KWPF 10th Anniversary Conference

Toward a New Decade of Inspiration

Towards Digital Twin : Indonesia 3D Cadastre

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Ministry of Agrarian Affairs and Spatial Planning

33 Provincial Land Offices

486 Land Offices

8107 Licensed Surveyor

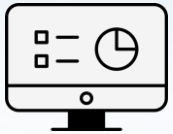
The equipment used consists of the following:
Global Navigation Satellite System (GNSS), drones (also known as Unmanned Aerial Vehicles or UAVs), Terrestrial Laser Scanners (TLS), and Light Detection and Ranging (LiDAR) technology

The authority for land registration is only applicable in non-forest areas

Indonesia Cadastre Overview -
Land Administration Timeline

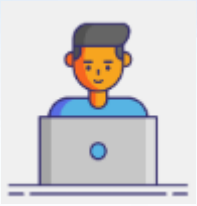
(1960)
Land Registration

1. Indonesia's land registration started since 1960 through the enactment of National Basic Agrarian Law (UUPA).
2. Prior then, the land registration was conducted manually.



(1998)
Digitization

1. The process of converting the information from analog to digital format.
2. Land Office Computerization and Land Office Desktop



(2014)
Web Based App

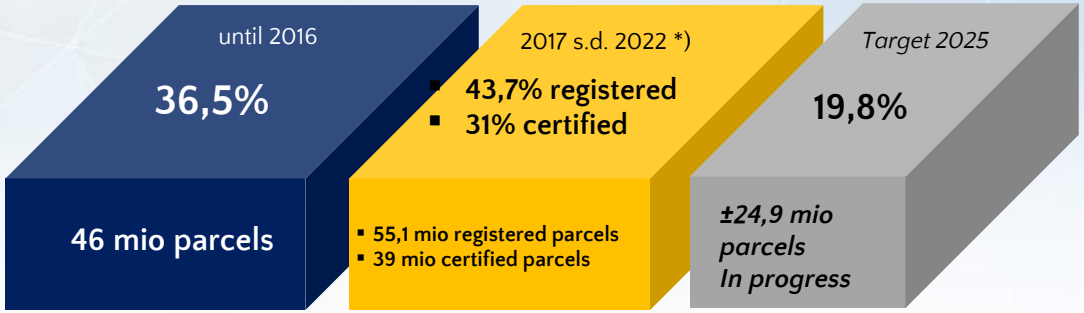
1. The process of using digitized information to make established ways of working to be simpler and effective and efficient.
2. Full web based Land Office Computerization in 486 Land Office across Indonesia.

(2020)
Digital Transformation

Changing the way business gets done and in some cases – creating entirely new form of business, namely:

- ❑ Electronic Mortgage
- ❑ Electronic Land Information Services
- ❑ Implementation of digital/electronic signature

Indonesia Cadastre Overview -
Land Registration Progress by 2022



Total registered land parcels: 101,1 million parcels (80,2%) and 85 million parcels have been certified (67,5%)

126 million parcels

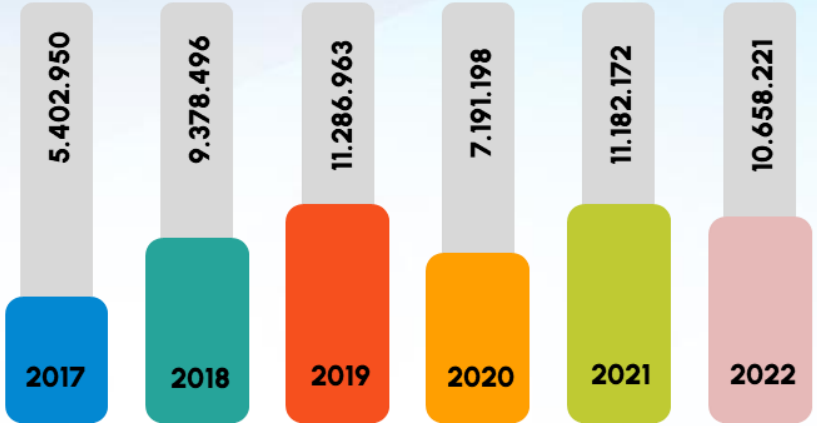
Land parcel registration progress up to 2022

101,1 mio parcels registered (80,2 %)	24,9 mio parcels (19,8%)
85 mio parcels certified (67,5 %)	41 mio parcels (32,5%)

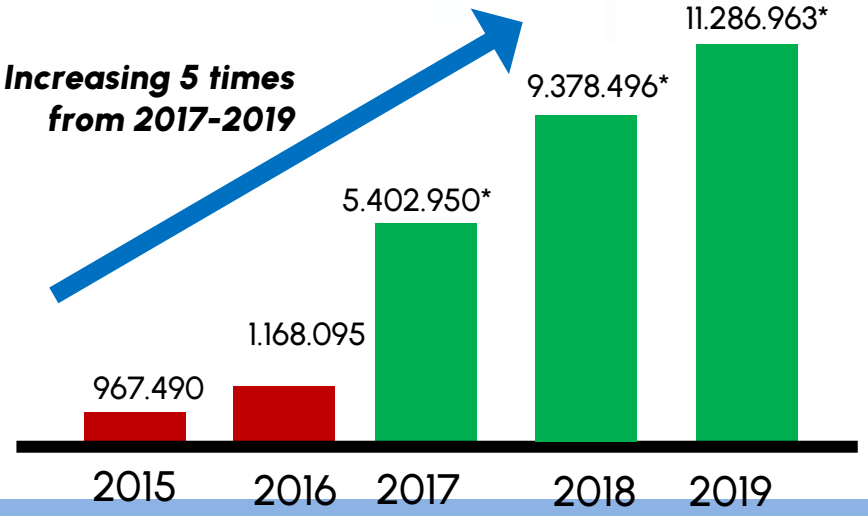
THE LAST SIX YEARS PROGRESS

Average Output 9.183.333

Average Land Certificates 6.500.000

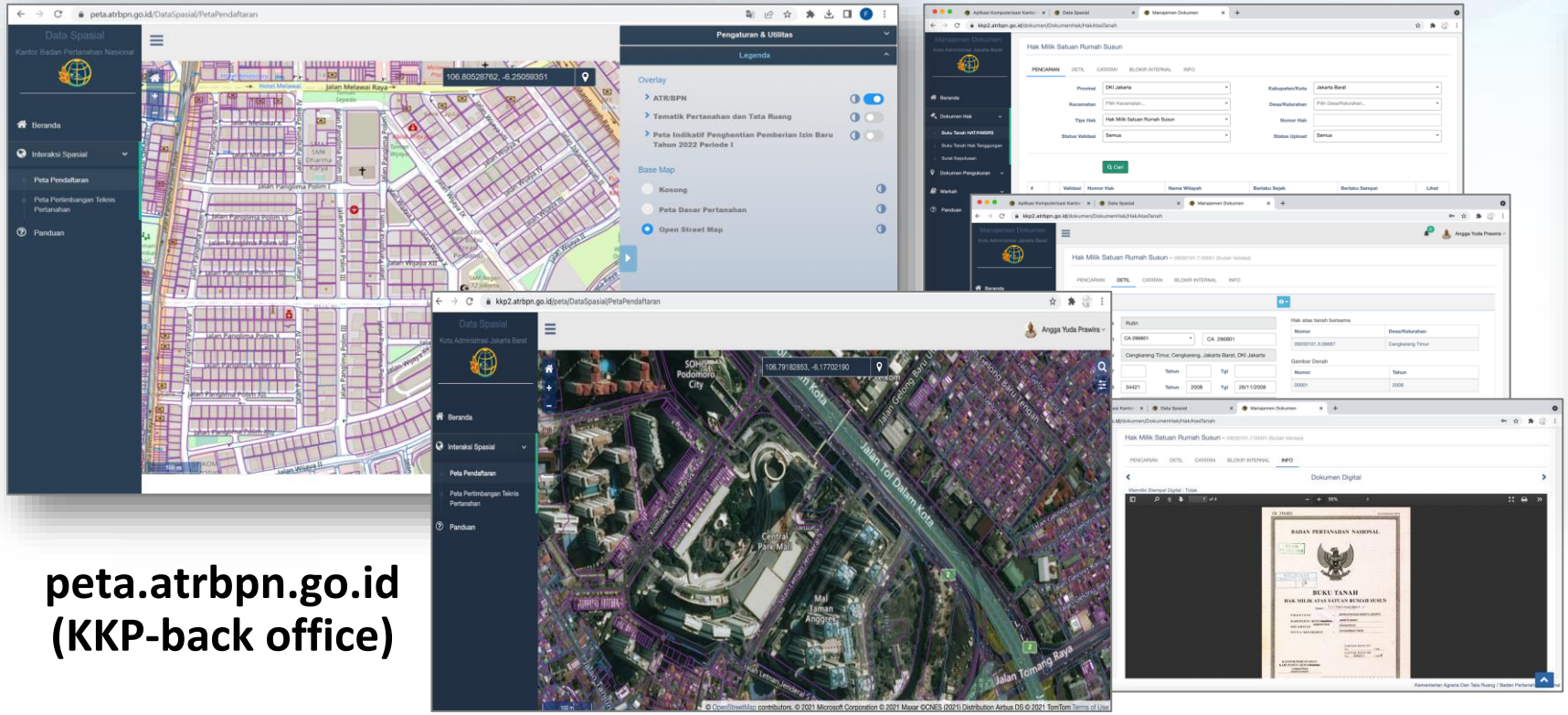


The Evaluation of Land Registration between 2017-2019

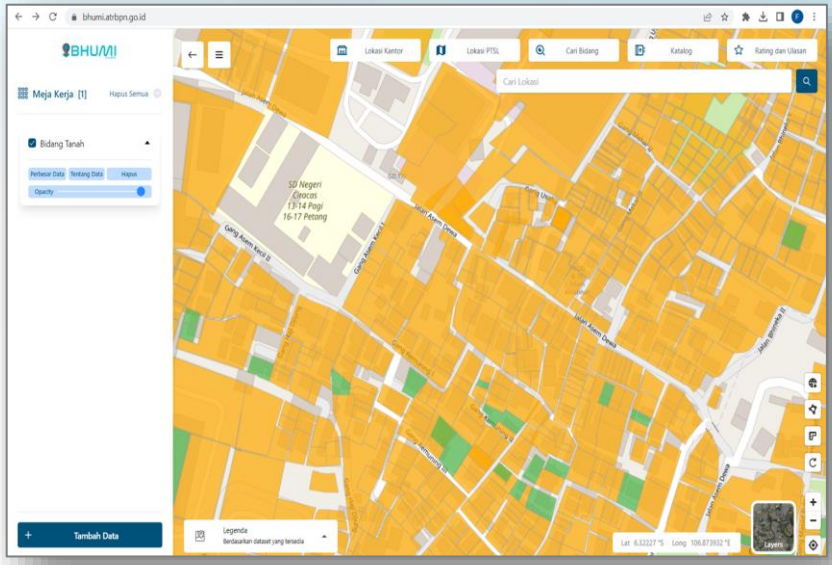


Indonesia Cadastre Overview -
Current Data Condition

In general, land parcels with its attributes is mapped and recorded in 2D using KKP (land services computerization), a centralized land management system



peta.atrbpn.go.id (KKP-back office)



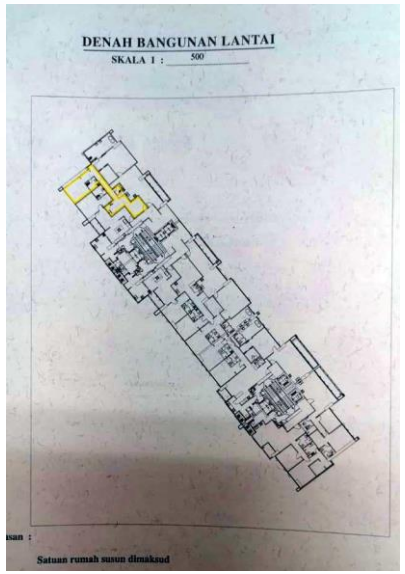
bhumi.atrbpn.go.id (public services)

Indonesia Cadastre Overview -
Strata Title Current Data Condition

Strata title data and its attributes also recorded in 2D

For example, until 2022 in DKI Jakarta Province, there are 280.075 Unit Rights to Flats Certificate have been generated.

No	Land Offices	Number of Unit Rights to Flats/Apartment
1	Central Jakarta	61.921
2	South Jakarta	77.268
3	West Jakarta	56.947
4	East Jakarta	25.771
5	North Jakarta	58.168
TOTAL		**280.075**



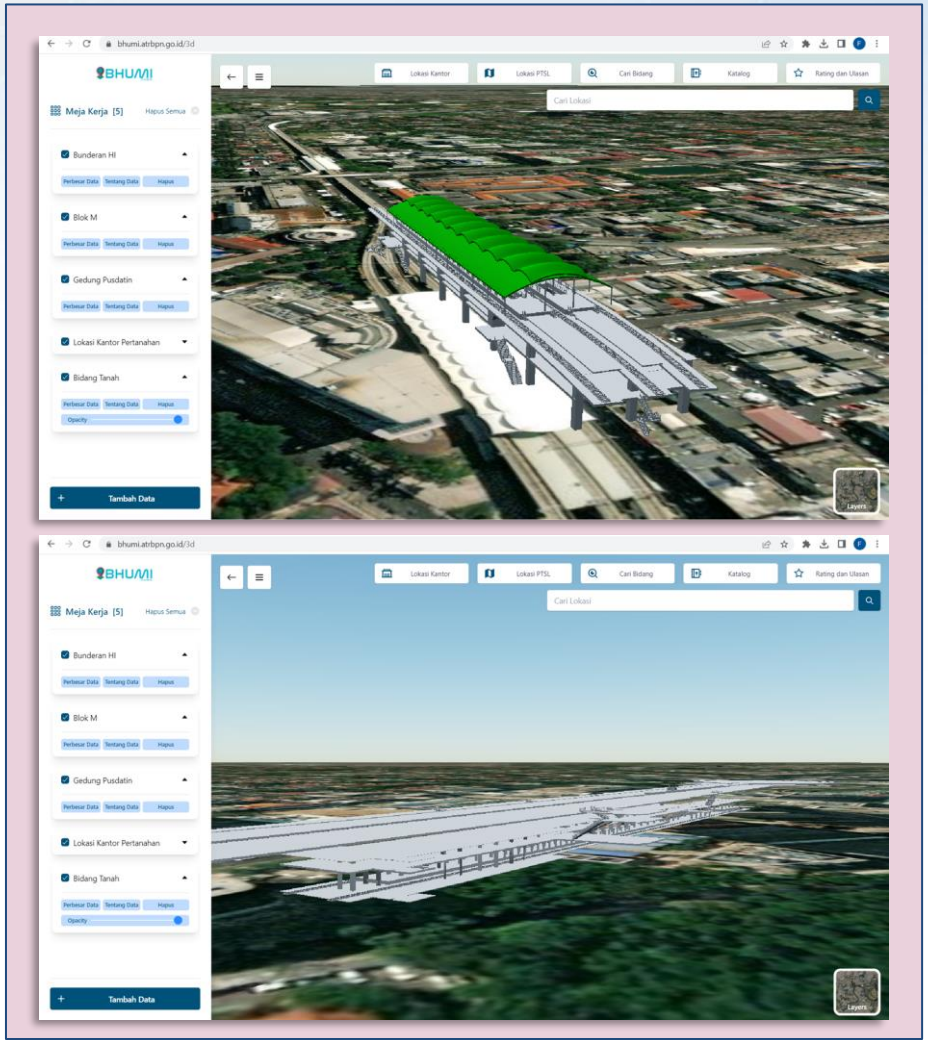
There are 1,508 high-rise building in DKI Jakarta with several activity functions (source DKI Provincial Government);

Out of 1,508 high-rise buildings, it is known that 512 already have a Strata Title Legalization from the Governor (33.95%) but not all are registered for strata title in ATR/BPN.

There are indications of Potential Lost of information, economic growth and revenue (tax, non-tax)

Indonesia 3D Cadastre Implementation -
Several Projects

There are several projects to implement pilot project 3D Cadastre in Indonesia



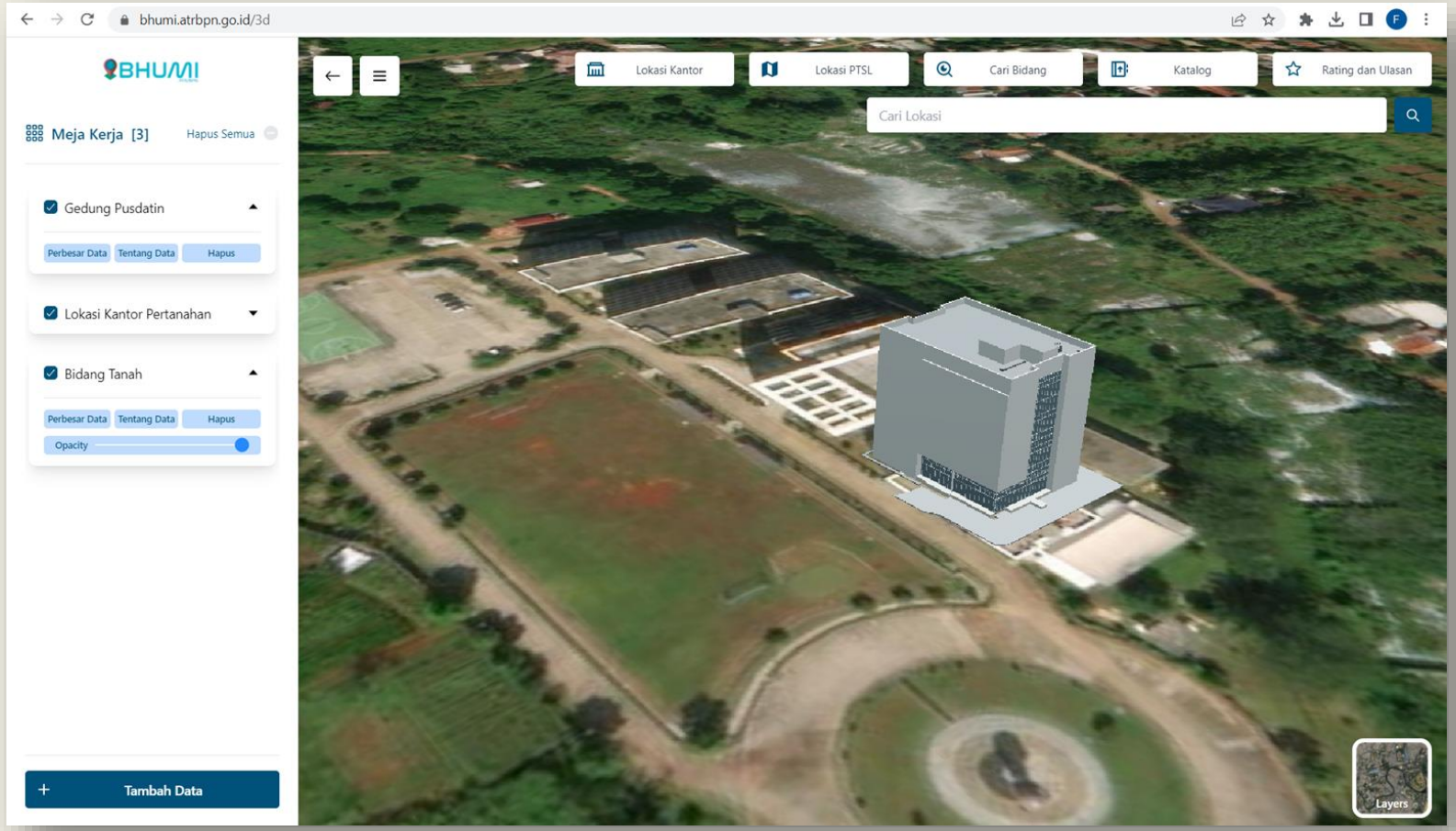
MRT Jakarta (2020)

- In 2020 (collaboration with Gadjah Mada University), MRT Jakarta corridor 1 (upper ground and underground).
- The model of MRT Jakarta was created by converting 2D As-Built Drawings into a 3D model using data validation with Total Station and Distometer, and then modeling in 3D using CityGML.
- The model has been published on bhumi.atrbpn.go.id by 3D tiles format, but it cannot load the 3D cadastre database because the application can't store the 3D database yet.

Indonesia 3D Cadastre Implementation -
Several Projects … cont'd

ATR/BPN Data Center Building (2021)

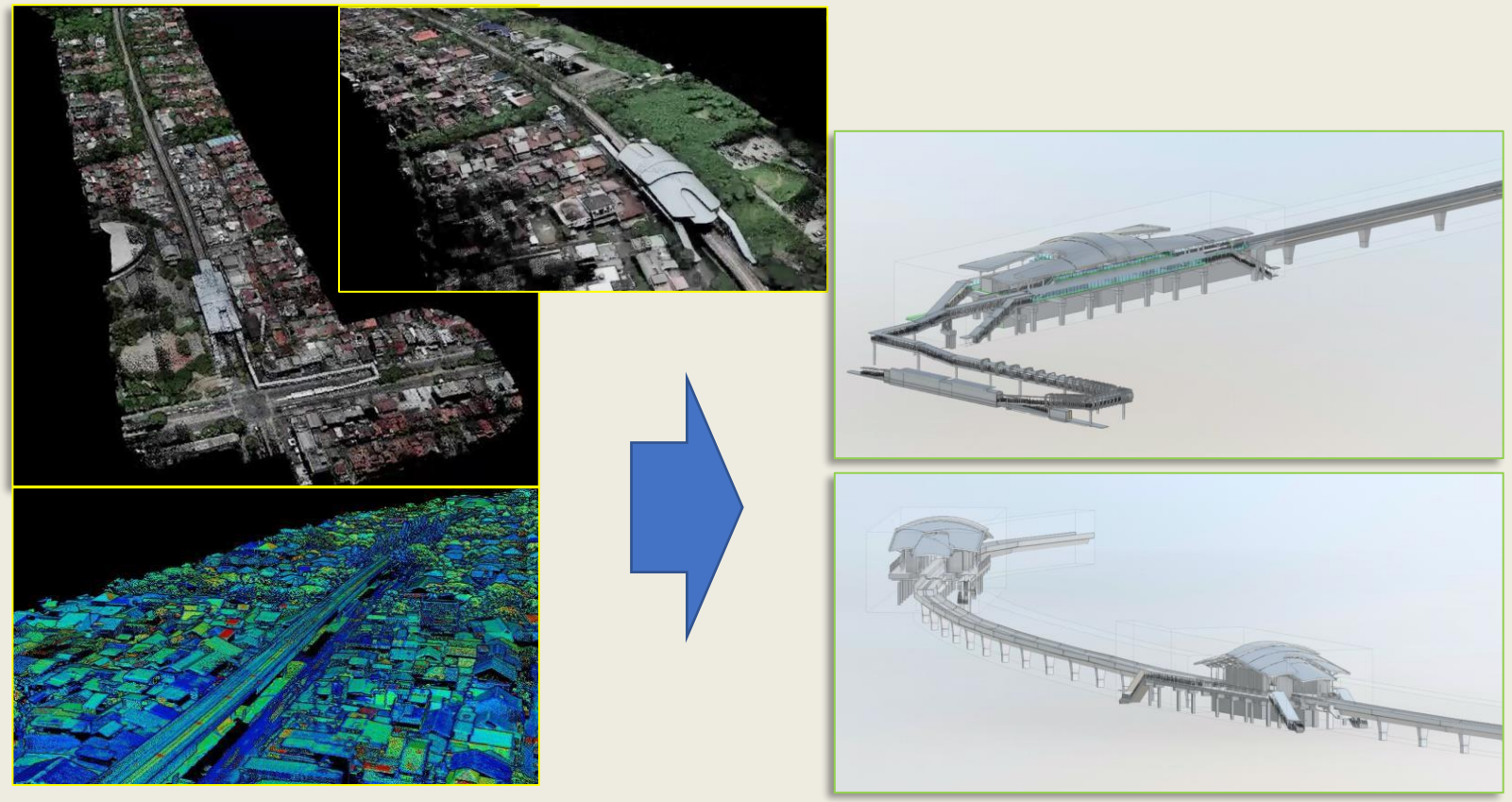
- ATR/BPN Data Center Building, Bogor; In 2021 (collaboration with PT. Deira Sygisindo) government properties (upper ground).
- The model has been created using CityGML and displayed on bhumi.atrbpn.go.id, but it is not yet able to load the cadastre database due to system limitations in storing the database.



Indonesia 3D Cadastre Implementation -
Several Projects … cont'd

LRT Jakarta (2022)

- In 2022 (collaboration with PT. Deira Sygisindo), LRT Jakarta corridor Velodrome Station to Pulomas Station (upper ground).
- The acquisition of 3D data for the LRT infrastructure was carried out using UAV Lidar, Aerial Photos, and TLS.
- The measured data has been used to create a 3D model using IFC.



REGULATION FOR IMPLEMENTING 3D IN STRATA TITLE (HMSRS)

Spatial Concept in Strata Title

Consists of individual strata title which can be owned separately, and joint land rights, joint objects and joint parts

Article 17 of Law Number 20 of 2011 regarding Strata Title

Strata Title can be built on Ownership Rights (HM), Building Use Rights (HGB) or Use Rights (HP) on state land and Building Use Rights (HGB) or Use Rights (HP) on Management Rights (HPL).

Article 33 Governor's Regulation (DKI Jakarta) Number 118 of 2020 regarding Spatial Utilization Permit

Drawing of the design concept comes with 3 dimensional scheme for non-residential buildings which have more than 8 floors.

Indonesia 3D Cadastre Implementation -
Several Projects of Strata Title

(DKI JAKARTA Context)

The Challenges In Implementing 3D Cadastre for Strata Title

There are +/- 249 high-rise buildings in DKI Jakarta that its Strata Title Legalization from the Governor have not been issued, therefore could not registered by ATR/BPN It is happened because of several problems :

1. The procedure for resolving violations/over-intensity of buildings or floors--both in replacement land and compensation--the process takes a long time
2. Permitting proposals based on the design plan— when the SLF (function-worthy certificate) permit is issued, the building is already constructed - - - it is might have some differences with the design plan.
3. The obligations fulfillment from the developer such as fulfillment of obligations for social facilities and public facilities either in the form of land or construction which must be submitted to the provincial government

Despite ensuring the certainty of the rights, the 3D model is needed for providing multipurpose information such as planning and spatial decision making.

Hence, the geodatabase and the visualization of 3D Model need to be prepared on an integrated application.

The Provincial Land Office of DKI Jakarta develop **KaKap** Application

Indonesia 3D Cadastre Implementation -
Several Projects of Strata Title

(DKI JAKARTA Context) … cont'd

KAdaster lengKAP (KAKAP)/ Complete Cadaster

What is KAKAP Jakarta?

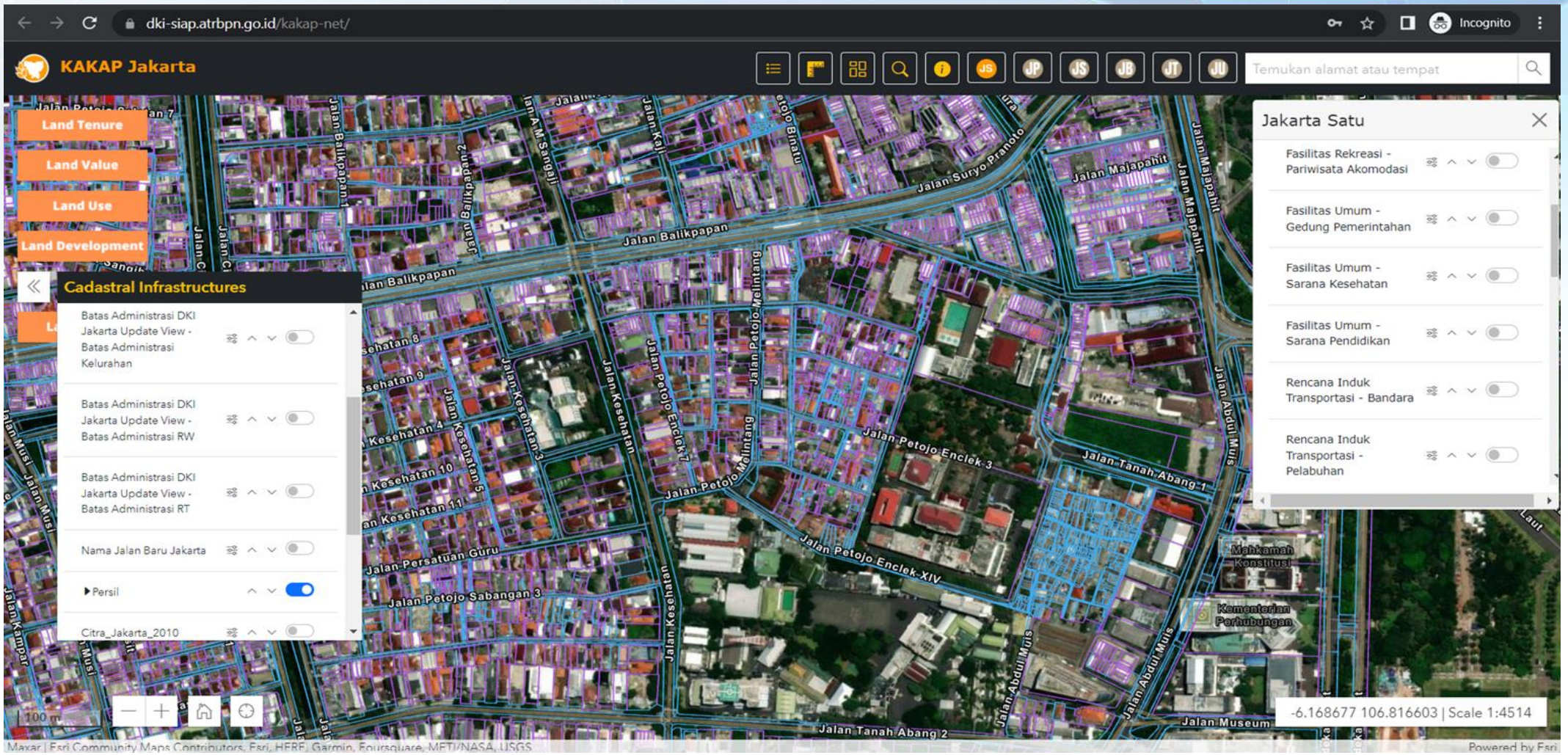
KAKAP Jakarta is an abbreviation of two Indonesian words, ***KAdaster lengKAP*** (meaning "Complete Cadaster"), aiming at ensuring all land parcels within the Province of Special Capital Region of Jakarta (Jakarta) are registered, mapped, and accounted for in the national land registry system of Indonesia; serving as the 'canvas' for an integrated land administration information system - leaving no one behind and no parcel behind.

KAKAP Vision

Complete Registration	Complete Information	Complete Coverage
All land parcels and rights are registered, mapped, and accounted for	All registered land parcels are recorded with complete land tenure, land value, land use, and land development information	All space on land, in the air, and on water are registered in the cadastral system

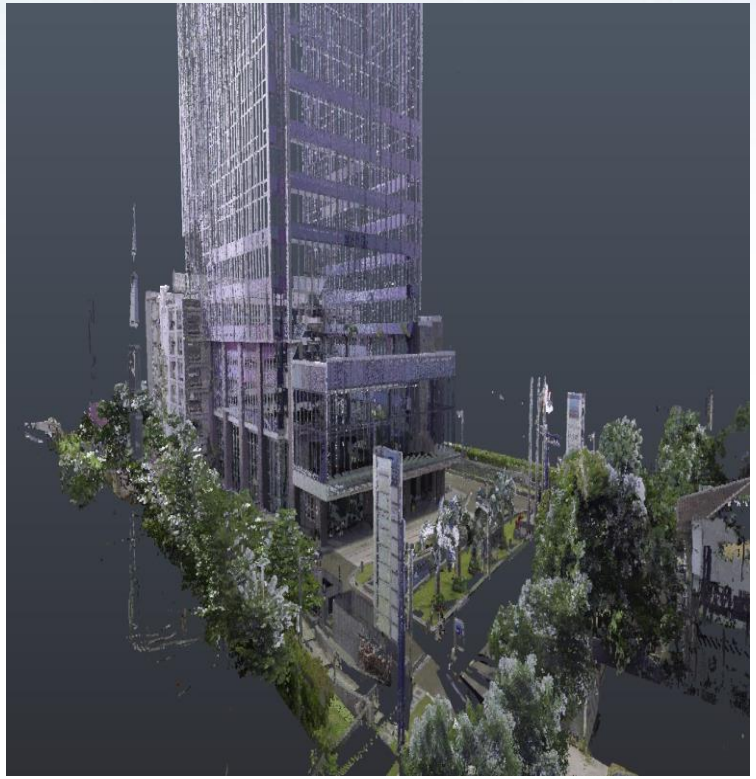
KAKAP is a platform for collaboration between ATR/BPN DKI Jakarta and Provincial Government

Indonesia 3D Cadastre Implementation -
Several Projects of Strata Title



Indonesia 3D Cadastre Implementation -
Several Projects of Strata Title

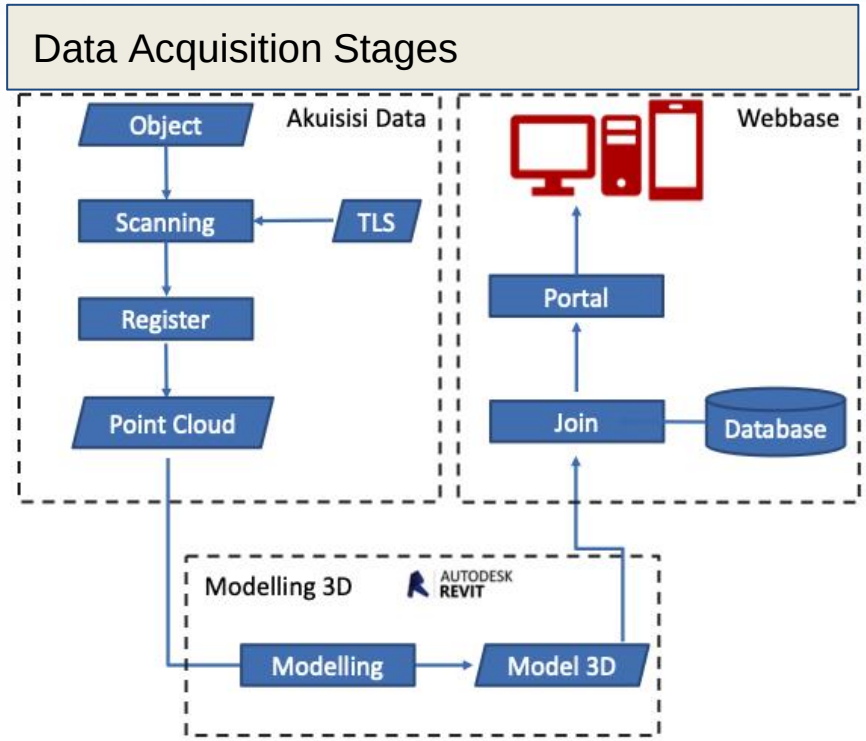
(DKI JAKARTA Context) … cont'd



3 DIMENSION CADASTRAL DATA ACQUISITION --- BIM

The initial step of applying 3-dimensional lies in:

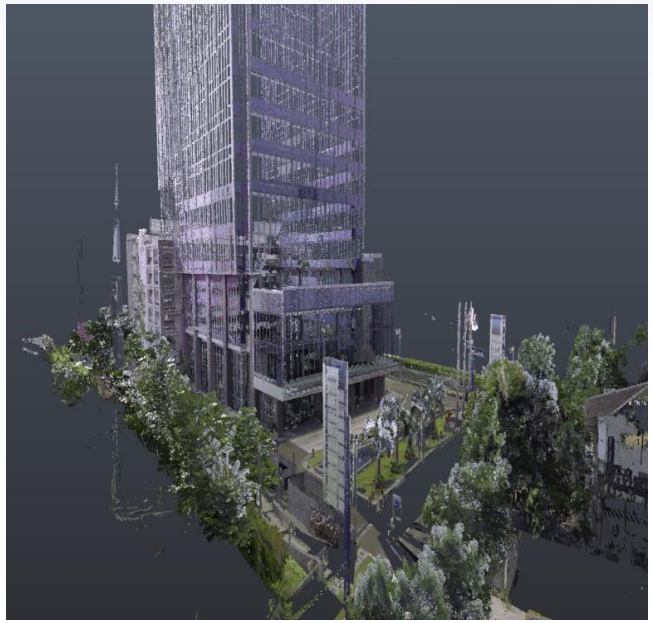
- The suitability of spatial documents of unit model with the physical existing in the field;
- Floor plans model visualization on strata title certificates (SHMRS);
- Data storage management and the visualization database.

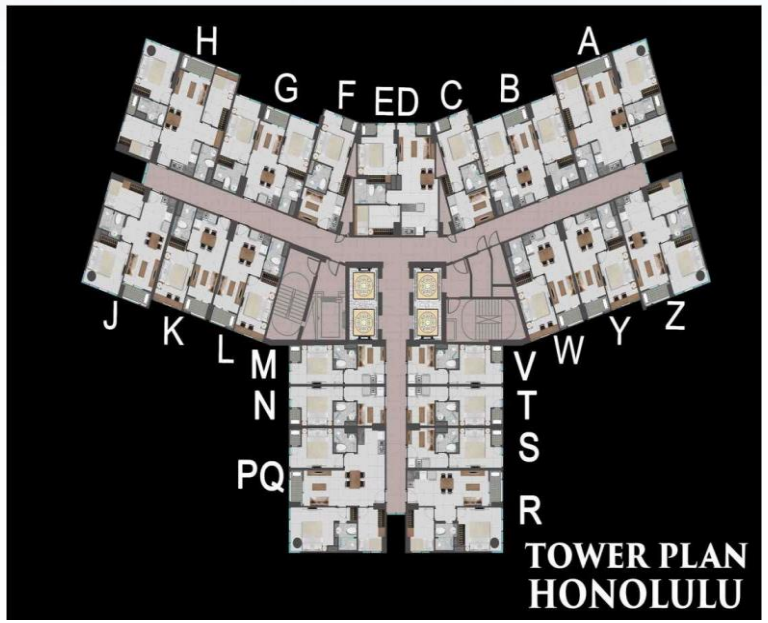


Indonesia 3D Cadastre Implementation -
Several Projects of Strata Title

(DKI JAKARTA Context) … cont'd

POINT CLOUD DATA ACQUISITION





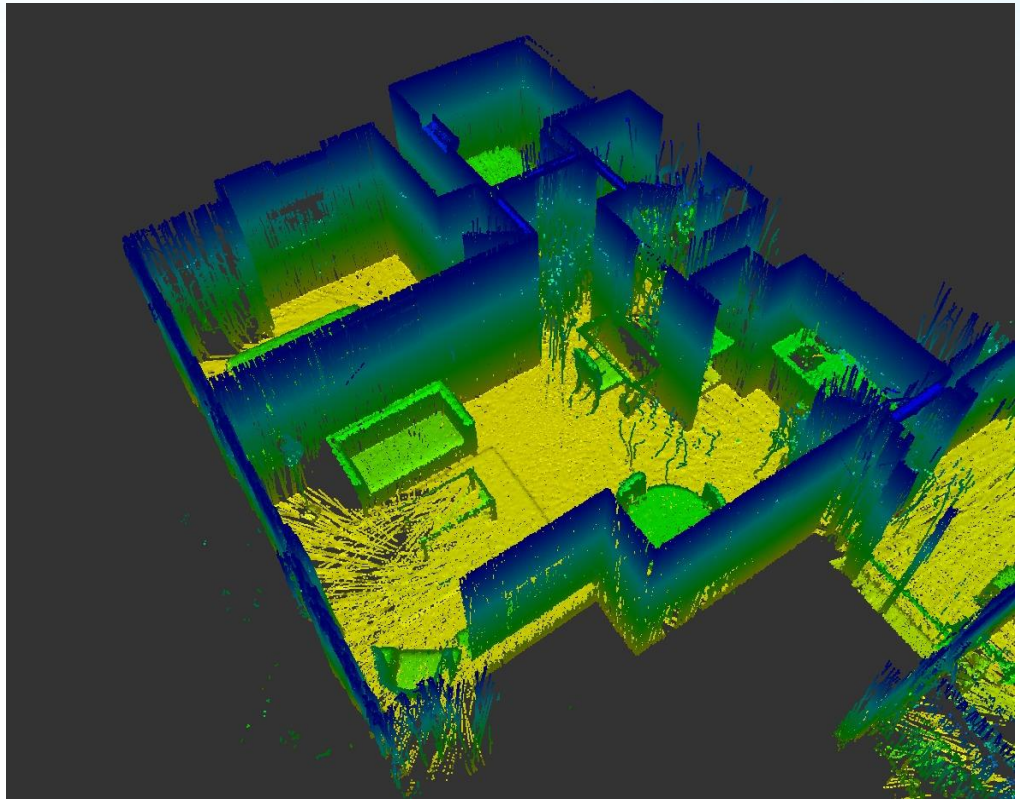
Point Cloud → Supporting Docs → Attribute Data

Indonesia 3D Cadastre Implementation -
Several Projects of Strata Title

(DKI JAKARTA Context) … cont'd

Honolulu Apartment

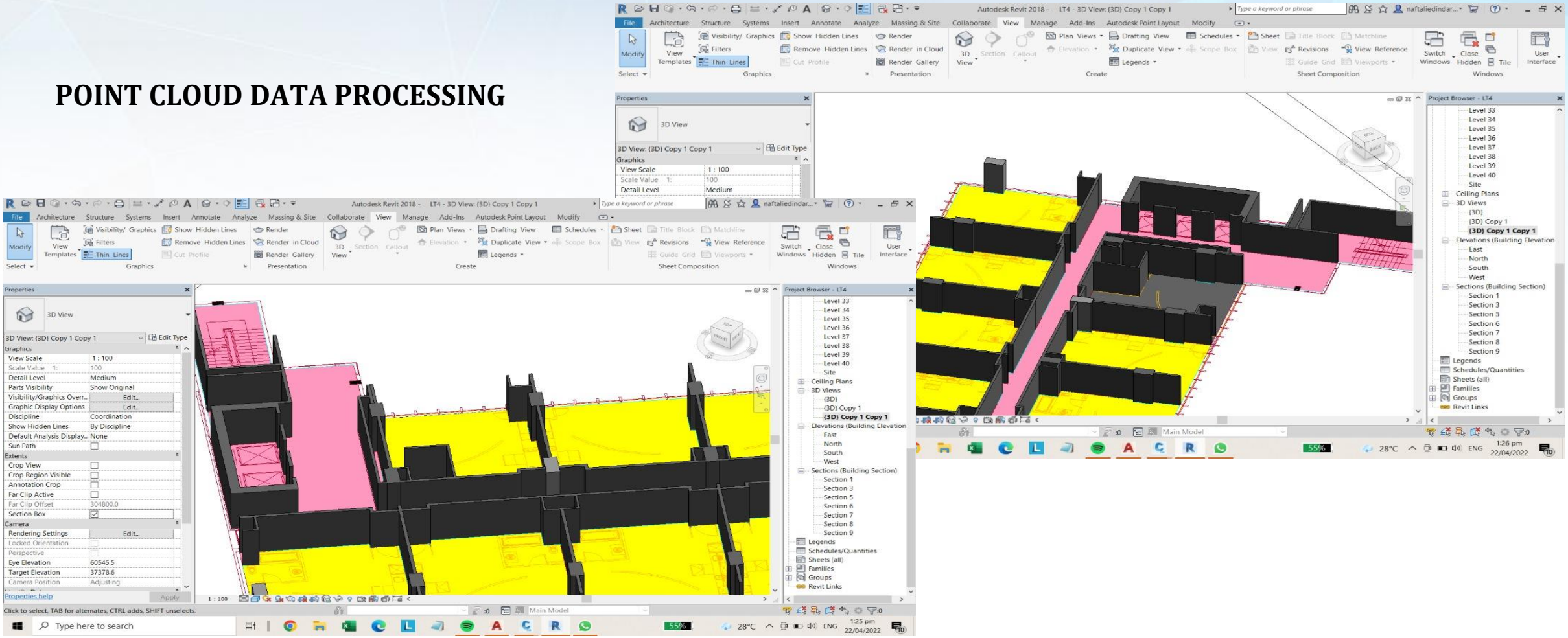
POINT CLOUD DATA ACQUISITION



Indonesia 3D Cadastre Implementation -
Several Projects of Strata Title

(DKI JAKARTA Context) … cont'd

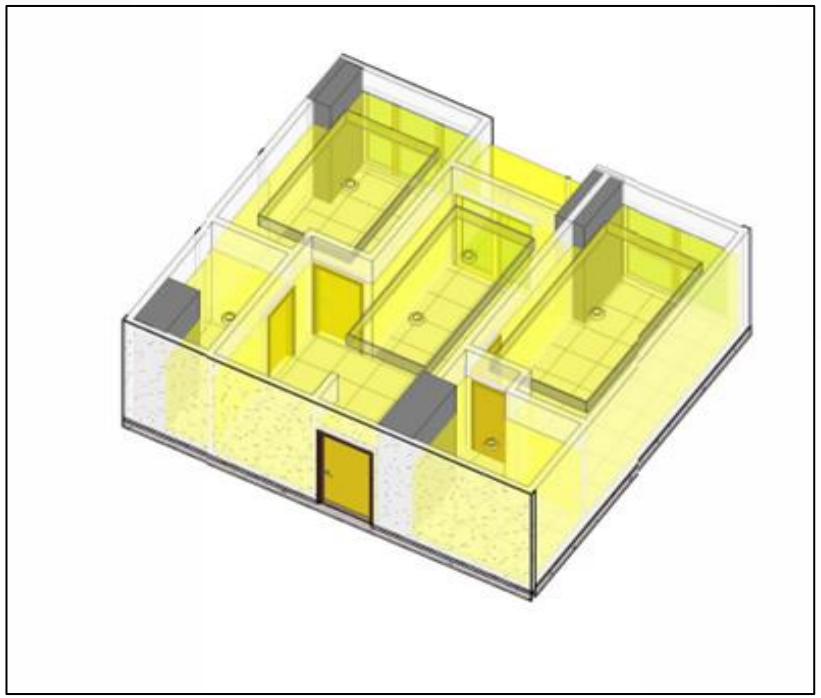
POINT CLOUD DATA PROCESSING



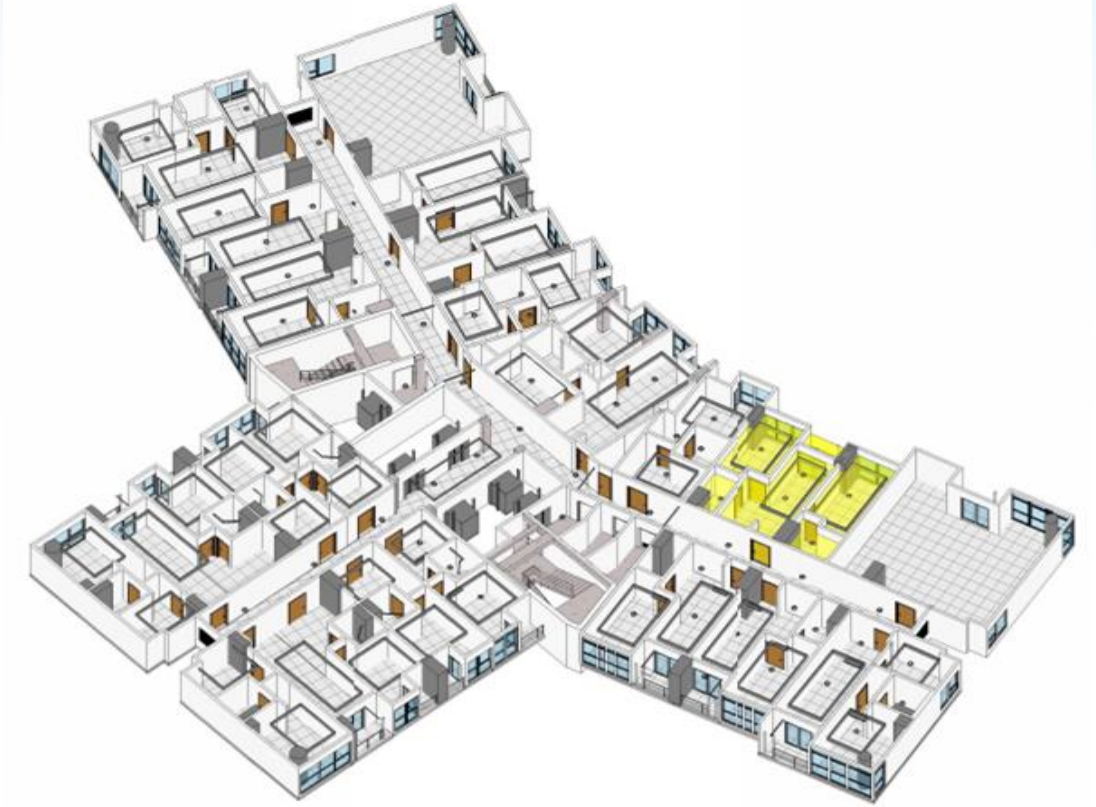
(DKI JAKARTA Context) … cont'd

DISPLAY OF UNIT MODELS ON STRATA TITLE (HMSRS)

3D UNIT SKETCH
Scale 1:100



3D FLOOR UNIT SKETCH
Scale 1:250



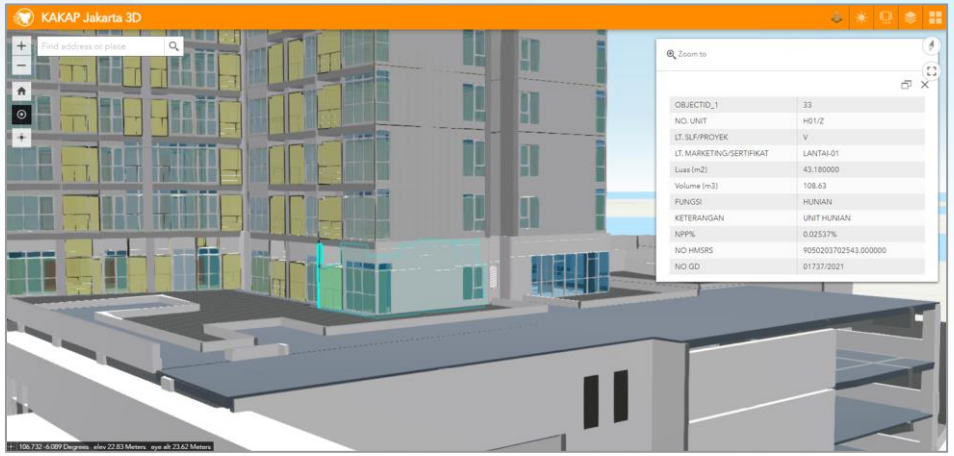
Indonesia 3D Cadastre Implementation -
Several Projects of Strata Title

(DKI JAKARTA Context) … cont'd

3D DISPLAY IN KAKAP

Gold Coast Apartment

- In 2021 (collaboration with PT. Deira Sygisindo), apartment (upper ground)
- The acquisition of 3D data was carried out using Terrestrial Laser Scanner (TLS), and modeling in 3D using CityGML. The model also displays the 3D representation of each floor of the apartment.

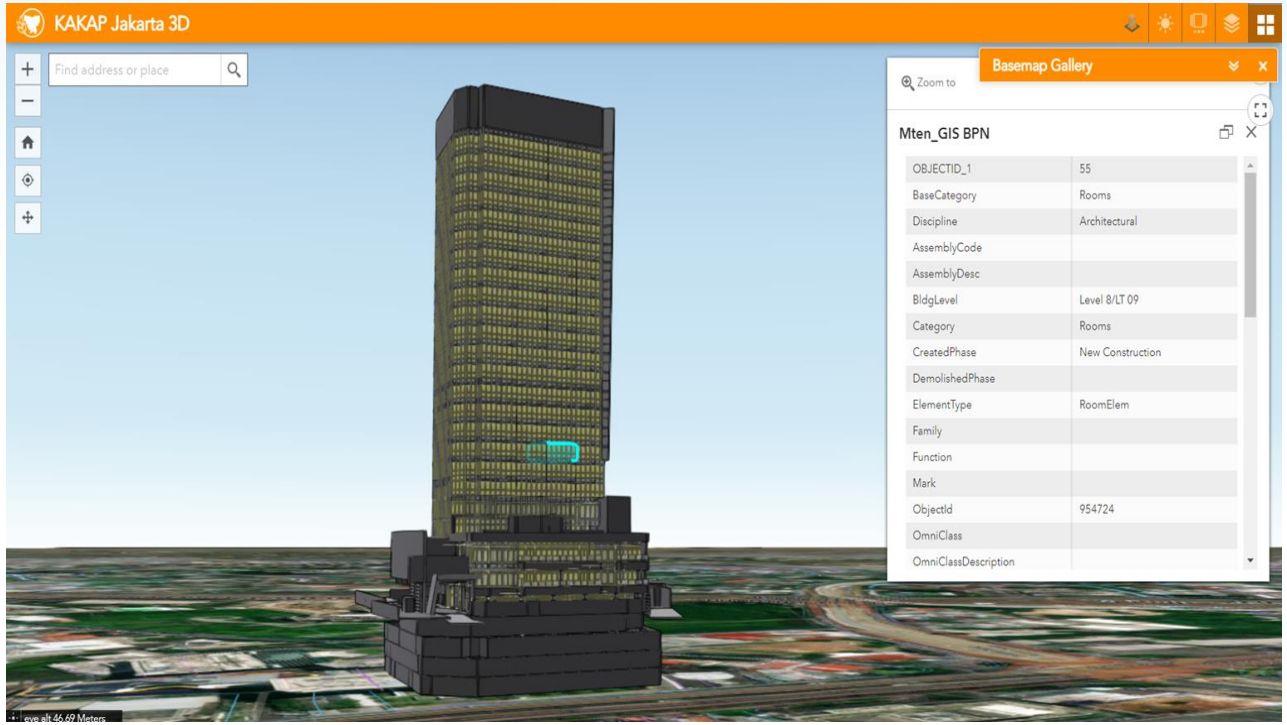


Indonesia 3D Cadastre Implementation -
Several Projects of Strata Title

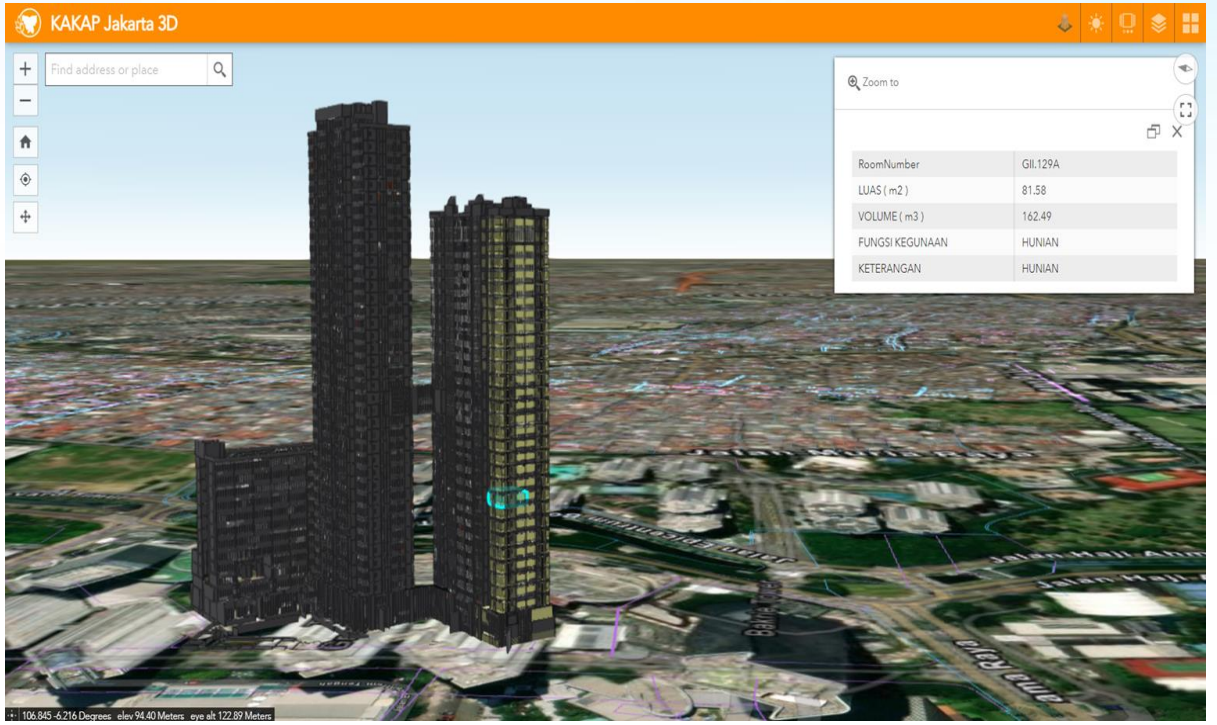
(DKI JAKARTA Context) … cont'd

Other Strata Title Projects

Menara Tendean Apartment



The Groove Apartment

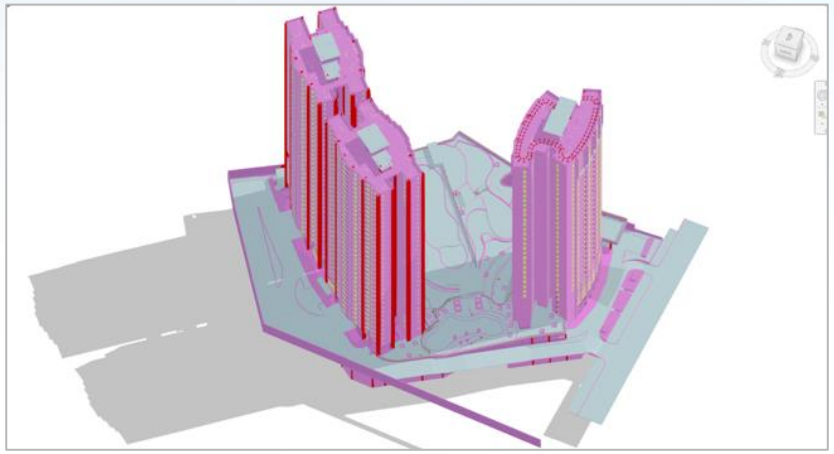


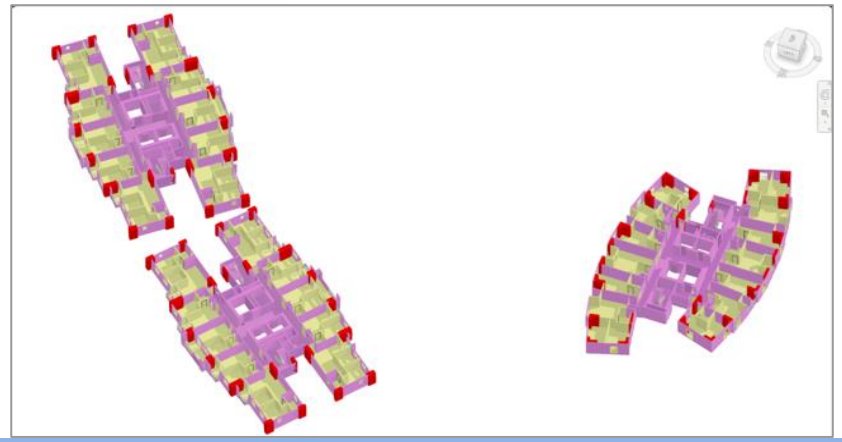
Indonesia 3D Cadastre Implementation -
Several Projects of Strata Title

(DKI JAKARTA Context) … cont'd

Ongoing Strata Title Projects

The Wave Apartment

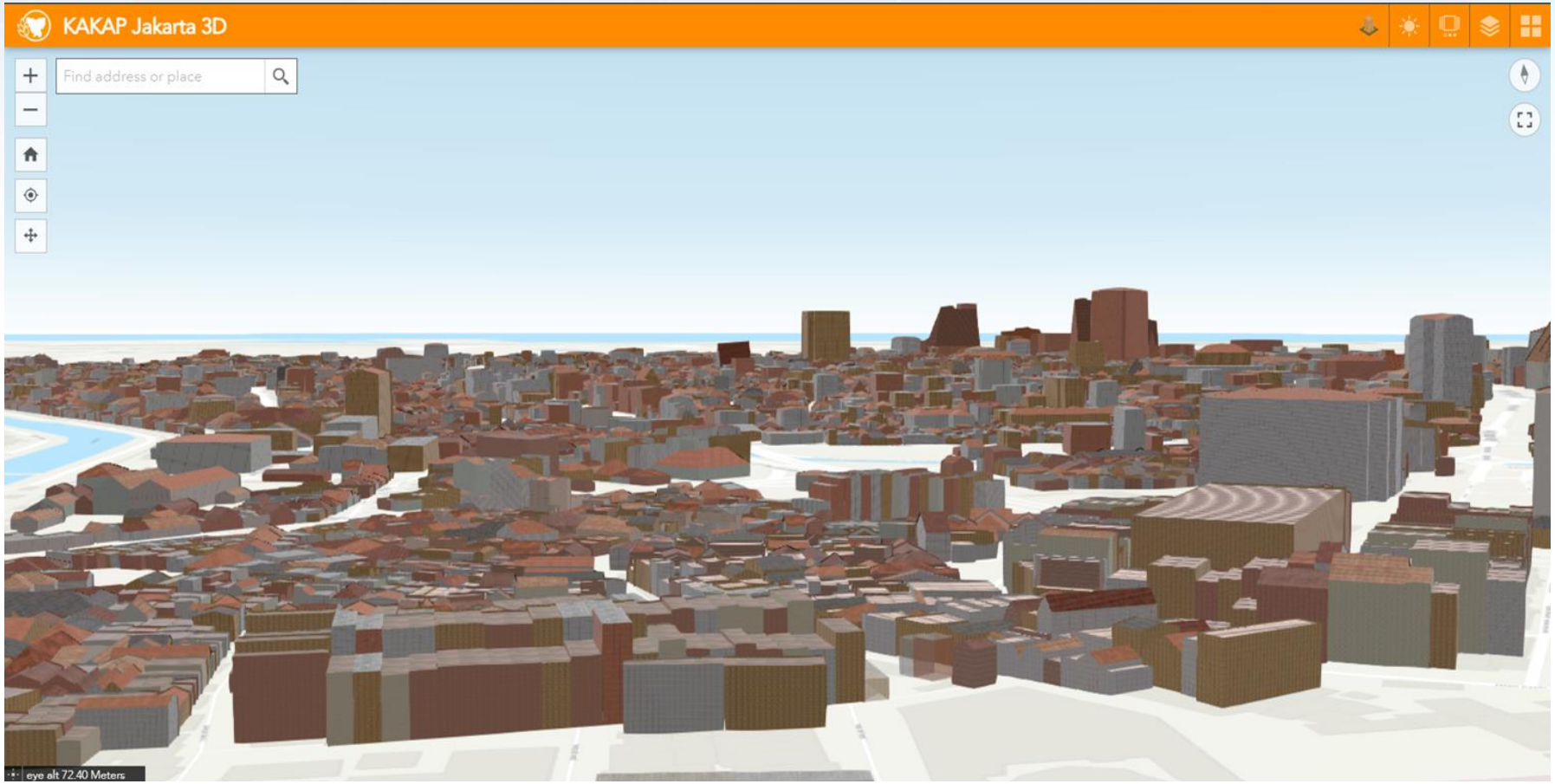




Indonesia 3D Cadastre Implementation -
Several Projects of Strata Title

(DKI JAKARTA Context) … cont'd

Ongoing in Development Digital Twin for Smart City



- Currently The Government of DKI Jakarta Province develop 3D model generated from LiDar Acquisition (2010) using Sketchup in 16 Sub District for visualisation of Spatial Planning Purpose to support Smart City concept.
- In 2023, there will be Aerial Photogrammetry and Lidar acquisition. Hence, this can become a basis data to develop 3D information system toward Jakarta Smart City.

Indonesia 3D Cadastre Implementation -
Several Projects

Indonesia Digital Twins base on GSCP Studies

Phase I (2020-2021)

- Diagnose the status of Indonesia's existing spatial data and cadaster maps
- Identify the opportunities and constraints in leveraging 3D geospatial solutions

Phase II (2021-2022)

- Develop the 3D cadastre business model using modern multipurpose cadaster solutions
- Specify 3D technical architecture and data requirements
- Build government capacity to design a Digital Twin for 3D cadastre

Priority Definition

- Business Models and Legal Mandates
- 3D GIS Technical Standards
- 3D Property Rights, City Planning and Monitoring

Indonesia 3D Cadastre Implementation -
Projection - Challenges - Next Steps

Projection

- The increasing needs of land for settlement push the development in upper and lower ground since the habitable land can not be expanded.
- In the future, the land registration system in Indonesia will continue to develop from 2D to 3D.
- Regulation as a basis of the vertical separation of ownership of the upper ground and underground followed by technical guidelines.
- 3D for multipurpose information: land tenure, land value, land use and land development.
- 3D information for smart city

Challenges

- The strata title have been registered (start in 90's) and stored data in 2D.
- The existing high-rise building does not modelling 3D yet, need conversion.
- The registering property of upper and underground building (not only strata title) is a high demand.
- There no business process for 3D cadastral registration, yet standardization of 3D data.
- The application of computerized land registration system (KKP) is still in 2D.
- The geoportal services (bhumi.atrbpn.go.id was built using Cesium) has not yet support LADM Business Process

Next Steps

- Regulation regarding management rights and land rights on the upper and under ground.
- Business process on registering 3D in the land administration system.
- Data standardization for 3D modelling.
- Introduce the electronic land certificate (Sertifikat Elektronik) for 2D and 3D
- Integrated 3D data information system

Grand Design Digital Twin

CADASTRE

- Parcel data
- Upper ground spaces (Ruang Atas Tanah)
- Underground spaces (Ruang Bawah Tanah)
- Flat (Rumah Susun)
- Marine cadastre

INCREMENTAL IMPROVEMENT

- 3D Basemap (Lidar)
- Block Adjustment
- Interoperability Data (Spatial planning, Public work, Statistic Beureau, etc)
- NSDI (National Spatial Data Infrastructure) Platform
- Complete digital cadastre

→ Digital Twin

The Ministry of Agrarian Affairs and Spatial Planning/National Land Agency

Organization Website : www.atrbpn.go.id

Headquarters Location:
Jl. Sisingamangaraja, Jakarta Pusat, DKI Jakarta, 12110 ID

THANK YOU

Serve, Professional, Trusted