

Driving economic transformation through digital twin city insights

Region	Asia and the Pacific
Award Scheme	Shanghai Manual
Themes	Data-Driven Process and Management Innovation Local Economic Development
Sustainable Development Goals	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

Singapore’s Virtual Singapore (VSG) initiative represents a cornerstone of the Smart Nation strategy launched in 2014 to drive digital transformation, optimize resource use, and foster economic innovation in a land-scarce, high-density environment. Developed by the National Research Foundation with GovTech, the Infocomm Media Development Authority, and the Singapore Land Authority, VSG is the world’s first nationwide 3D digital twin city model. Built on the 3DEXPERIENCity platform, it integrates real-time data across transportation, environment, and energy systems, creating a dynamic simulation environment for urban governance, planning, and research. The platform enables government agencies, businesses, and academia to model and test real-world scenarios, reducing planning risks and accelerating innovation. Supported by a strong data governance framework ensuring privacy and algorithmic transparency, VSG facilitates cross-sector collaboration and participatory urban development. It has enhanced inter-agency coordination, reduced infrastructure costs, and catalyzed growth in Singapore’s digital economy, which now contributes over 17 per cent of GDP. By linking digital infrastructure, research, and industry, VSG exemplifies how data-driven urban management can foster resilience and competitiveness. The model is globally replicable, offering a framework for sustainable, inclusive, and innovation-led urban growth.

Background and Objective

As a densely populated city-state with limited land, Singapore launched its Smart Nation strategy in 2014 to enhance efficiency, resilience, and competitiveness through digital technology. A central element of this strategy is Virtual Singapore (VSG), the world’s first nationwide 3D digital twin city model. Built on Dassault Systèmes’ 3DEXPERIENCity platform, VSG integrates real-time geographic, demographic, mobility, and environmental data into a dynamic simulation environment. The platform enables government agencies, businesses, researchers, and citizens to model, test, and optimize urban systems for planning, risk management, and innovation. The initiative aims to strengthen evidence-based decision-making, improve urban governance, and drive economic transformation by fostering innovation and industrial growth. It seeks to leverage data and simulation to enhance environmental resilience, optimize

infrastructure, and stimulate new business models in the digital economy.

Actions and Implementation

Led by the National Research Foundation, in collaboration with the Infocomm Media Development Authority, GovTech, and the Singapore Land Authority, the project established a multi-agency governance structure and research consortia with national universities. The platform combines high-precision 3D mapping with real-time data integration across transportation, energy, and environmental systems. Open APIs and shared simulation tools enable developers, enterprises, and academic institutions to test applications and services within a controlled environment. A robust data governance framework ensures privacy protection, algorithmic transparency, and public accountability.

Outcomes and Impacts

VSG has become a key pillar of Singapore's digital economy, supporting urban planning, energy optimization, climate adaptation, and industrial innovation. It has reduced trial-and-error costs for infrastructure projects, improved inter-agency coordination, and generated new opportunities in data analytics and simulation industries. The platform underpins a growing innovation ecosystem that connects research, government, and private enterprise, contributing to sustainable growth and urban resilience.

Sustainability and Scalability

The initiative is sustained through national-level coordination, continuous technological upgrading, and integration with emerging technologies such as AI and quantum computing. Its standardized governance and open innovation model make it replicable for other cities seeking to balance efficiency, inclusivity, and security in digital transformation.

Gender and Social Inclusivity

While primarily focused on economic and governance outcomes, VSG indirectly supports social inclusivity through its open-access innovation framework and participatory urban design tools, allowing citizens and researchers to engage in scenario planning for liveability, safety, and accessibility.

Innovative Initiative

VSG represents a global benchmark in the use of digital twins for national governance. Its integration of 3D modelling, real-time data, and simulation-based decision-making provides a unified platform for collaboration across sectors. By aligning data governance, innovation policy, and industrial development,

it establishes a new paradigm for smart and sustainable city planning.

Resources devoted to delivery

The project is funded through the National Research Foundation and implemented jointly by GovTech, the Singapore Land Authority, and Dassault Systèmes. It leverages national infrastructure investments in data, 5G connectivity, and AI R&D. Public–private partnerships provide continuous technological and financial support for maintenance, research, and innovation.

Conclusion

Singapore's Virtual Singapore exemplifies how digital twin technology can transform governance and economic systems in high-density urban environments. By merging real-time data with spatial analytics, the initiative enhances resilience, efficiency, and innovation capacity. It provides a replicable model for cities worldwide seeking to harness digital transformation for sustainable, inclusive, and data-driven urban development.