

BIM and GIS for Digital Hong Kong

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Lands Department



Construction Innovation Expo 2019
17 December 2019



CONSTRUCTION
INDUSTRY COUNCIL
建造業議會



發展局
Development Bureau

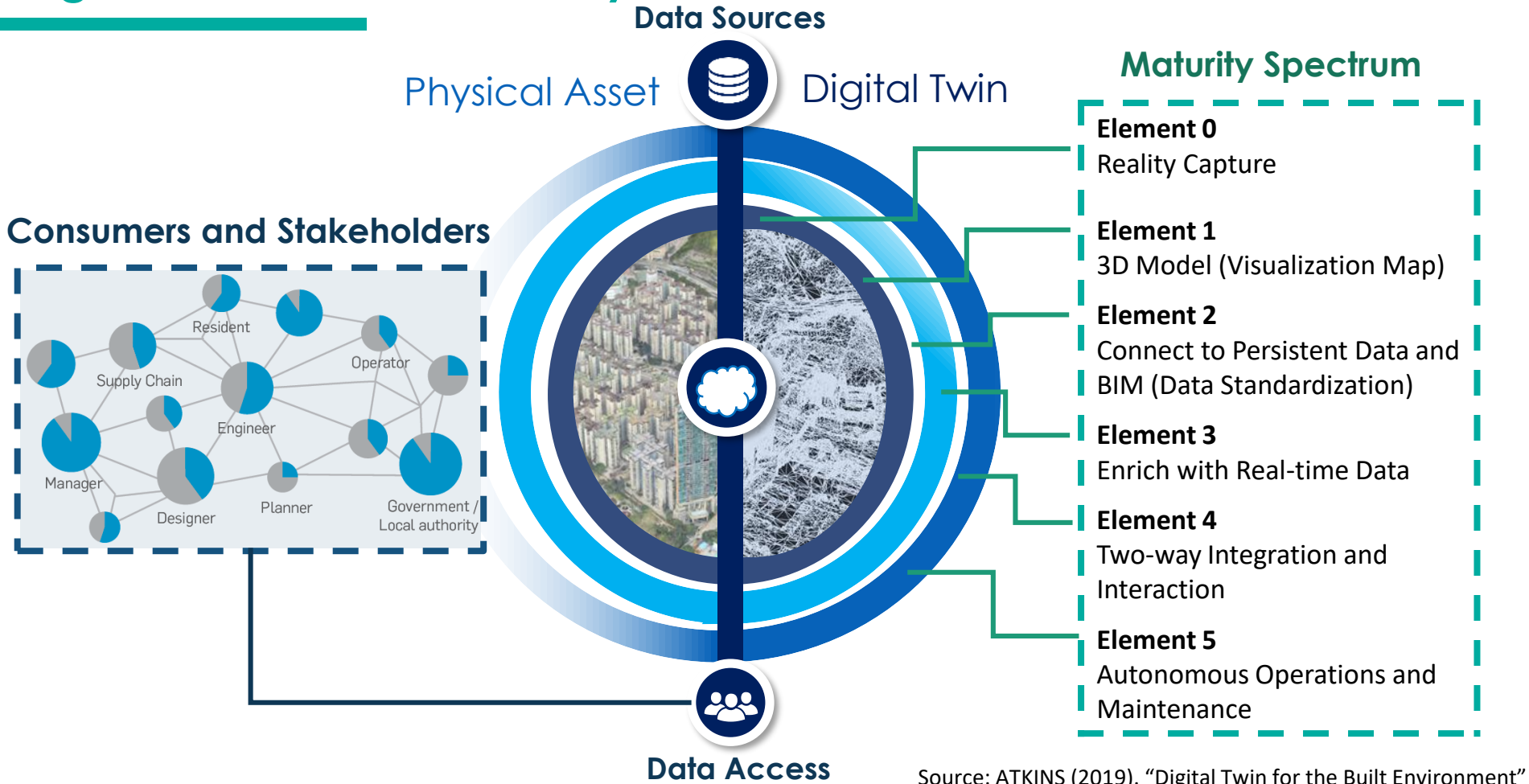


Our City Needs Digital Twin





Digital Twin for A Smart City



The Geospatial Contribution to Digital Twin



**Reality Capture
& 3D Modelling**



Connect to BIM



**Data & Positioning
Infrastructure**

The Geospatial Contribution to Digital Twin



**Reality Capture
& 3D Modelling**

3D Digital Map

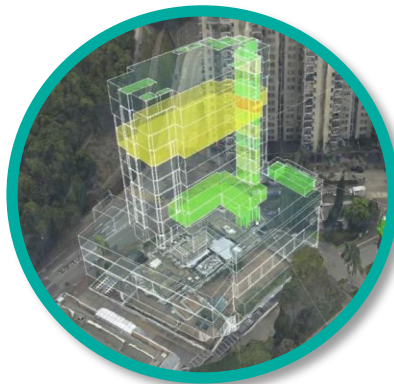
3 Stages of 3D Digital Map Development

Stage 1



**3D Maps
for Visualization**

Stage 2



**3D Maps for Unit-based
Indoor Applications**

Stage 3



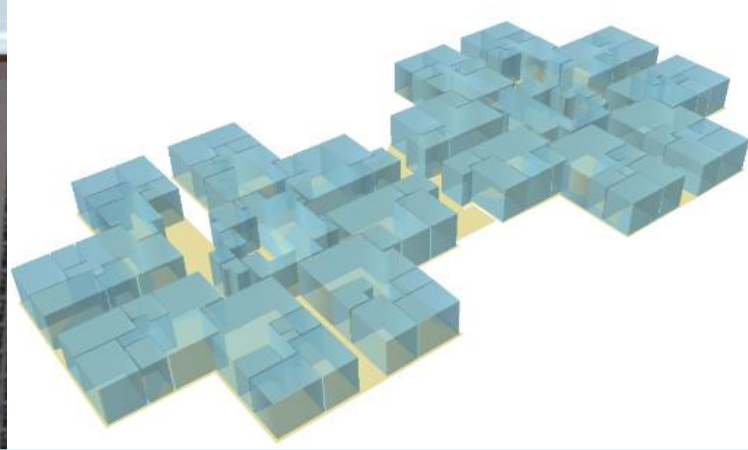
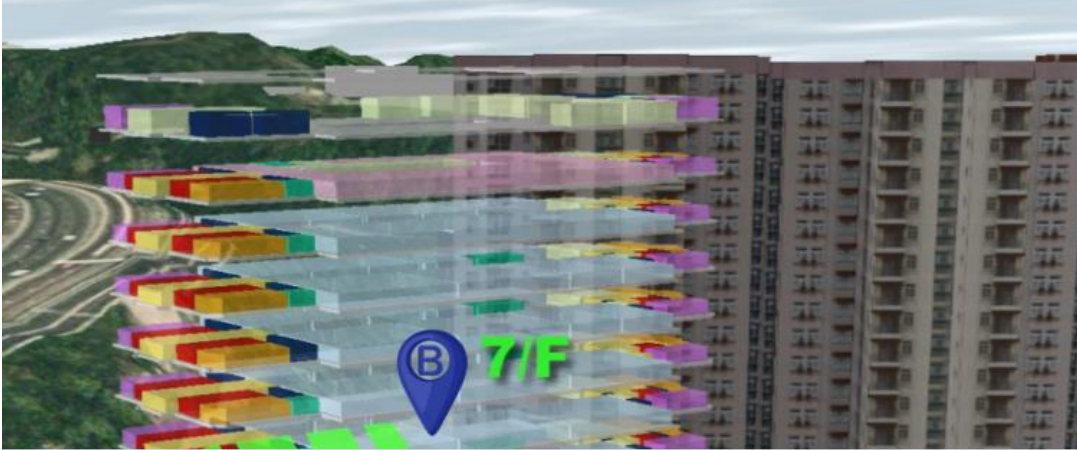
**3D Maps for
City Modelling**

An aerial photograph of a city, likely Los Angeles, showing a complex network of roads and buildings. A semi-transparent teal overlay covers the right half of the image, representing a digital map. The text 'Evolution of Digital Map From 2D to 3D' is written in white on this overlay.

Evolution of Digital Map From 2D to 3D

Stage 1 – 3D Maps for Visualization





Stage 2 - 3D Digital Map Development (3D Indoor Map for unit-based indoor applications)

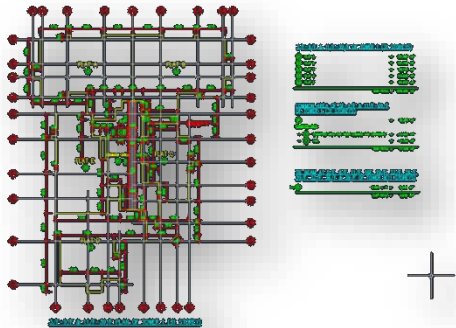


Stage 2 – 3D Digital Map Development

Data Sources of Comprehensive 3D Map Objects

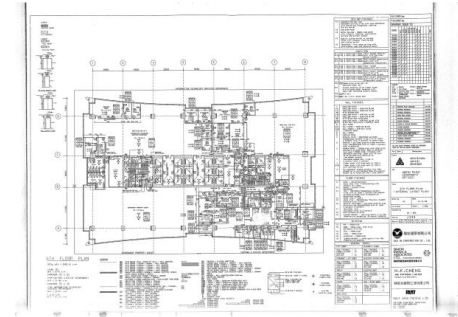
1. Scanned Copies of Building Plans

- Provision of hardcopies
 - Scanned to pdf format
- Provision of scanned copies in pdf format

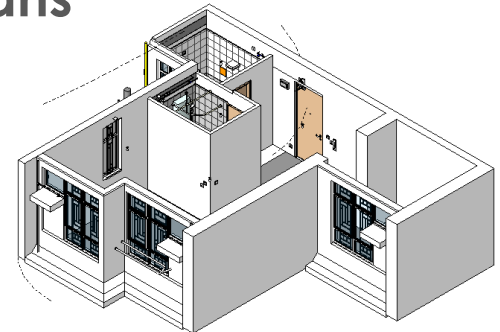


2. Digital Building Plans

- In CAD format

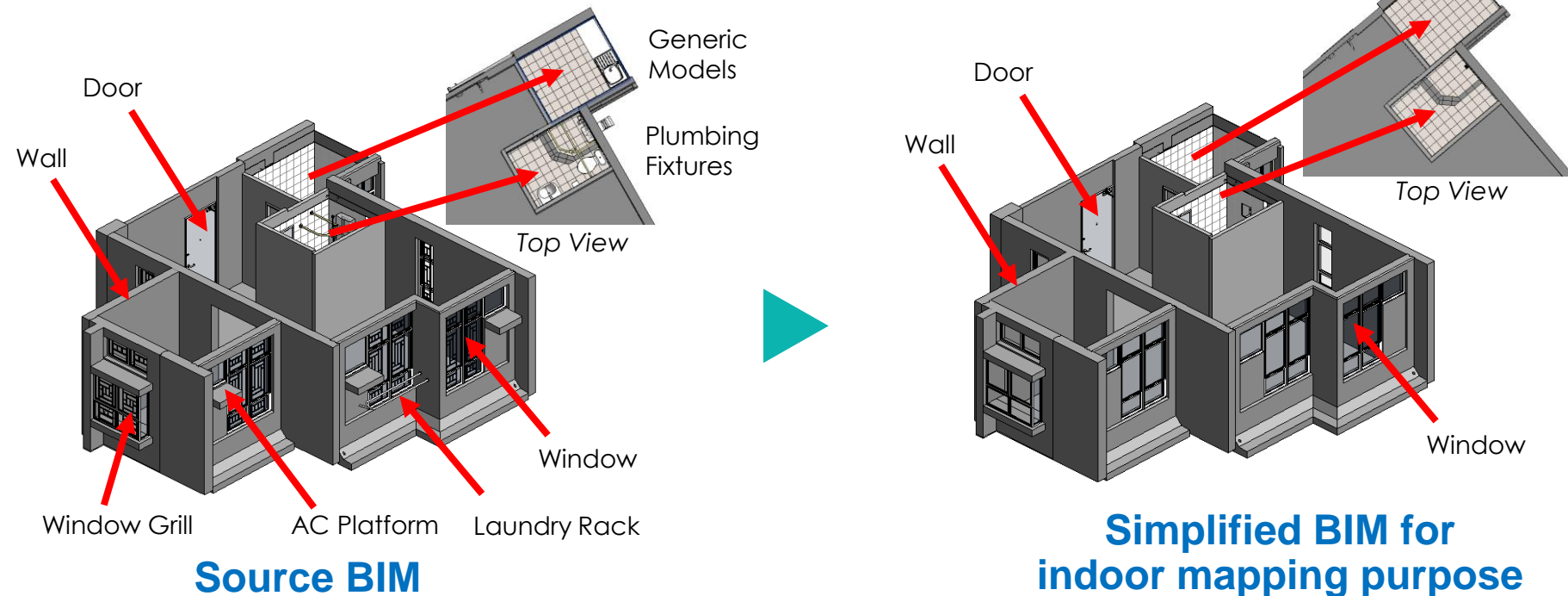


3. Building Information Modelling Models



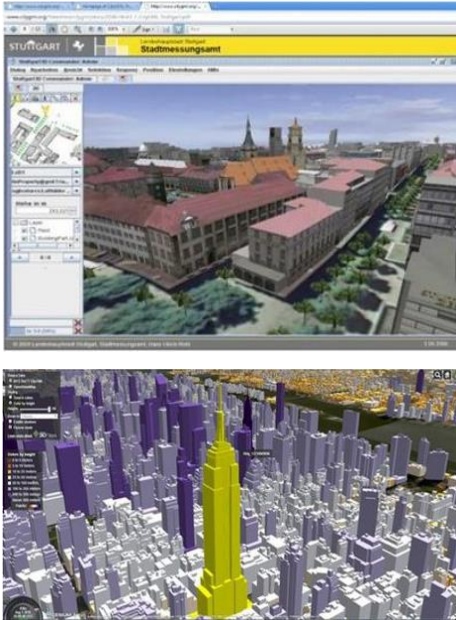
Stage 2 – 3D Digital Map Development

Enrichment of 3D Digital Map using BIM Models



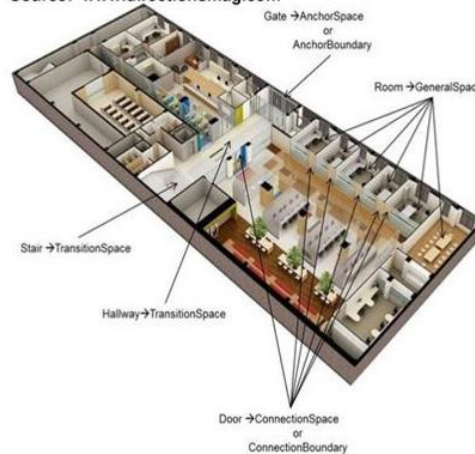
BIM helps to enrich 3D Digital Maps

Stage 3 – 3D Maps for City Modelling (Object-Oriented 3D Model)



3D City Modelling Standards - OGC CityGML & IndoorGML

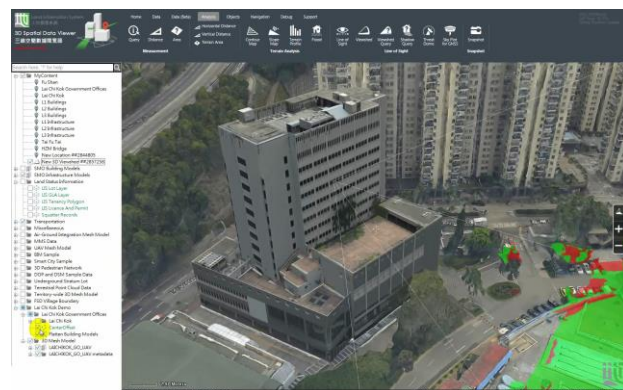
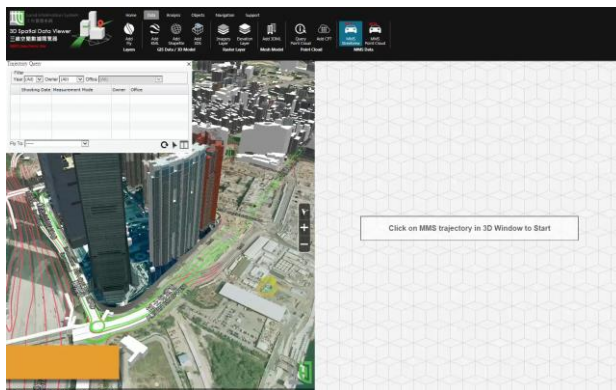
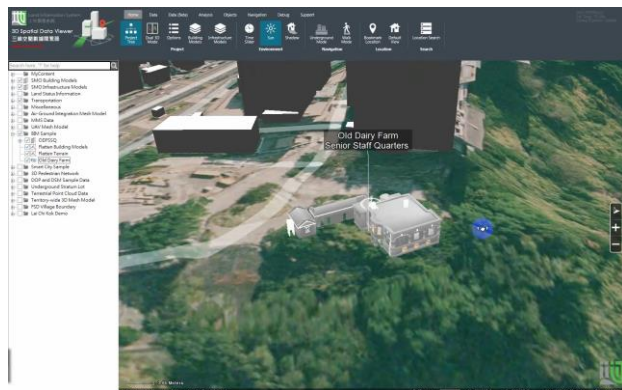
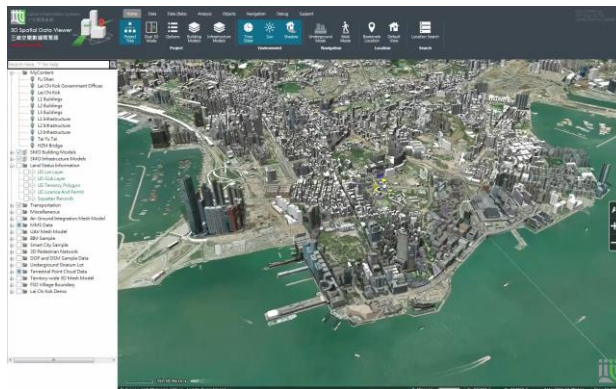
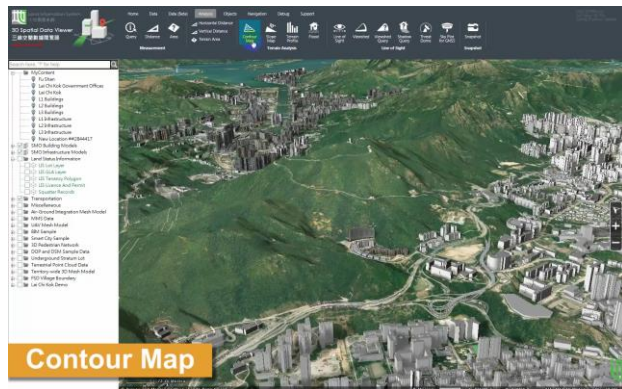
Source: www.directionsmag.com



- Urban Planning / Operations
- Emergency Mgt / Response
- Transportation / Routing / Logistics
- Indoor navigation
- Retail Site analysis
- Sustainable / Green Communities
- City Services Management
- Noise abatement
- Telecommunications placement
- Many other uses...

Source: <http://www1.nyc.gov/site/doitt/initiatives/3d-building.page>

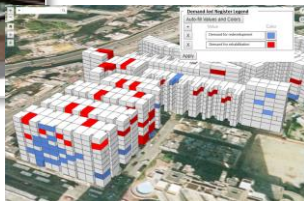
3D Data Sharing Platform



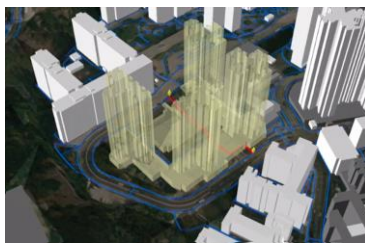
3D Digital Map Streamlines the Construction Life Cycle



Feasibility Study



Re-development Study



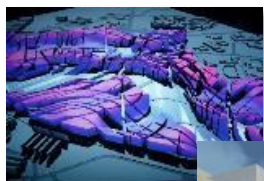
Optimum route finding in different development stages with Intelligent Pedestrian Network



Inspection with indoor 3D map

Planning & Design

Design Options



Visualisation / Simulation

Construction



Progress monitoring with IoT and UAV integration

Operation & Maintenance



Efficient asset locates for on-going maintenance

The Geospatial Contribution to Digital Twin

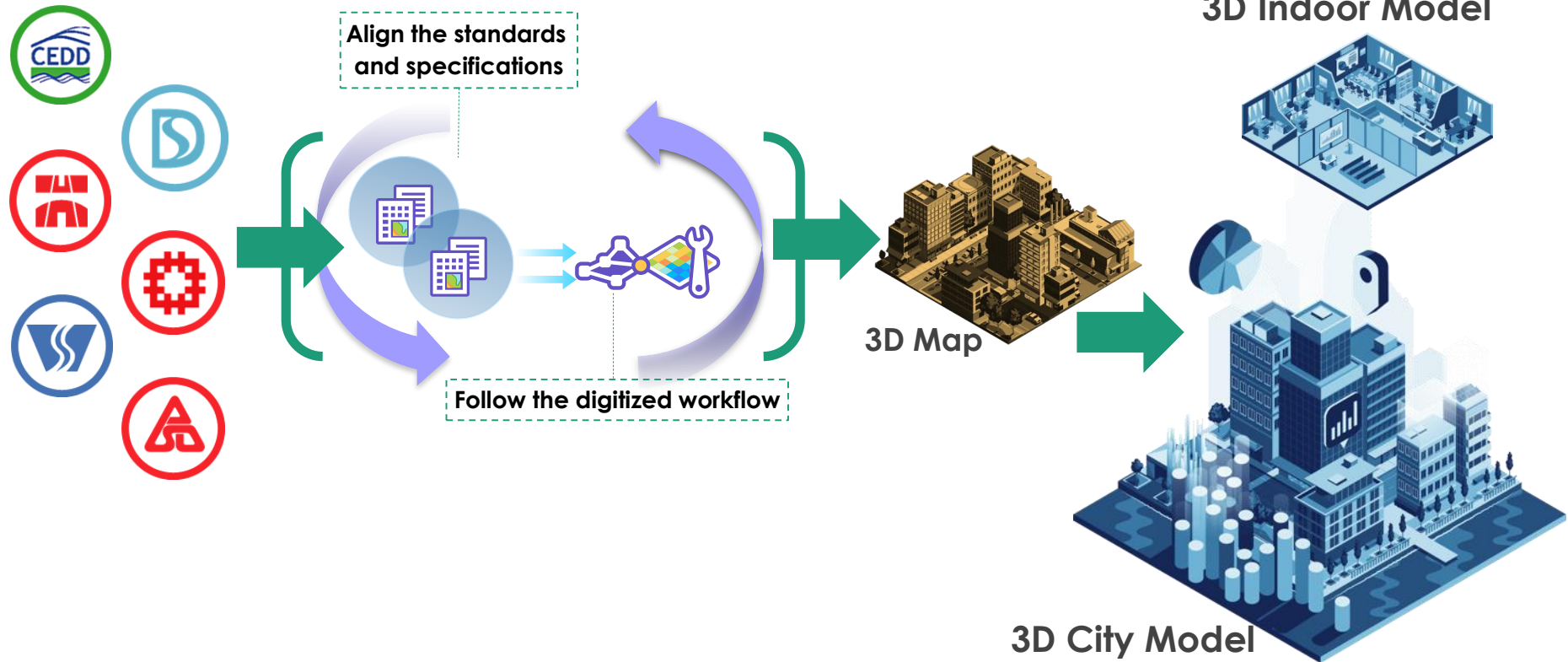


**Reality Capture
& 3D Modelling**

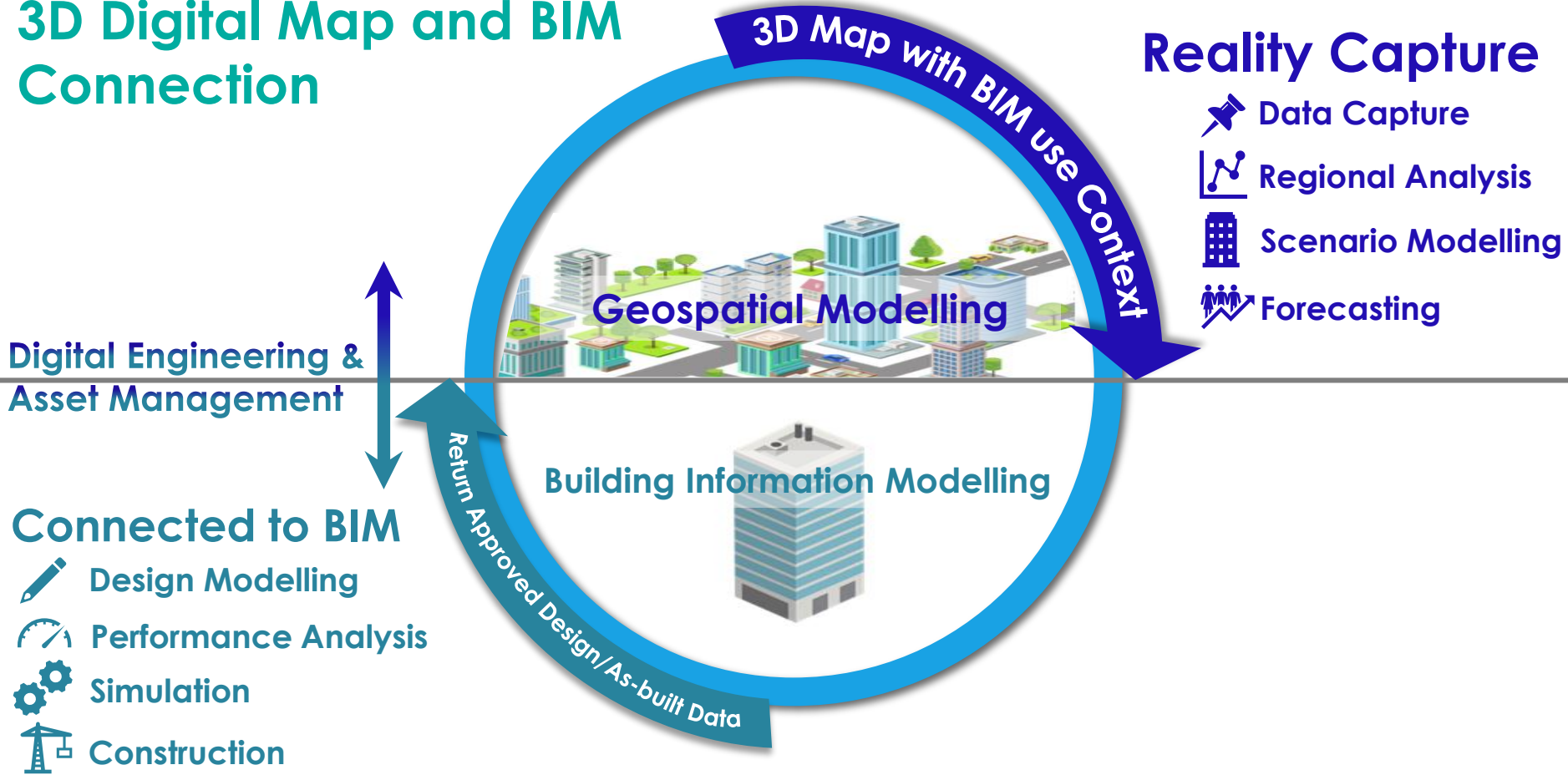


Connect to BIM

The Path from BIM to Digital Twin



3D Digital Map and BIM Connection

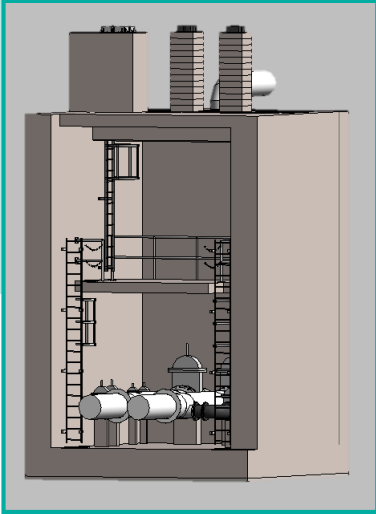


Developing a BIM Data Repository

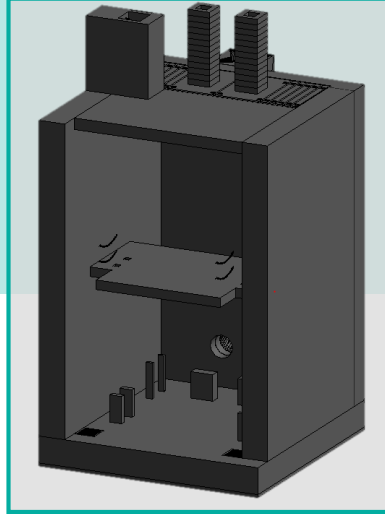
Integrating BIM to GIS

BIM Data Simplification

Simplification Results



Source BIM Data



Simplified BIM Data



Simplified FBX



GIS Platform

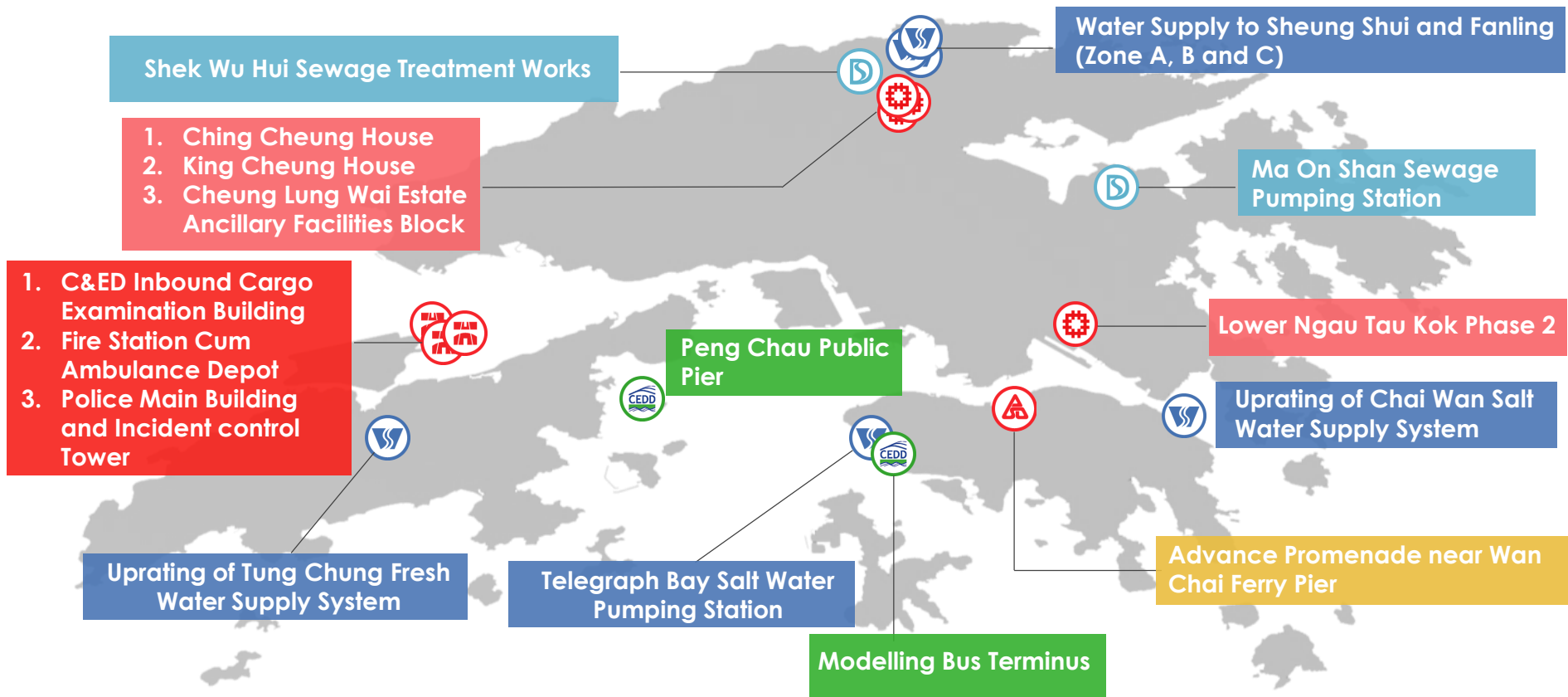
Pilot Project – BIM Data Repository

[BIM Data Repository]



Lands Department
地政總署

BIM Repository Prototype – with models from Works Departments



Consultancy Study for BIM Standards Alignment



Kwu Tung North

Fanling North



Selection of Kwu Tung North & Fanling North NDA for the Study

- Availability of About 3,000 Nos. of Design BIM Models (Advance Works and First Stage)
- Contain Different Types of Infrastructures from 6 Nos. of Works Departments
 - ArchSD – Visitor Centre of the Nature Park
 - CEDD – Slope
 - DSD – Drainage, Sewerage, Sewage Pumping Station
 - EMSD - Reprovisioning of Temp Wholesale Market
 - HyD – Roadworks
 - WSD – Waterworks, Fresh Water Services Reservoir, Flushing Water Services Reservoir

古洞北
粉嶺北 新發展區
KWU TUNG NORTH / FANLING NORTH
New Development Areas

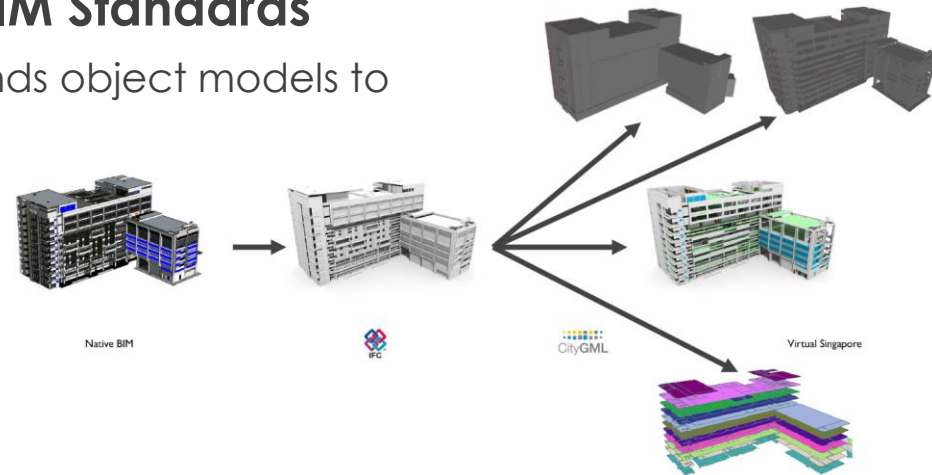
5 Steps for BIM Standard Harmonization

Step 1 - Alignment of BIM Standards across Works Departments

- To align and formulate a common standards and guidelines for BIM adoptions by reviewing the current BIM standards and guidelines of works departments

Step 2 - Revision/Revamping of Existing Design BIM Data according to the Aligned BIM Standards

- Convert and revamp some thousands object models to the new aligned BIM standards



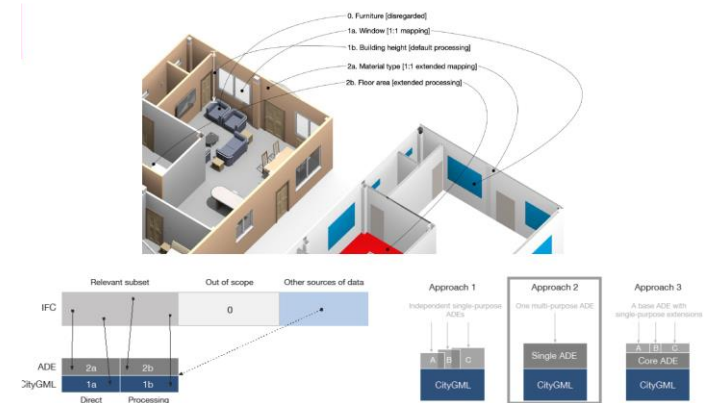
5 Steps for BIM Standard Harmonization (Con't)

Step 3 - Simplified/Shareable BIM

- Define common user requirements and rules for handling on shareable BIM and data extraction amongst works departments

Step 4 - Establishment of a BIM Data Repository for Works Departments

- Develop a common platform for sharing of BIM data among works departments/works projects, and supporting BIM/GIS integration, 3D mapping and CSDI



Step 5 - 3D Map with BIM Use Context to Works Departments

- Design 3D Map with BIM use context to works departments

Digital Map – is no longer only a Backdrop in Works Projects



The Geospatial Contribution to Digital Twin



**Reality Capture &
3D Modelling**



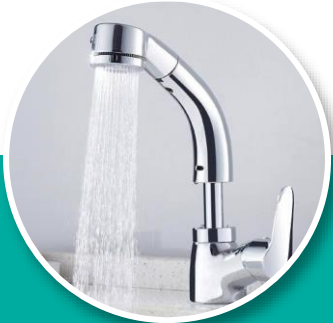
Connect to BIM



**Data & Positioning
Infrastructure**

What is Infrastructure?

General purpose infrastructure like water pipe, gas pipe, electricity network and broadband that are fundamental for daily life activities



Water



Gas



Lighting



Network

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Data as Infrastructure

A strong data infrastructure would enhance the efficiency for data consumption and sharing

Data as Infrastructure



Data creates value: leveraging data to get more out of infrastructure

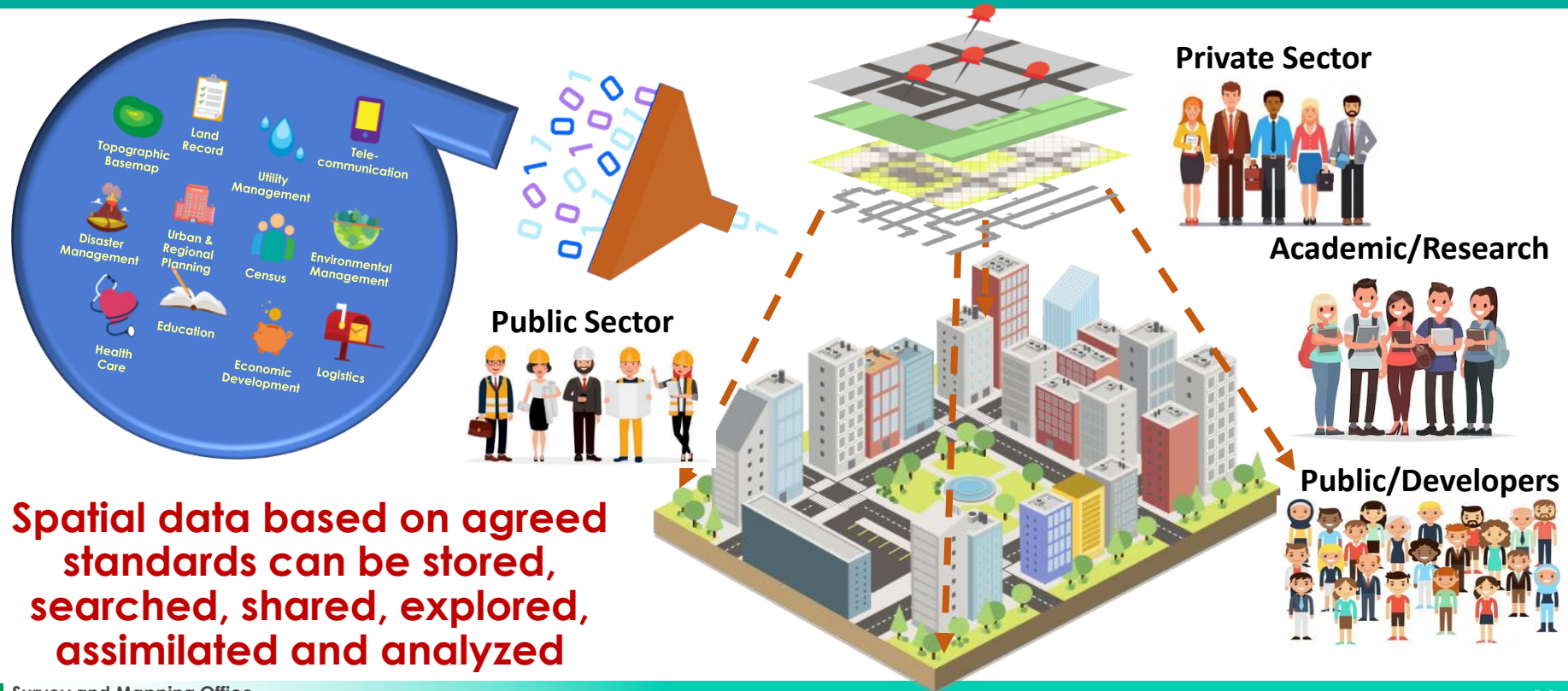
Data informs how infrastructure is built, managed and eventually decommissioned, and real-time data can inform how infrastructure is operated on a second-to-second basis.

Data is now as much a critical component of infrastructure as steel, bricks and mortar. Data is part of infrastructure and needs maintenance in the same way that physical infrastructure needs maintenance

Source: National Infrastructure Commission, British

Need for Common Spatial Data Infrastructure

A map-based information infrastructure leveraging GIS technology



Spatial data based on agreed standards can be stored, searched, shared, explored, assimilated and analyzed

Common Spatial Data Infrastructure

Vision



To contribute to a livable, competitive, innovative, sustainable and smart Hong Kong through the provision of convenient, easily accessible, high quality and up-to-date spatial information and services

Mission



Maximise innovation, knowledge and value creation for the Government, business and the community

5 Objectives



Enhance data interoperability



Promote the use of geospatial intelligence and applications



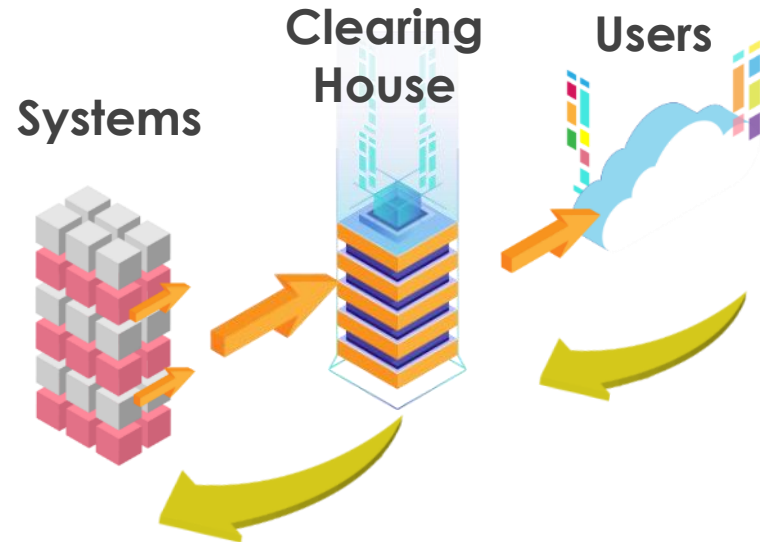
Improve geospatial capability and knowledge



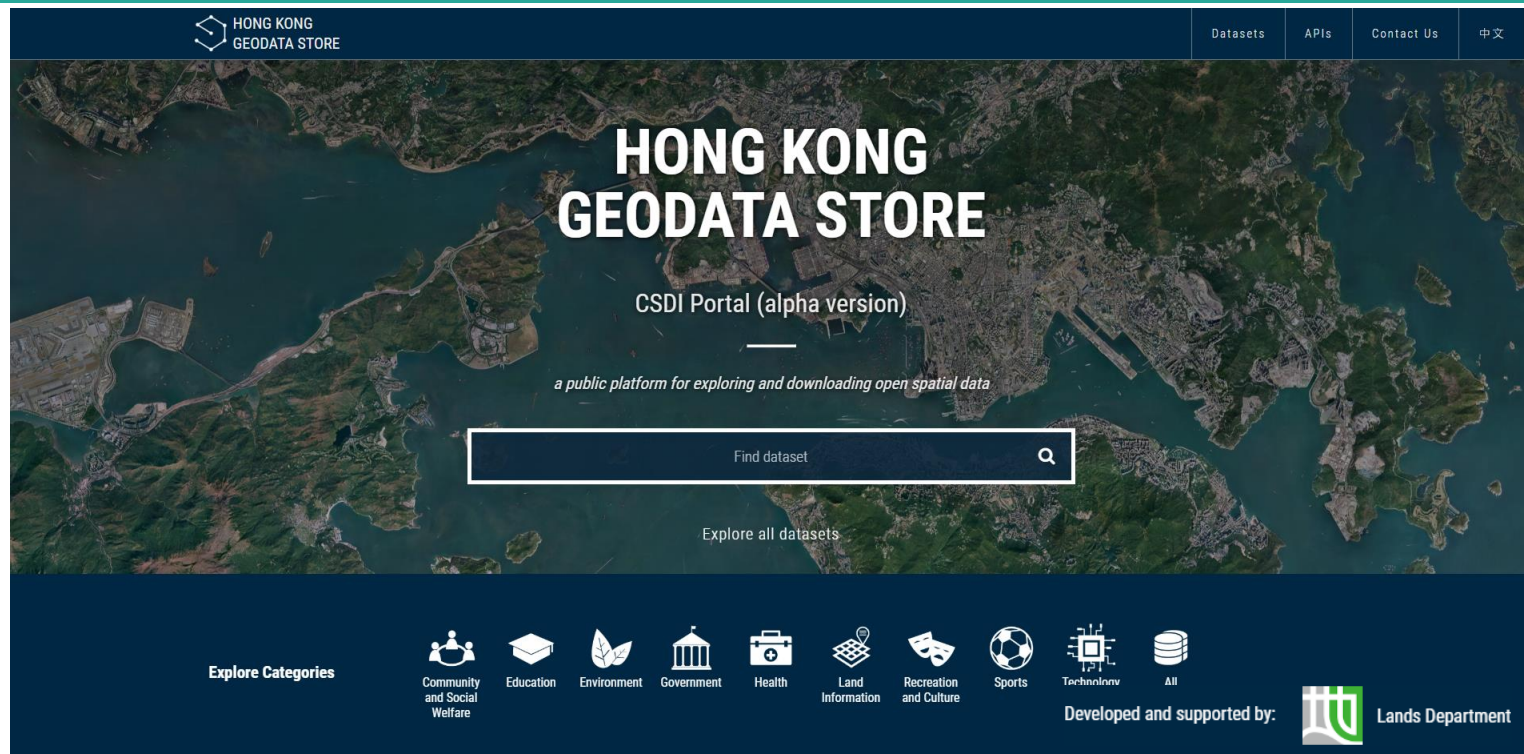
Increase accessibility and usability of spatial data



Foster a collaborative culture



CSDI Portal



- As at **Dec 2019**, released **140+** spatial datasets of **public facilities** and **land information**
- Committed: **70+** spatial datasets **owned by DEVB's family for Government use by end 2021**
- **Open to public access by end 2022**

QR Code



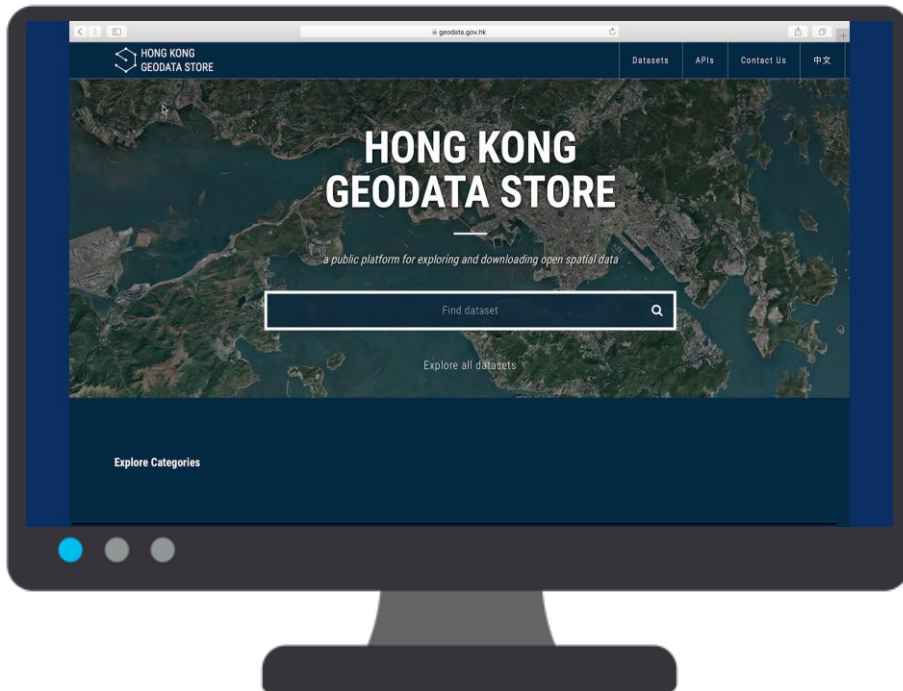


HONG KONG GEODATA STORE

香港地理數據站



Hong Kong GeoData Store (<https://geodata.gov.hk>) was launched on 10 Dec 2018 as the alpha version of CSDI portal to enhance sharing and accessibility of spatial datasets to facilitate innovative and value-added reuse by application developers, academia and the public



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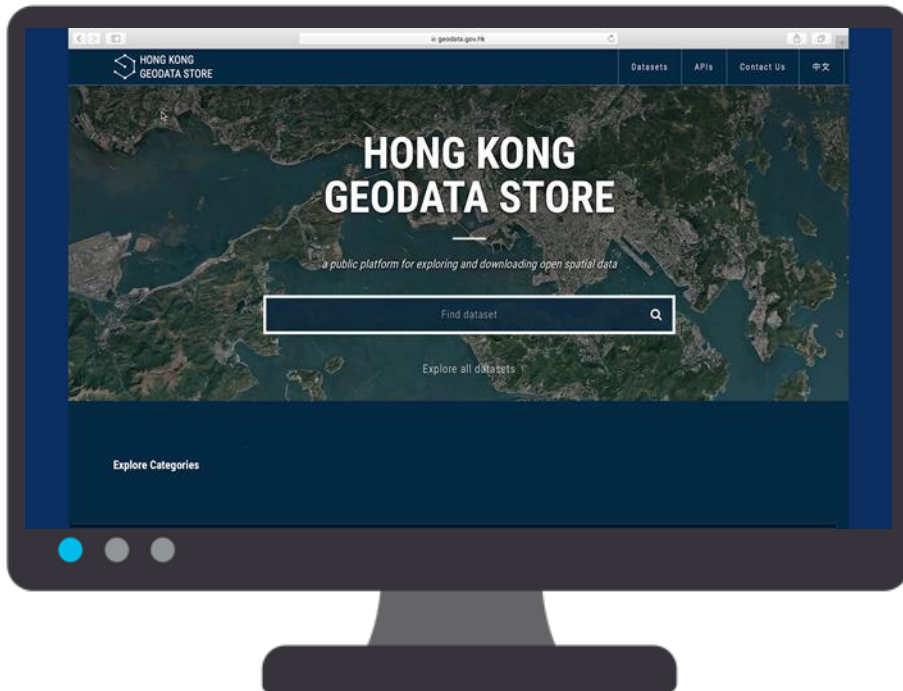


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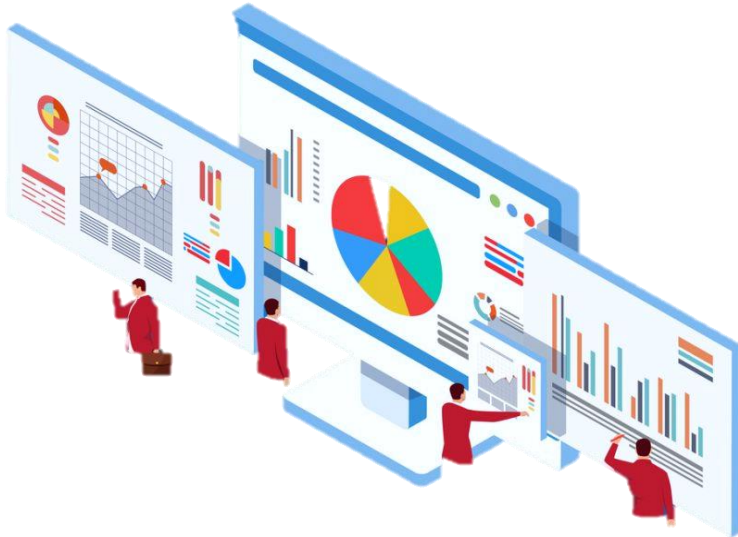


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District-based Spatial Information Dashboard

Realization of “Data as Infrastructure”



01

Support Smart City Initiatives

02

Provide an Innovative & Interactive Approach, using Key Performance Indicators (KPIs), to instantly visualize and analyse the Common Spatial Data

03

To investigate Trends and discover Insights from large volumes of data

04

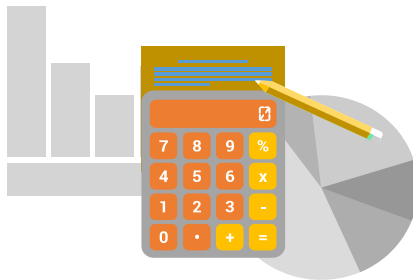
Provide Better Quality Services

District-based Spatial Information Dashboard

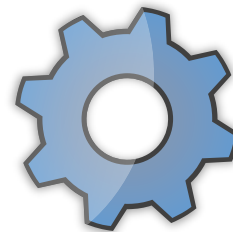




3D Location



Big Data Analytics



**Sensor Network &
Data Interoperability**

3D Internet of Things Smart City Platform



Real-time / Near Real-time



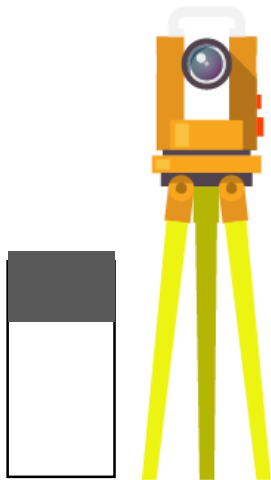
Smart Applications

Positioning Infrastructure for 3D IoT Smart City Platform

• Outdoor

Geodetic Network

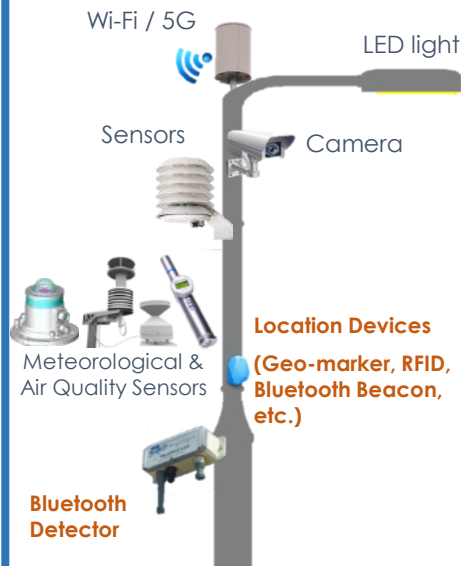
Over 5500 Control Stations Covering Territory-wide Hong Kong



Hong Kong Satellite Positioning Reference Station Network (SatRef)



Smart Lamp Post (Trial Run)



• Indoor

Ubiquitous Positioning and Mobile Location-based Services (Under Study)



How Government Takes the Initiatives?

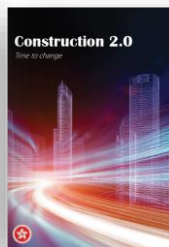
Timeline of CSDI, 3D Map & BIM Adoption

Policy Address Jan 2017 and Oct 2017, **Promote the establishment of CSDI**; Actively seek to require consultants and contractors to use **BIM technology**, Implement **Open Data Policy**

Issue of **TC 7/2017**
Adoption of Building Information Modelling for Capital Works Projects in Hong Kong

Issue of **Construction 2.0**

Issue of **TC 18/2018**
Adoption of Building Information Modelling for Capital Works Projects in Hong Kong



2017

2018

2019

2020

BIM Adoption @ DevB

BIM Adoption @ BD

ADV034 on BIM

Practice note PNAP ADM-2

3D Map & CSDI @ DevB

The Innovation and Technology Bureau published in Dec 2017 the Smart City Blueprint for Hong Kong setting out the **overall framework and strategy for developing Hong Kong into a Smart City** – including CSDI, 3D Map and BIM.

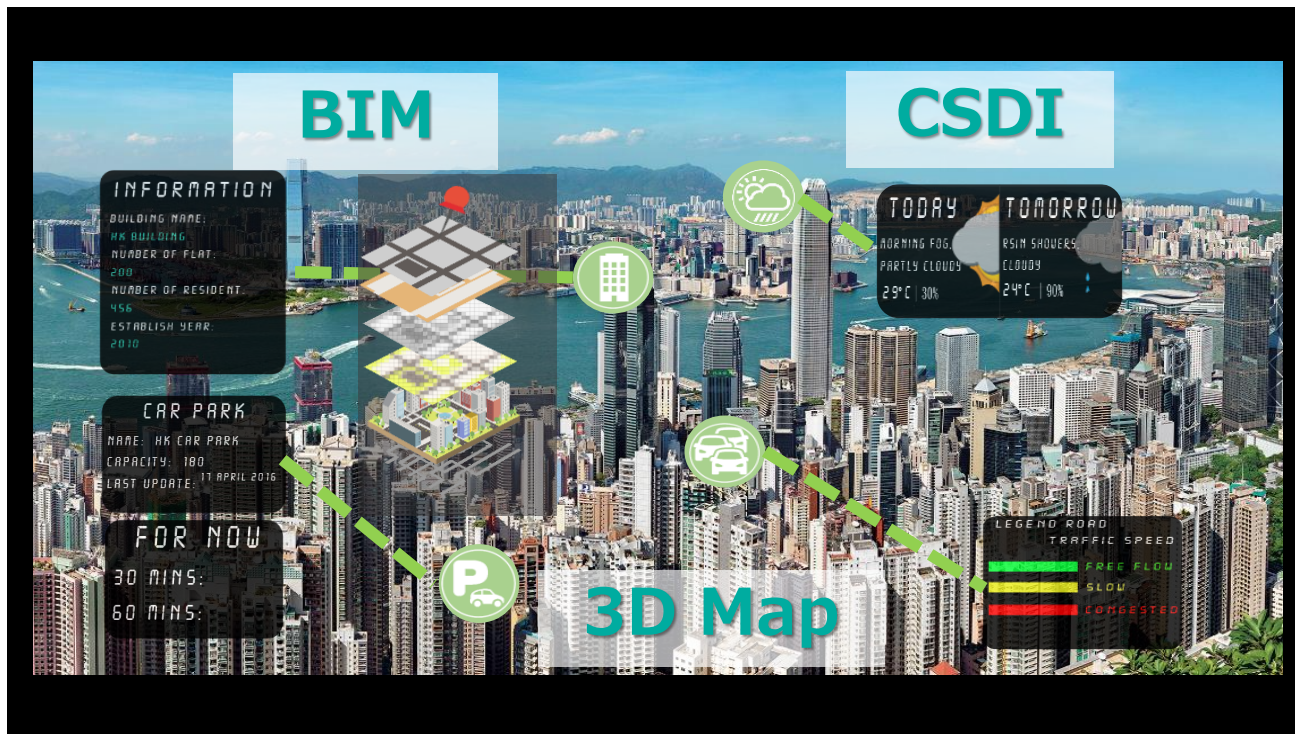


Earmark \$300 million to develop a geospatial data sharing platform (CSDI Portal) and 3D digital maps of the whole territory



Steering Committee on Innovation and Technology endorsed the CSDI Paper on 3 June

Our goal is to develop a Smart Hong Kong with Digital Twin



thank
you!

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