 years ago, Suzhou’s Gusu District concentrates 54 historic neighbourhoods and world-renowned gardens within a 14.2 km² ancient city. Stewardship was hindered by scattered datasets, unclear property rights, multi-owner dwellings, limited maintenance capacity and low societal participation. The objective was to build an authoritative, shared digital foundation that aggregates heritage, planning, environmental and community data; enables precise protection and risk management; and channels public–private investment into sensitive revitalization. By creating a CIM plus digital-twin platform grounded in unified standards and continuous updates, Gusu sought to preserve authenticity, enhance safety and resilience, and renew cultural vitality with broad citizen engagement.

Actions and Implementation

Gusu led a phased programme: first, a comprehensive “cellular dissection” of the ancient city using laser scanning, drones, archival digitization and oral histories, covering >95% of households and 19 asset classes. Next, the district launched a CIM + Digital Twin platform with 3-cm oblique photography, multi-scale models (city–block–building) and common services (geo-coding, APIs). Cross-department rules standardized data updates and sharing. IoT sensors on timber structures feed real-time tilt, subsidence, temperature and humidity to early-warning dashboards and residents’ phones. The platform supports permit/works visualization, scenario simulations for streets and courtyards, and open-data products (via the Suzhou Big Data Exchange) to attract responsible private participation.

Outcomes and Impacts

The platform now supports 17 departments with 6 major data classes and 268 subcategories accessed >20,000 times daily. Millimetre-level garden components are maintained proactively; EWS reduces structural risks and accelerates emergency response. Planning simulations lowered trial-and-error in renewal projects. Through the Ancient City Protection and Revitalization Partnership, 121 historic houses were adaptively reused (boutique hotels, creative offices, museums), strengthening local jobs and diversified revenues. AR/VR, drone shows and 720° remote tours broadened audiences and lengthened stays while reinforcing cultural identity. Residents’ reporting closed governance loops, raising stewardship and transparency. Collectively, Suzhou aligned conservation with inclusive economic revitalization.

Sustainability and Scalability

Sustainability is embedded through institutional ownership (district data bureau and protection committee), unified standards, and continuous data governance. Lifecycle records of restoration create durable knowledge assets, lowering future costs. Open APIs and marketplace-ready datasets finance upkeep and incentivize third-party innovation. The multi-scale modelling method (macro–meso–micro) and staged rollout survey, platform, operations, open data are replicable for other heritage cities with differing capacities; pilots can start on priority precincts and expand as data matures. By coupling precautionary risk monitoring with sensitive adaptive reuse, Suzhou balances authenticity, resident well-being and economic viability, ensuring long-term cultural and financial resilience.

Gender and Social Inclusivity

The programme centres people as custodians. Household-level surveys incorporated women, elders and long-term tenants in oral histories, ensuring intergenerational narratives and invisible care labour were documented. Mobile reporting tools enable residents including older adults to flag hazards; alerts are

paired with on-site assistance through community grid officers. Revitalization prioritizes mixed-use functions (public culture, affordable services, creative work) to sustain everyday livelihoods, not only tourism. Barrier-free digital content (360/720° tours, AR captions) broadens access for persons with disabilities and remote audiences. By recognising diverse stakeholders and everyday practices, the initiative strengthens belonging and equitable benefits within the ancient city.

Innovative Initiative

Suzhou fuses heritage humanities with high-precision geomatics: a city-scale, 3-cm digital twin integrated with millimetre-accurate garden components and IoT structural telemetry. The “cellular dissection” method, combining scan-to-BIM, oral histories and archival scans creates living dossiers for each courtyard. Governance innovation matches tech: cross-department standards, citizen co-production, and an open data marketplace that treats curated cultural datasets as digital public goods and assets. Simulation-led planning reduces intervention risk, while AR/VR storytelling, remote immersion and blockchain collectibles diversify cultural value chains without overburdening fragile sites. This synthesis reframes conservation as a data-driven, participatory, regenerative economy.

Resources devoted to delivery

Resources combined district budgets (data bureau, protection committee), specialized survey teams (more than 100 experts across architecture, planning, history, geomatics), and sustained O&M for sensing and platform services. Capital outlays covered aerial/ground surveys, laser scanners, drones, mobile mapping, data centres and API services. Operational costs fund sensor networks, emergency alerts, content production (3D/VR) and community facilitation. Revenue streams include public funds, guided adaptive-reuse partnerships via the public resource trading platform, and monetization of standardized datasets through the Suzhou Big Data Exchange reinvested into conservation. Clear procurement, update cycles and third-party reviews ensure accountability and technical continuity.

Conclusion

Suzhou demonstrates how a heritage city can use digital twins, standards and open collaboration to protect authenticity while revitalizing livelihoods. By unifying data, institutionalising cross-department governance and engaging residents as co-stewards, Gusu District shifted from reactive repairs to proactive, evidence-based care. Opening datasets catalysed sensitive private investment and broadened cultural participation on-site and online. The approach delivers resilience, equity and economic vitality without sacrificing historical integrity offering a transferable model for historic cities seeking to balance preservation with contemporary needs in a resource-efficient, people-centred way.