Bentley®
Advancing Infrastructure

Cities Driving Sustainable Development through Digital Transformation

4.2 billion people live in urban areas. By 2050, that number will expand to 6.7 billion.[1]

Cities must adapt

Cities are undergoing rapid changes. They must deliver new housing and supporting infrastructure while remaining competitive and adaptable with a focus on economic growth, safety, and security. Many cities are proactively investing in a resilient future by committing to sustainable development goals such as:
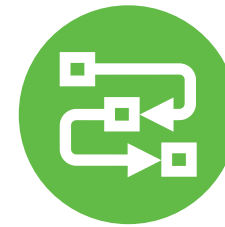
Ensuring residents have safe access to water, sanitation, and energy.

Combating climate change and its impacts.

Implementing smart transportation and utility usage.

Improving planning across all city systems.

With a rapid upsurge in smart city digital technologies that can help address these issues, the smart cities market will grow to nearly USD 821 billion by 2025.[2]

Data overload can make things worse

With the rise of smart technology and Internet of Things devices, cities are collecting electronic data in unprecedented volumes. However, they need to understand how to use that data to support their decision-making. Going digital presents a real opportunity for cities to change how they work by using their data more effectively. But without a way to manage and use their data effectively to support decision-making and address real problems, cities may find themselves drowning in data while thirsting for insight.

Managing and sharing data is key

An emerging trend is the growing adoption of digital twins to enable cities to meet their challenges. Digital twins, which serve as living replicas of city infrastructure and systems, are redefining how cities plan and manage their infrastructure. They also encourage collaboration and engagement across departments as well as with other government agencies, businesses, and the public.
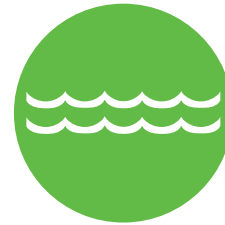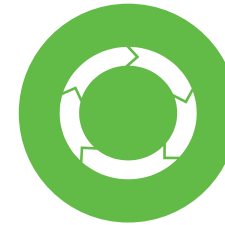
With digital twins, you can:

Visualize plans and projects at campus and city scale.

Optimize crowd and transportation mobility.

Develop a flood resilience strategy.

Manage public works projects.

Support initiatives to provide a high quality of life for residents.

There are a myriad of ways city digital twins can support a more holistic view of city systems and produce a better understanding of the often siloed repositories of data cities capture. *Here are at six examples of how cities are applying this technology.*

Dublin Digital Twin Accelerates Digital Transformation

Dublin gets a twin

The Dublin Digital Twin project is a joint initiative among the City of Dublin, Bentley Systems, and Microsoft to create a large-scale digital model of Ireland's capital and largest city. Initiated in February 2020, the goal of the Dublin Digital Twin Project is to provide real-world context and visuals to enable engineers, architects, constructors, city planners, and civilians to identify, design, and execute on urban solutions for years to come. Dublin is proving that a city-scale digital twin can influence similar changes for future urban spaces anywhere in the world.

Potential use cases

The potential use cases are limitless. City leaders can use a city-scale digital twin to plan events and activities that are safer and socially distanced. Developers can also use digital twins to gauge the impact on climate and sustainability, while utility operators can use them to simulate and predict issues for preventative measures and quick responses. Additionally, emergency services can use a digital twin to manage pre-incident management across a city.

Cities are discovering that digital twins can help them become more efficient, and they can reinvest savings into enhanced services or for advancing sustainable development goals.

Watch this short TwinTalk video to find out more about this project›

"To overcome the challenges of getting public review and comment for new development projects in Dublin during the pandemic, we turned to Microsoft and Bentley to create an interactive virtual environment to ensure our citizens could provide their input from the safety of their homes and keep the development projects on track. The impact of the pandemic has forced cities like Dublin to accelerate their digital transformation journeys."

—Jamie Cudden, Smart City Program Manager at Dublin City Council

Gothenburg, Sweden Wins with Digital Engagement

Gearing up for growth

Gothenburg, Sweden's the second largest city, is quickly expanding, and plans are under way to accommodate **150,000 new residents and 80,000 new homes and offices** by the year 2035. Clear communication and involving citizens early in the planning stages are crucial to avoid misunderstandings and formal complaints that could delay urban planning. Gothenburg realized that using a 3D environment could engage inhabitants in the planning process. A complete 3D model of the metropolitan area was created with ContextCapture for use as an urban planning visualization canvas. OpenCities® Planner serves as the simulation and dialogue platform for online, mobile, and showrooms – spreading 3D project visualizations to the residents of Gothenburg, project stakeholders, and potential investors.

Achieving incredible citizen engagement

When the Gothenburg project was first published, it produced 10,000 unique views in the first 24 hours, resulting in a very successful communication platform for the project. Some projects, such as Västlänken, a tunnel project in central Gothenburg, are seeing thousands of visitors, and a vibrant discussion is enabled online. As a next step, Gothenburg decided to make the ContextCapture model available as open data to further stimulate smart city application development and the democratization of their data.

Learn more in the Digital Cities Reality Modeling e-book›

"Our portal MinStad and Bentley's OpenCities Planner has supported the initiative to improve communication with our citizens and to create an active engagement in the development of Gothenburg."

—Eric Jeansson, Geodata Strategist, City Planning Division, Gothenburg City

From 2016 to 2035, EUR 100 billion will be invested in properties and infrastructure.
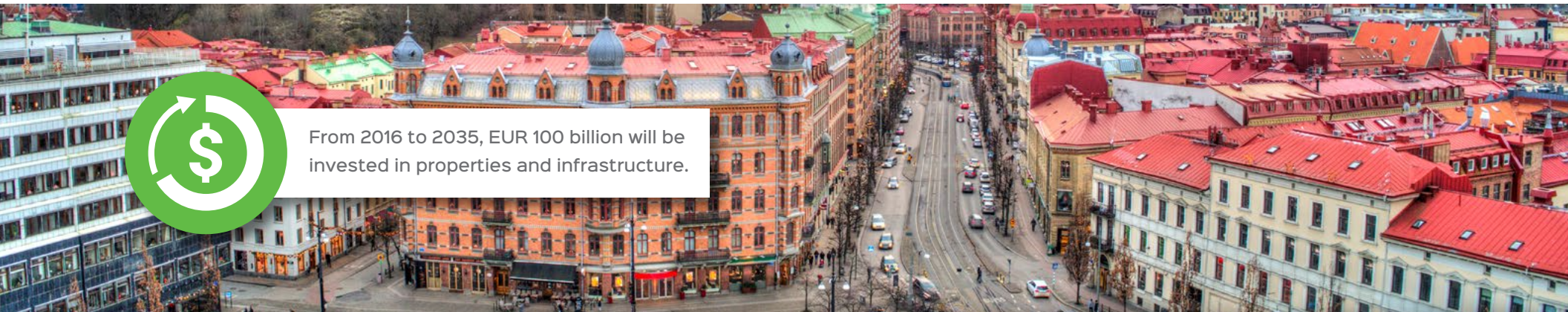
Helsinki Builds and Leverages its City-Scale Digital Twin

Helsinki has a long tradition of 3D city modeling dating back to the mid-1980s. As part of a three-year project completed in 2017, Helsinki launched a EUR 1 million initiative to generate a 3D representation of the entire city. The model is now provided as open data to involve the public and encourage commercial research and development.

Promoting smart development

For the Helsinki 3D+ project, the team created accurate base maps and geo-coordinated utility networks using OpenCities Map. They then generated a 3D mesh representation of the entire city from 11 terabytes of imagery using Bentley's reality modeling applications, which were also used to model the surface and terrain. Lastly, the team collaborated and managed all the data that would be uploaded to a web portal for distribution and general access using ProjectWise®. As part of its digital city initiative the 3D model has improved Helsinki's internal services and promotes smart development.

Learn more about the Helsinki 3D+ project›

"We are helping to create a better life for citizens using knowledge-based discussions and making decisions based on that data."

—Jarmo Suomisto, Architect, Project Manager, Helsinki 3D+, City Executive Office, City of Helsinki

Growing smart cities with digital twins

Building upon this digital foundation, Helsinki partnered with Forum Virium to take on their SmartKalasatama project. In addition to developing new digital services for Helsinki, the project will help the city reach its carbon neutrality goal by 2035. Helsinki's digital twin serves as the starting point for visualizing and communicating all projects throughout Helsinki before actual implementation. Helsinki and Forum Virium engage stakeholders, including current and potential Kalasatama residents, developers, and city leaders, with an easily accessible environment in OpenCities Planner. This approach enables them increase public engagement via mobile devices and gather input from crowdsourcing, ultimately reaching a larger, more diverse cross section of the city.

Watch this video on the SmartKalasatama project›

Goals

The city of Helsinki has three major goals:

Develop new digital services for the city.

Achieve carbon neutrality by 2035.

Provide open access to the public, industry, and third-party developers.

11TB
of imagery

50,000
oblique images

600
ground control points

10–30cm
accuracy

Singapore Uses Digital Twin for 3D Land Management

Nowhere to go but up

The Singapore Land Authority (SLA) manages land use on the island nation to create as many development opportunities as possible. However, with aboveground and belowground buildings and infrastructure growing and overlapping 2D maps can no longer convey accurate GIS information for the nation. GPS Lands Singapore approached SLA with a solution that would create the Singapore Digital Twin platform, which gathers 3D geospatial data for the island into a single place. Aerial and road-based mapping teams captured digital terrain and street-level imagery, then combined them into a single platform for data verification.

Building a city digital twin

GPS Lands Singapore imported all point cloud data and panoramic images into its Singapore digital twin platform using Orbit 3DM® Content Manager. The finished map uses Orbit 3DM Cloud to publish mapping data for entities across the country. Singapore's digital twin now displays all parts of the nation in highly detailed 3D representations, from buildings to individual trees and lamp posts. The full map is now exported and shared with various government agencies to help with asset management and decision-making, including detailed tree and green space management.

Learn more about this project here›

6,000 kilometers of roads
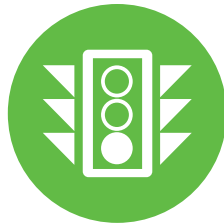
Captured roads, curbs, and adjacent features including trees, fire hydrants, traffic lights, and lampposts

Completed in 40 days

"Orbit's ease of use and its interaction of high-quality datasets have opened up many possibilities for government stakeholders to efficiently manage features and assets of interest."

—Johnson Ang, Project Manager, GPS Lands Singapore
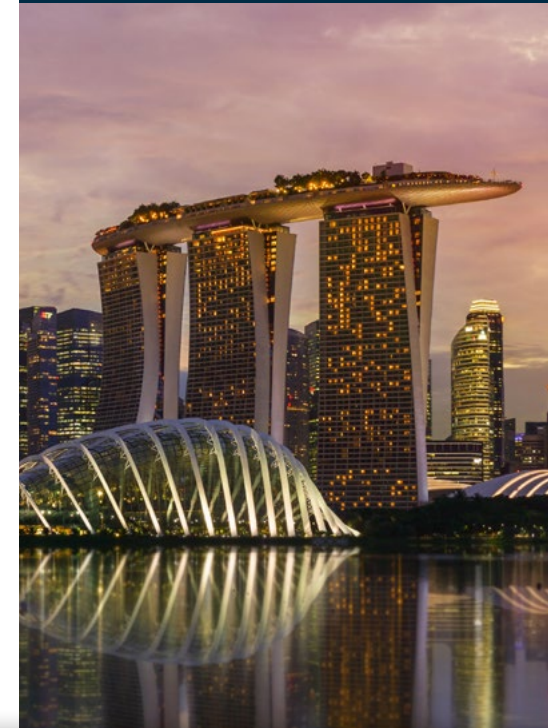
Stockholm Communicates More Effectively on Urban Development

A plan for growth

Stockholm plans to build 140,000 new apartments by the year 2030 to meet growth projections. Communicating clearly and involving citizens early in the planning stages is crucial to avoid misunderstandings and formal complaints that could delay the urban planning process. Stockholm quickly realized the value of using 3D visualization to engage inhabitants in the planning process from the beginning. A photorealistic 3D digital twin of the metropolitan area, which spans about 500 square kilometers, was created with ContextCapture, while OpenCities Planner serves as a visualization and dialogue platform to spread 3D project visualizations to residents, project stakeholders, and potential investors. Stockholm is now working toward a digital twin, a fully updated and semantically rich 3D city model, which would enable even more powerful visualizations as well as analyses and simulations.

Facilitating citizen engagement

To ensure all residents can explore the digital twin and understand the impact of the development plan, the city of Stockholm established an ongoing exhibit in the heart of the city. Stockholmsrummet showcases a 3D presentation of their digital twin, which is open to the public and attracts thousands of visitors every year. The 3D presentation gives viewers a visual context to the development plan and helps the city provide openness and transparency. Additionally, Stockholm is carrying out several web and mobile-based dialogue projects to collect comments and capture opinions from the public, substantially widening the reach of the dialogue and communication.

Learn more about this project here›

"The 3D model of Stockholm and its published scenarios has attracted more interest and helped explain complex urban development projects."

—Maria Uggla, Geodata Strategist, City of Stockholm
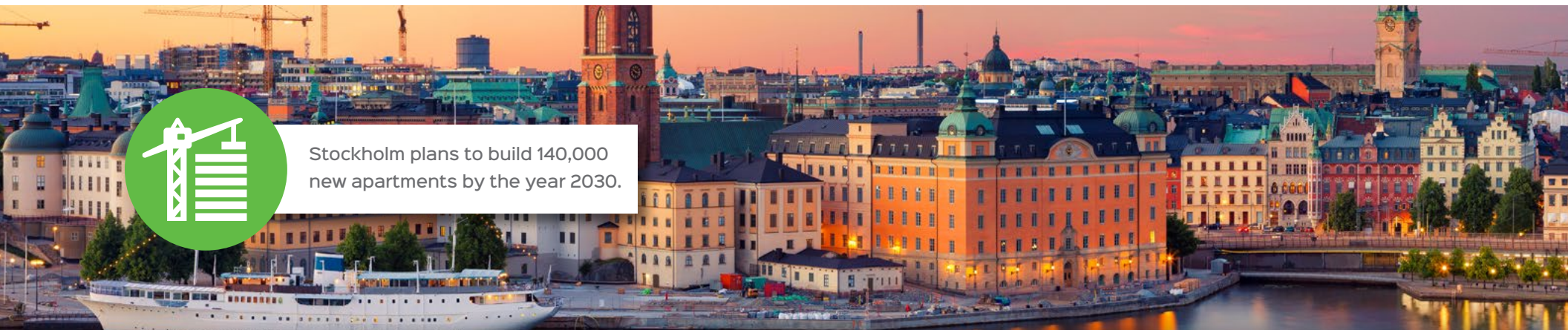
Stockholm plans to build 140,000 new apartments by the year 2030.

Flanders is Building a Better City Digital Twin

Expanding a 3D city map with new technology

The Flanders Geographical Information Agency wanted to improve its system of 3D street-level maps of roads by taking advantage of improved technology and producing higher quality images. They contracted Image-V, a joint venture between Teccon and Sweco, to capture spherical imagery and LiDAR data for **65,000 kilometers** of roads in the city and produce an updated, web-accessible map within two years. To meet the requirements for the new project, Image-V had to capture high-resolution images and 3D point clouds to facilitate detailed notations and measurements. Additionally, they were tasked with importing data from the first mapping project so that users could access historical data and view how the city has changed over time.

Making mapping data ubiquitously accessible

Image-V determined that Orbit 3DM applications could help them deliver the project on time and meet all expectations. Orbit 3DM Content Manager helped them establish a production workflow and blur sensitive areas such as faces and license plates. With Orbit 3DM Publisher they made detailed measurements, extracted features, and published the image data online. Now, users such as public authorities can adopt the mapping data into their workflows and develop their own plugins. Orbit applications helped Image-V capture and process nearly **13 million images** and, including LiDAR data and the historic images, **250 terabytes of data.**

Learn more about this project here ›

For More Information

For more information on how Bentley can help you drive sustainable development in your own city, please contact us.

Contact Us Now ›   **Visit Us Online** ›

About Bentley Systems Bentley Systems (Nasdaq: BSY) is the *infrastructure engineering software company*. We provide innovative software to advance the world's infrastructure – sustaining both the global economy and environment. Our industry-leading software solutions are used by professionals, and organizations of every size, for the design, construction, and operations of roads and bridges, rail and transit, water and wastewater, public works and utilities, buildings and campuses, and industrial facilities. Our offerings include *MicroStation*®-based applications for modeling and simulation, *ProjectWise* for project delivery, *AssetWise*® for asset and network performance, and the *iTwin*® platform for infrastructure digital twins. Bentley Systems employs more than 4,000 colleagues and generates annual revenues of more than $800 million, in 172 countries. www.bentley.com

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