3D Cadastre Web Map: Prospects and Developments

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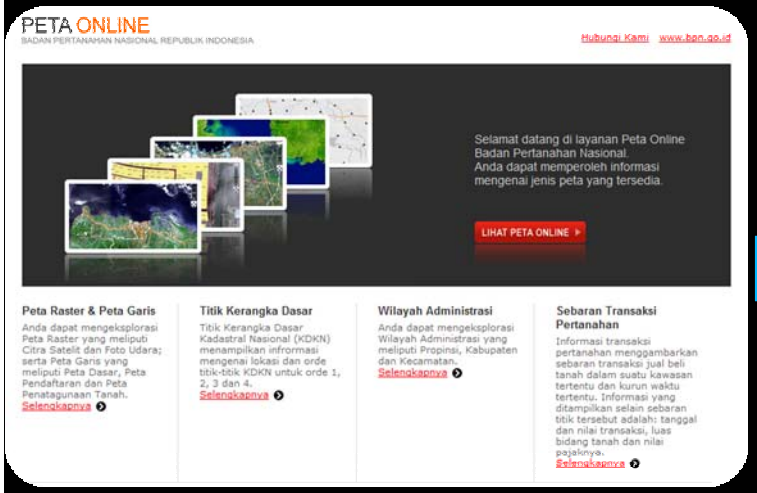
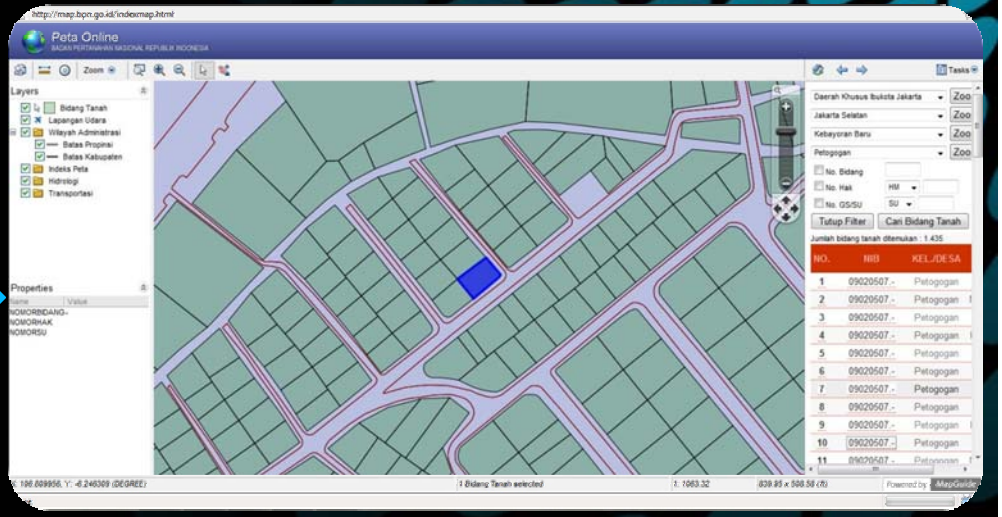
Why doing 3D Survey & Mapping services for LA?
(Indonesian case)





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Up to 2009 land registration:
-Only up to 40% out of 86.845.839 parcels (2D)
- Survey and mapping activities intensified

Vertical/3D constructions with rights:
- growing interest
- limited legal foundations (only for apartments)
-other 3D constructions and uses above and below land parcels not yet defined

Why doing 3D Survey & Mapping services for LA? (Indonesian case)

Courtesy: flickr

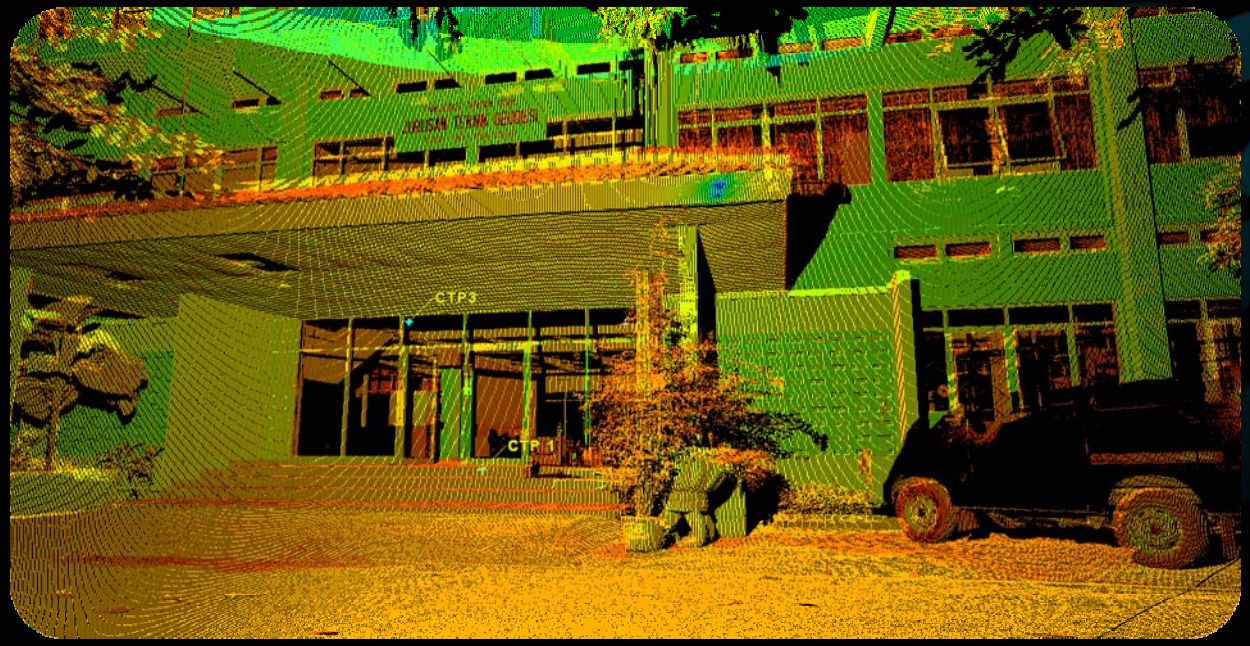
In line with the plan to renew Land Administration Law, registration services to 3D property objects will be accomodated

Motivation for 3D Cadastre Web Map

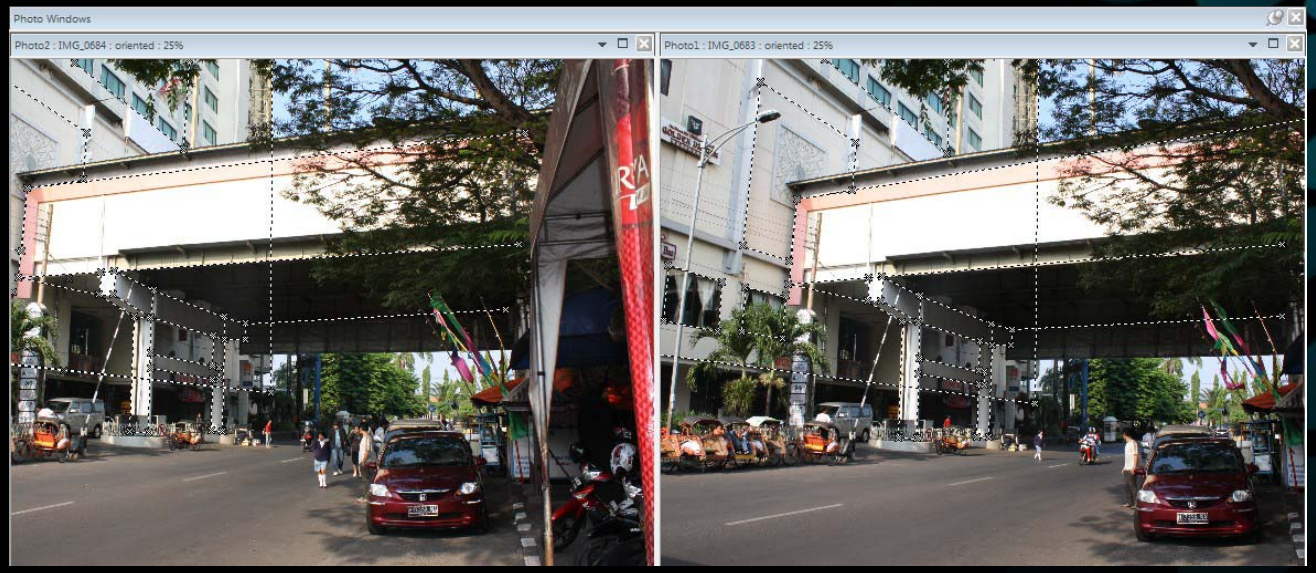
From Surveying to Modeling

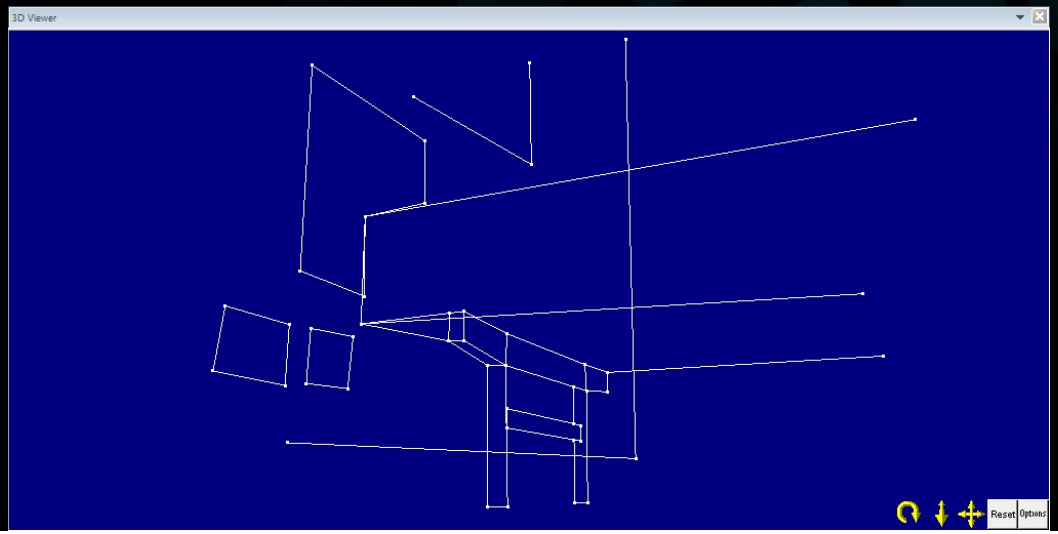
- current survey and photogrammetry technologies offer full support to generate 3D data model in the format of CAD drawings
- More possibilities to convert CAD data into geometries in geospatial databases

Terestrial laser scanner

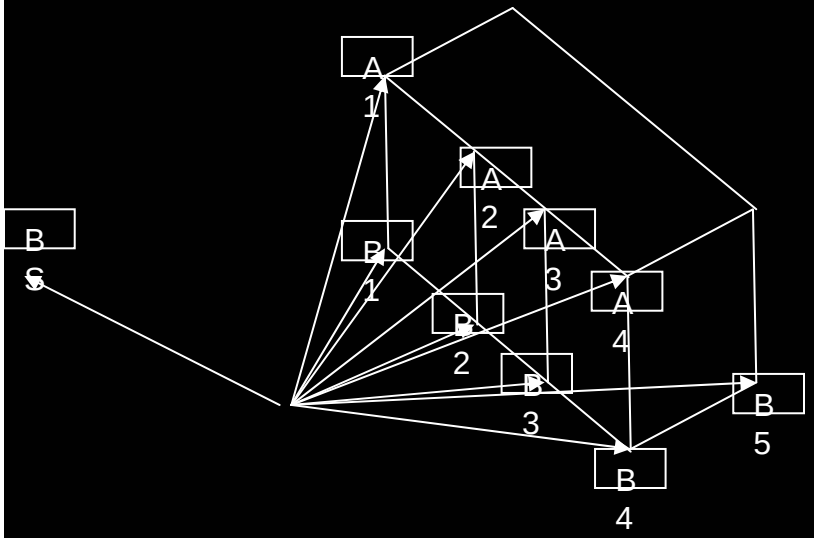


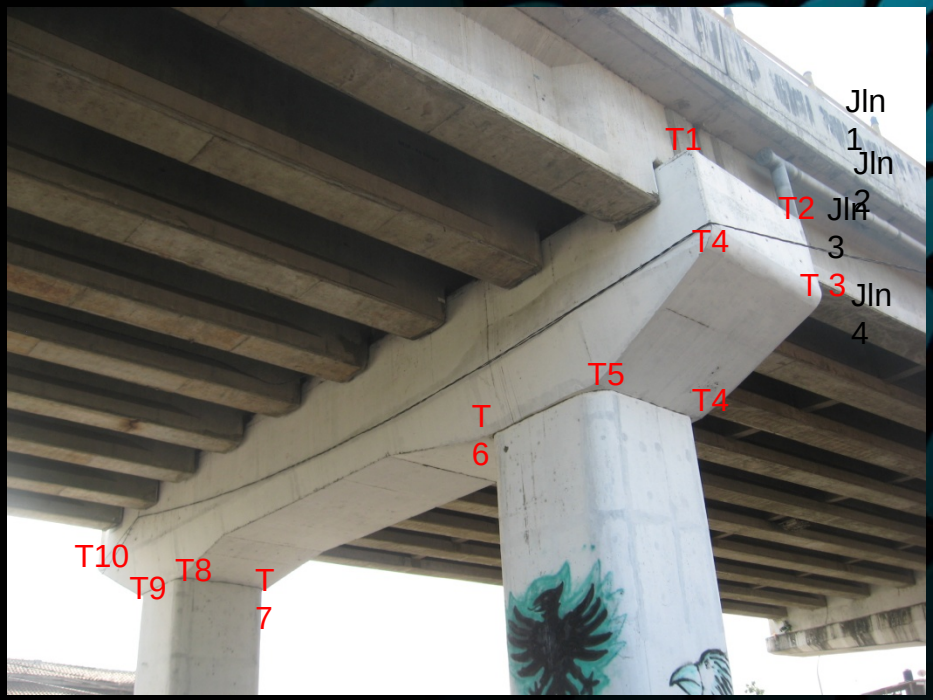
Non topographic photogrametry measurements





Total Station Measurements



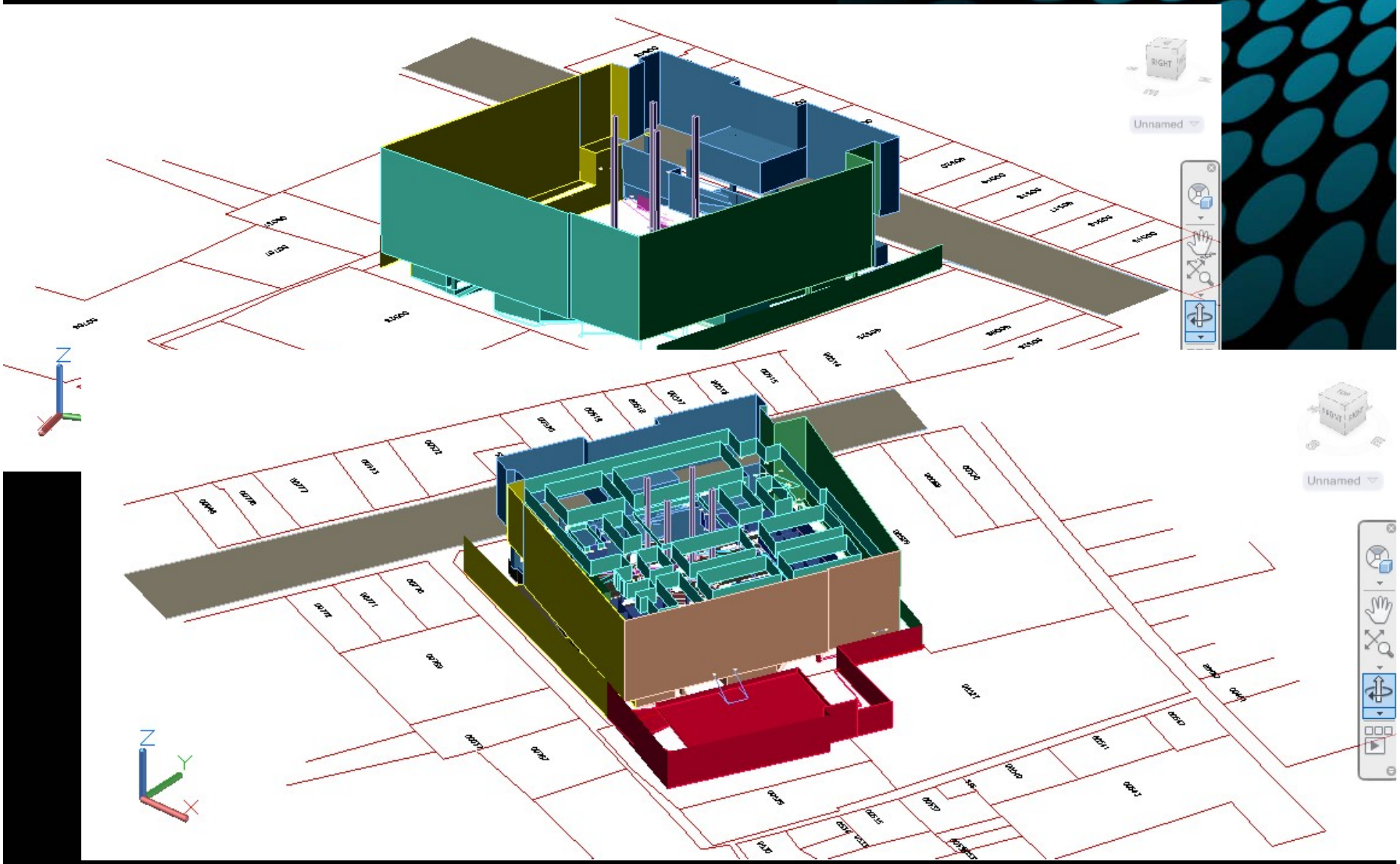


Motivation for 3D Cadastre Web Map

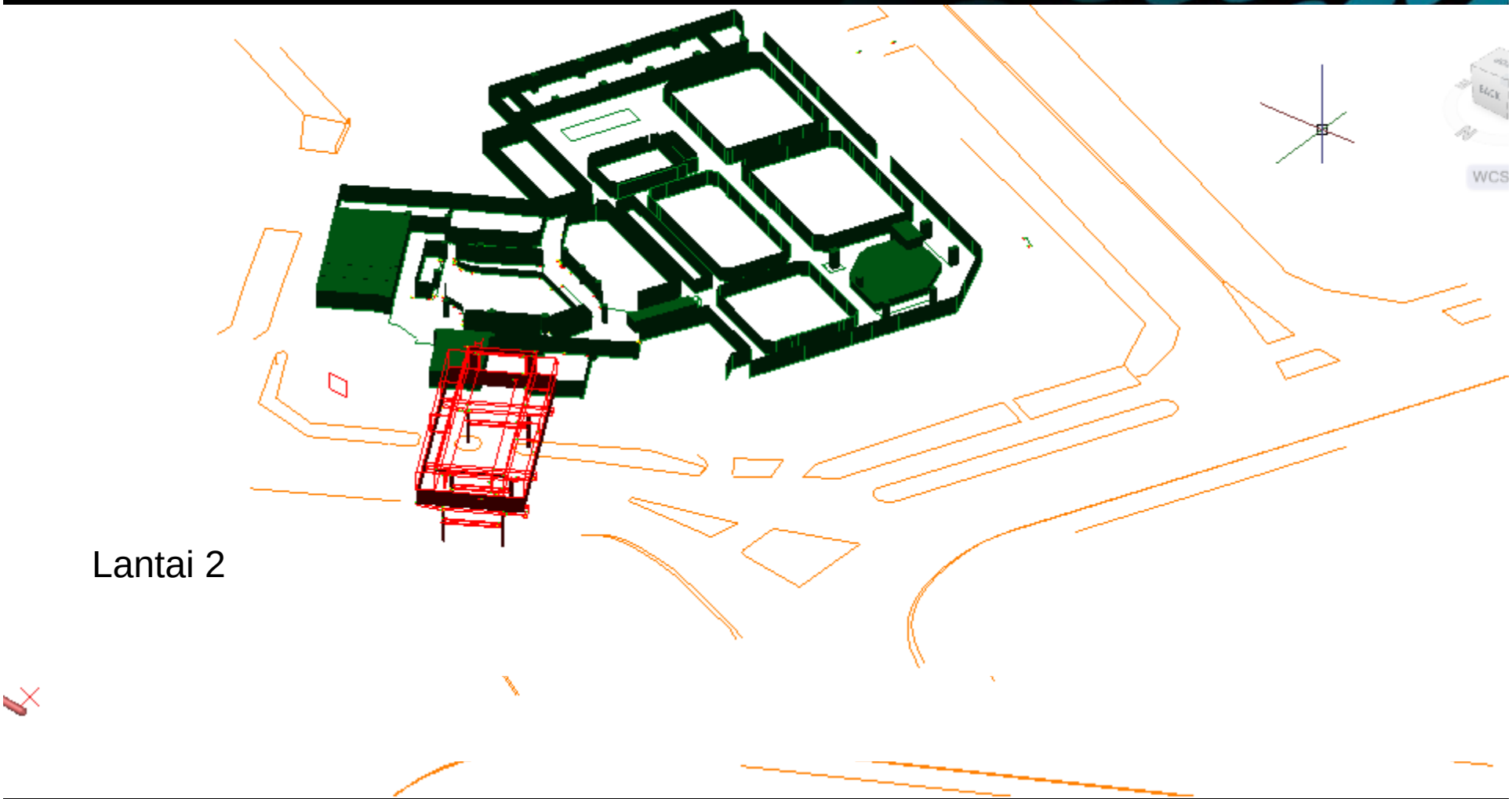
From Modeling to Rendering/Visualization

- Need a proper yet consistent system to facilitate the use of resources (database, survey plans, documents) for supporting land registration activities (incl. 3D property registration) & spatial planning through web-based solutions
  → efficiency
  → coordinated actions
- National land information policy: Integrated Land Information and more toward distributed services
- Needs for collaborative uses of Cadastre Data

From Survey to CAD data: Example 1



From Survey to CAD data: Example 2



Lantai 2

Needs

Visualize 2D and 3D data together through geospatial web browsers
Possible formats: VRML/GeoVRML(?), X3D, KML.....

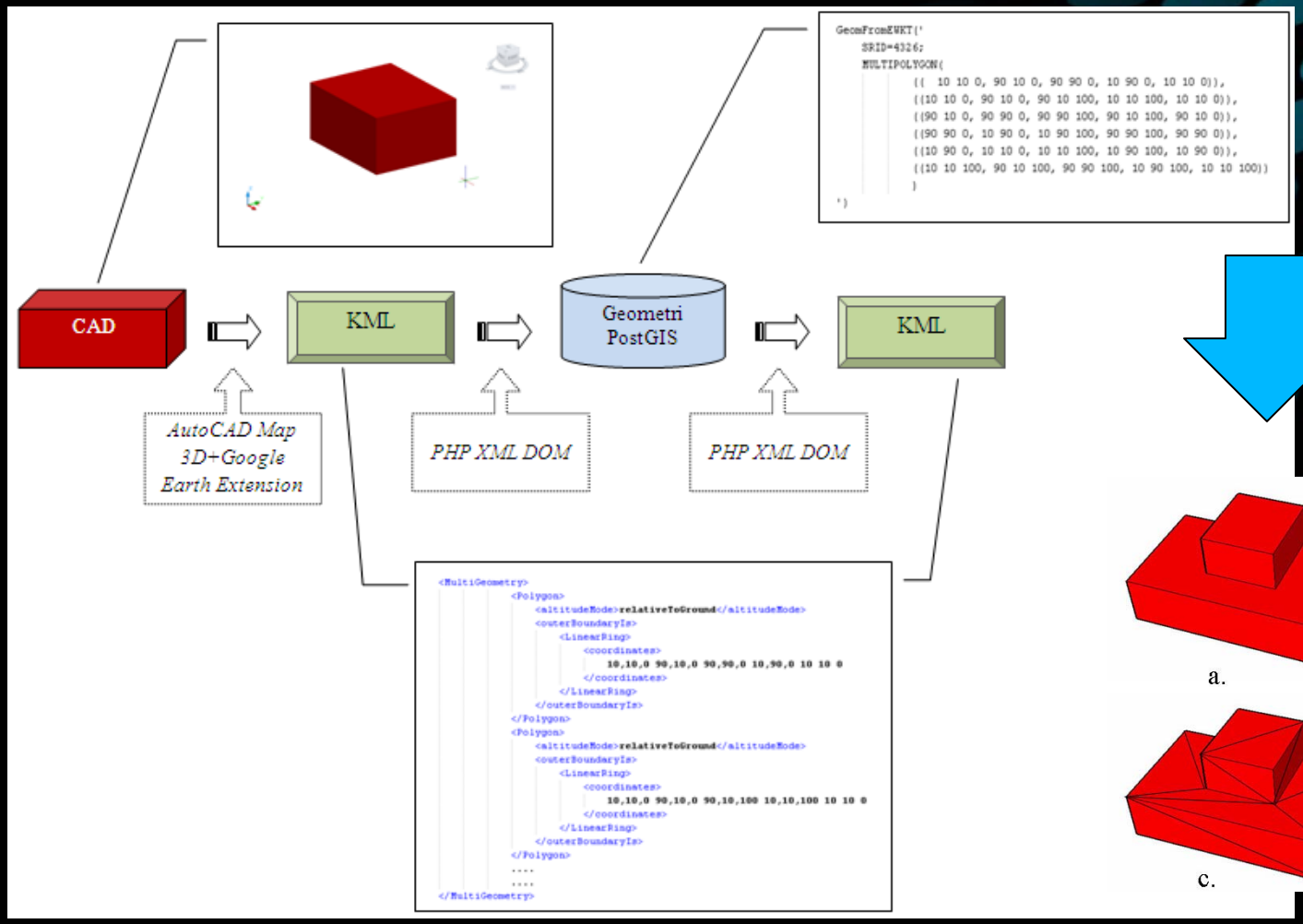
Exchange 3D data (together with 2D)
Possible formats: Collada, GML, CityGML, KML.....

For planning and disaster management applications, online access and visualization of (geometric) 3D cadastral data are often required in order to support data sharing and data communication.

Possibilities - Opportunities

- Store CAD data as geometries in geospatial DB
  → limited possibilities exist: e.g. Not all support volumetric representation
  → limited topological definition
- Go forth and back from CAD visualization to DB storage (with strict connectivity between CAD system and DB system)
- Convert 3D data separately and get them ready in specific 3D browsers
- Possible integrated visualization of X3D objects and attributes through web browsers utilizing X3D plug-in

Case Study 1: 3D Cadastre Web Map for Space Management



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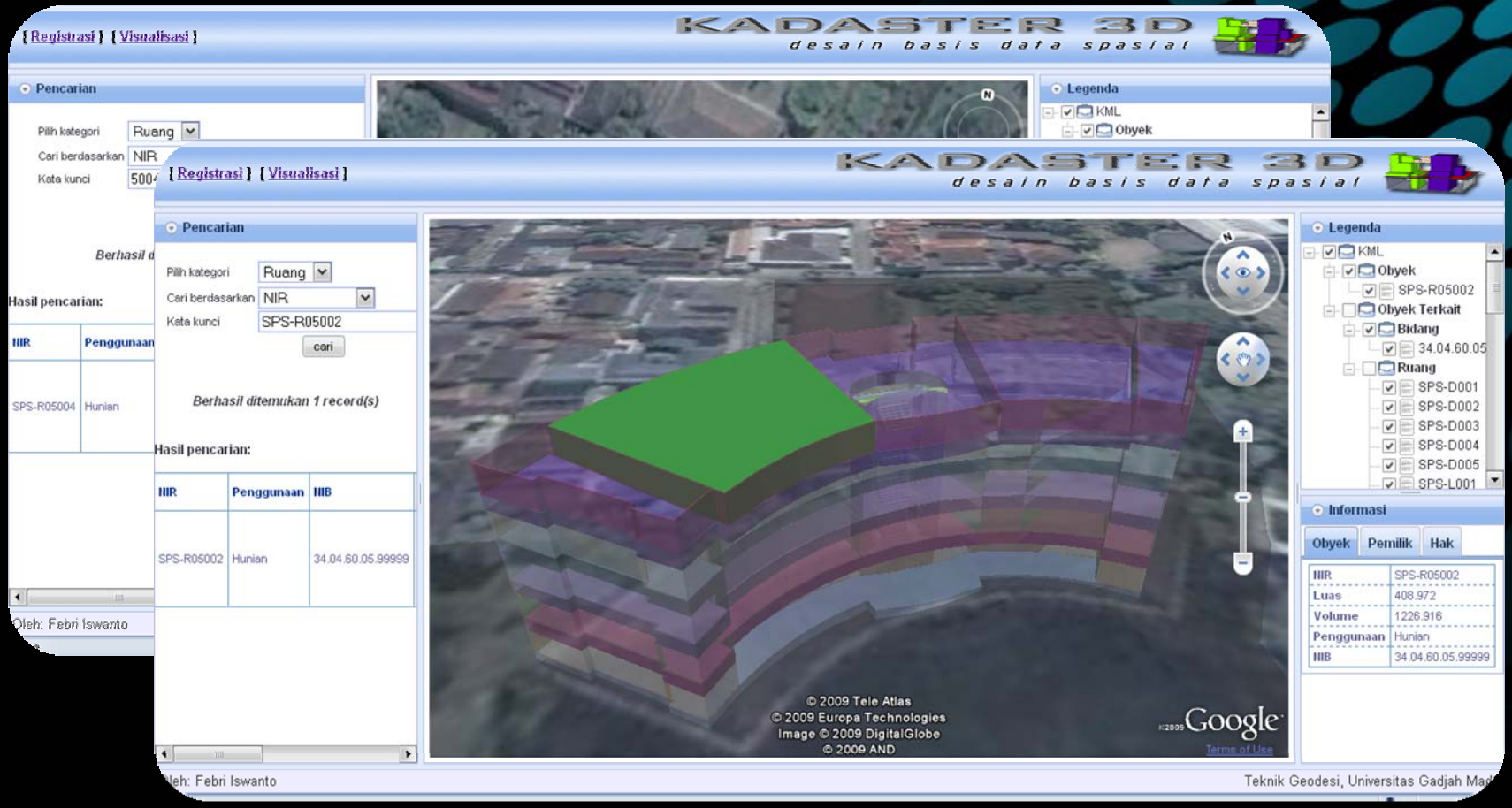
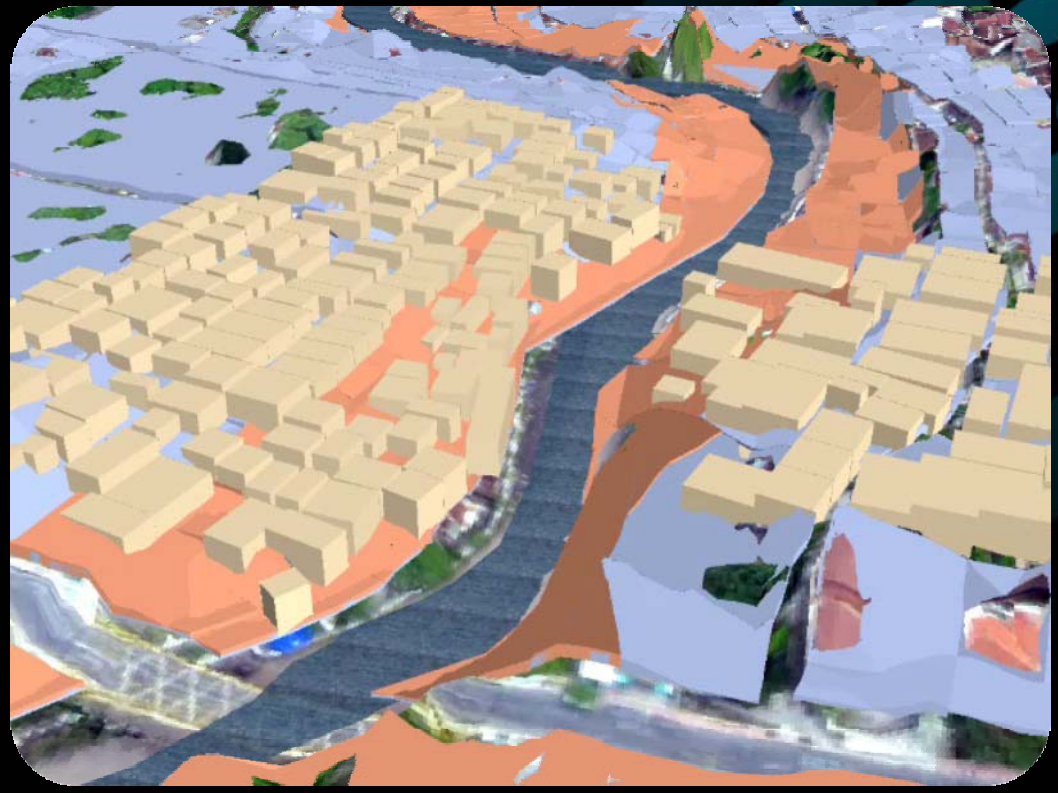
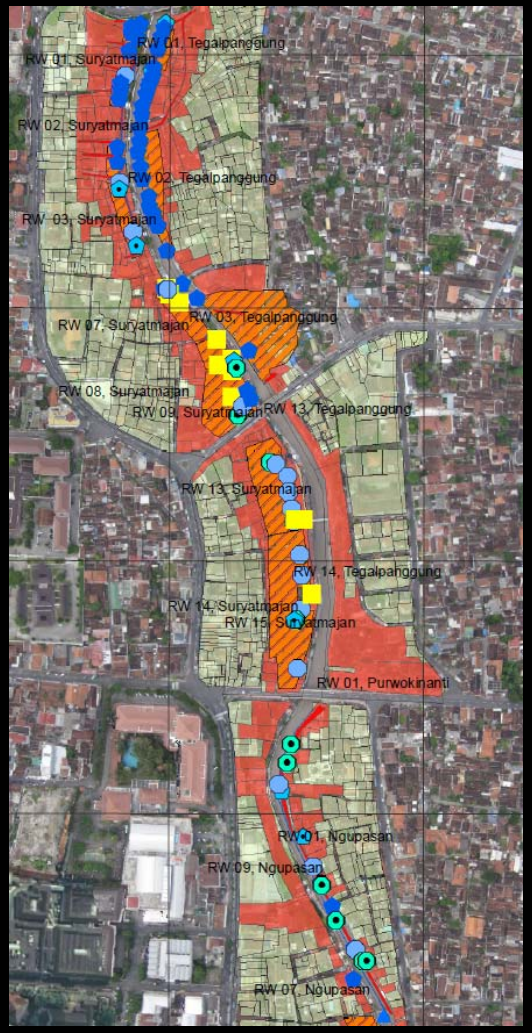


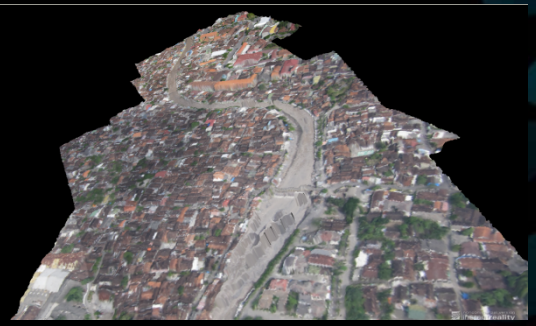
Case Study 2: 3D visualization of affected land parcels of flood hazard post Mt. Merapi eruption



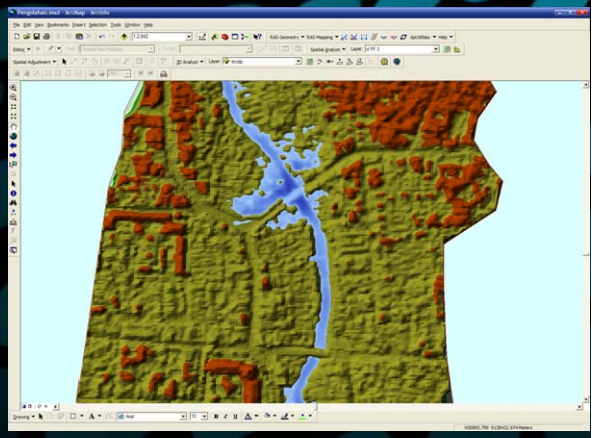
Data



Impacted Parcels

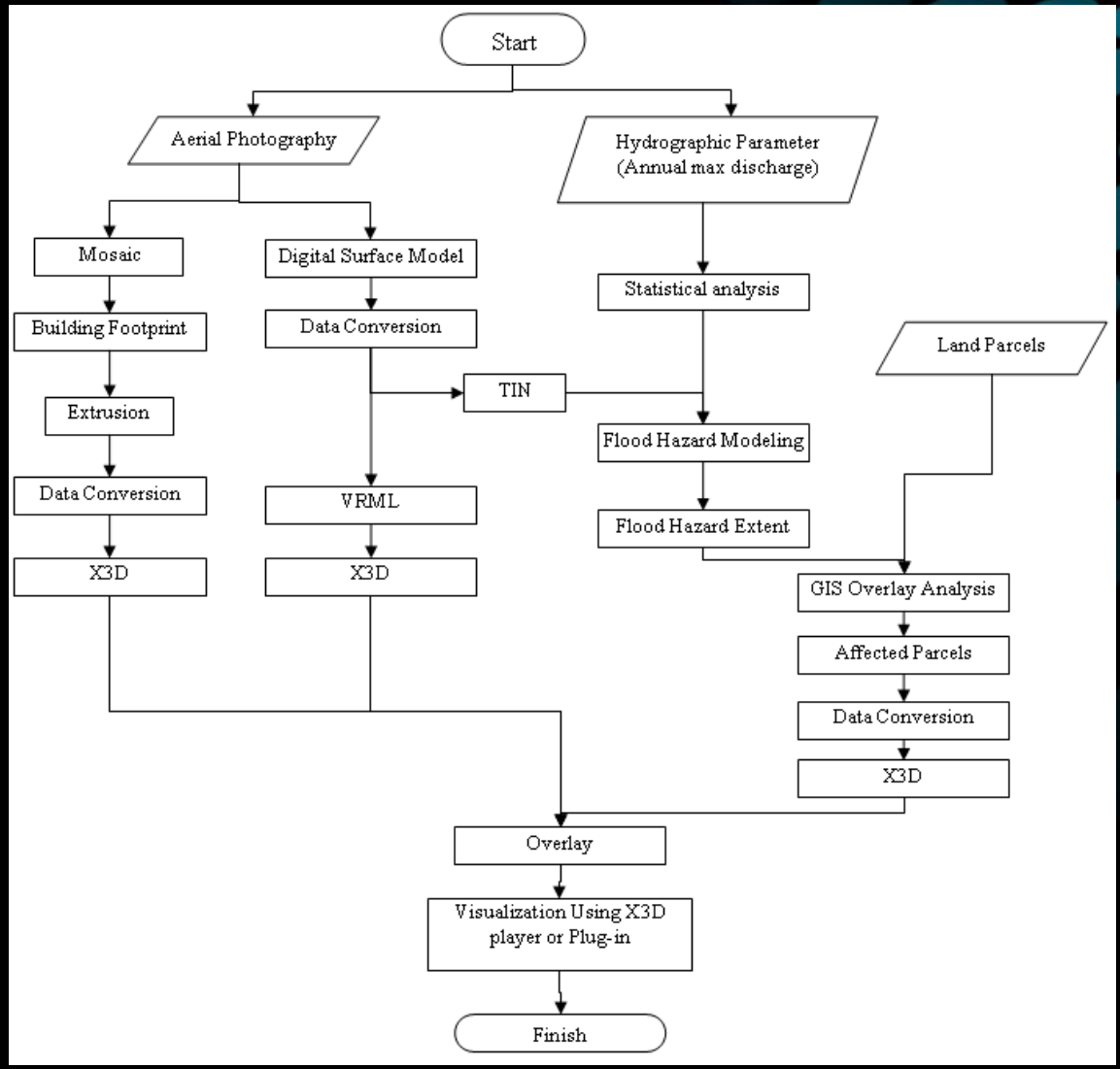


Topography from SF Aerial Photogrammetry

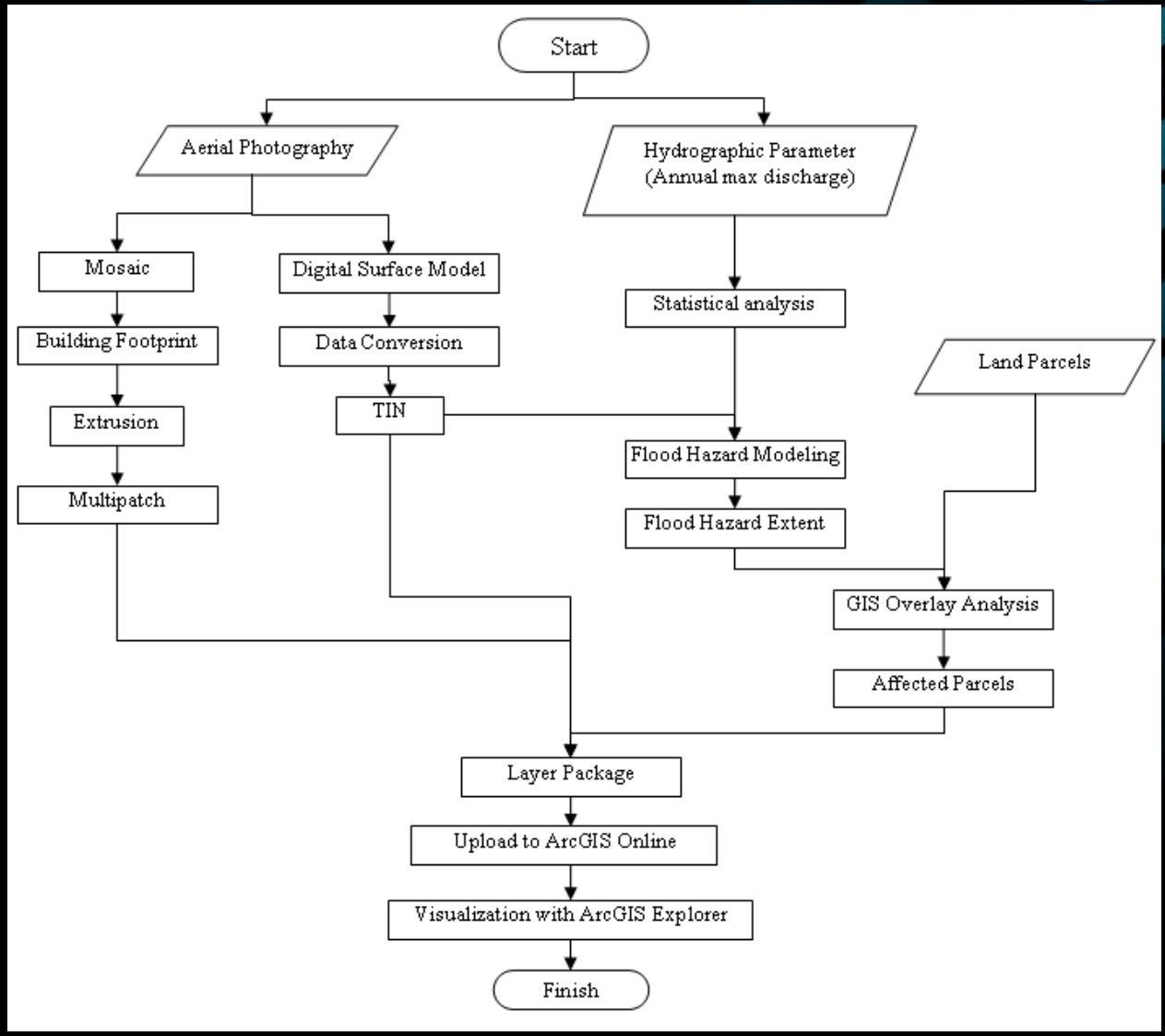


Flood map

Case Study 2 workflow for VRML and X3D format



Case Study 2 workflow for ArcGIS Vis



Findings

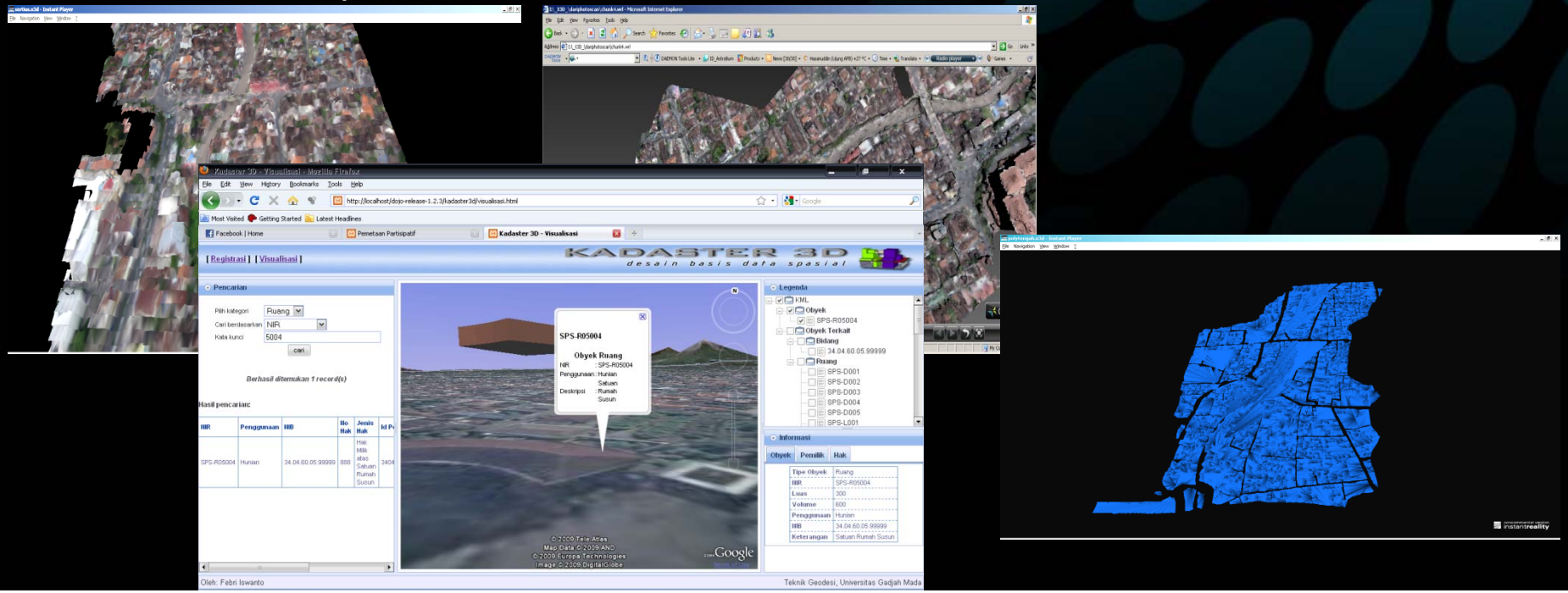
Despite current conversion tools provide promising opportunities in creating standardized format of X3D:

- some digital surface data, which is originally in *.WRL format, appears to be corrupt
- texture mapping of the digital surface are finished successfully, while some others failed

3D polygon of land parcels seemed to be corrupt, while the case didn't seem to be happened in its VRML format

Data exchange/interoperability still low (ArcGIS case)

User Interaction problems



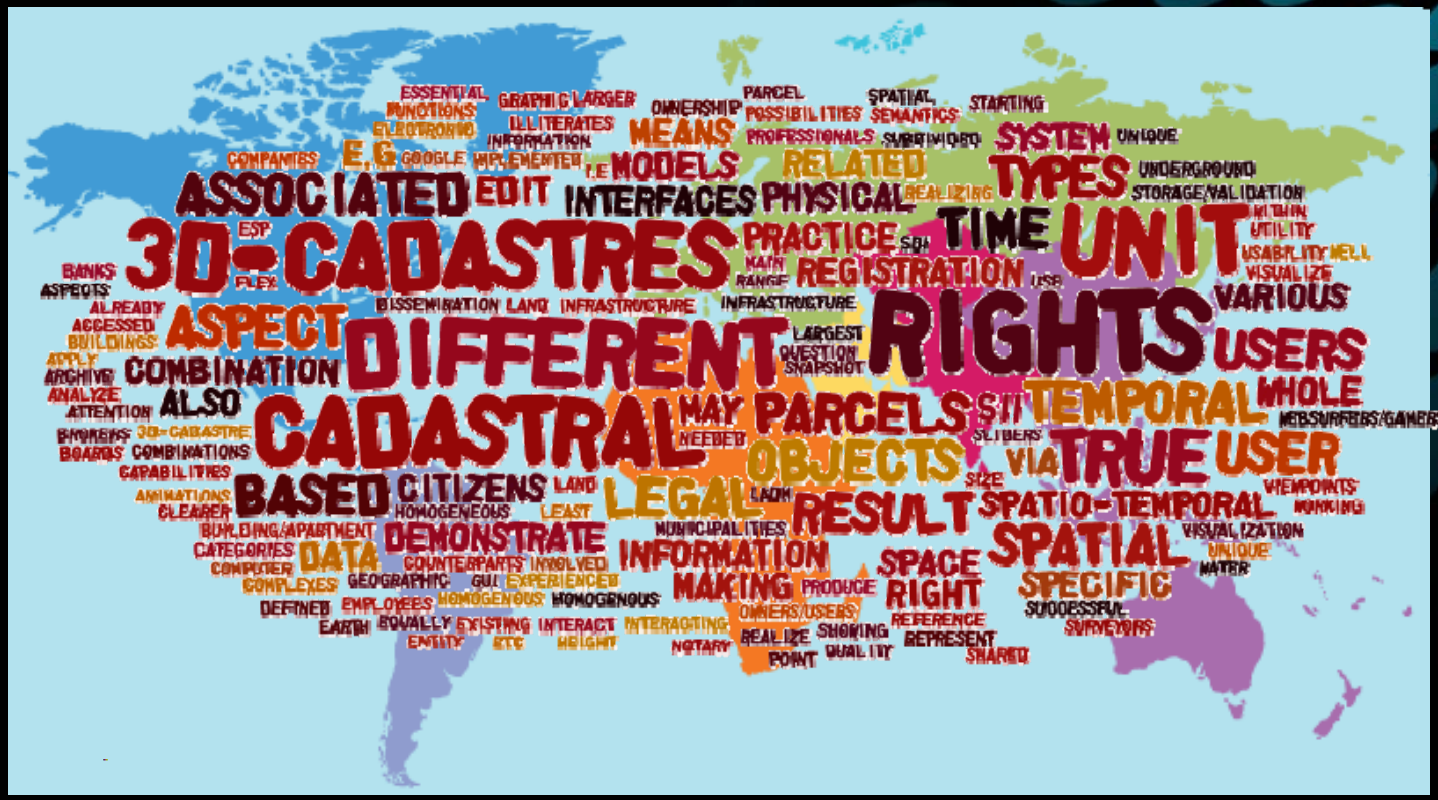
Concluding Remarks

3D visualization options using open source 3D formats and browsers are still limited.

Regardless the limitation of the existing geo DBMS in storing 3D geometries, the presented solution that proposes the use of KML and PostGIS is considered to be sufficient to extend 2D cadastre geodatabase into 3D hybrid cadastre geodatabase

The use of X3D in web cadastre has a promising future to present 3D cadastre data along with the earth's terrain surface, yet some obstacles and constraints must firstly be considered.

More opportunities for 3D formats and services needed to support full interoperability



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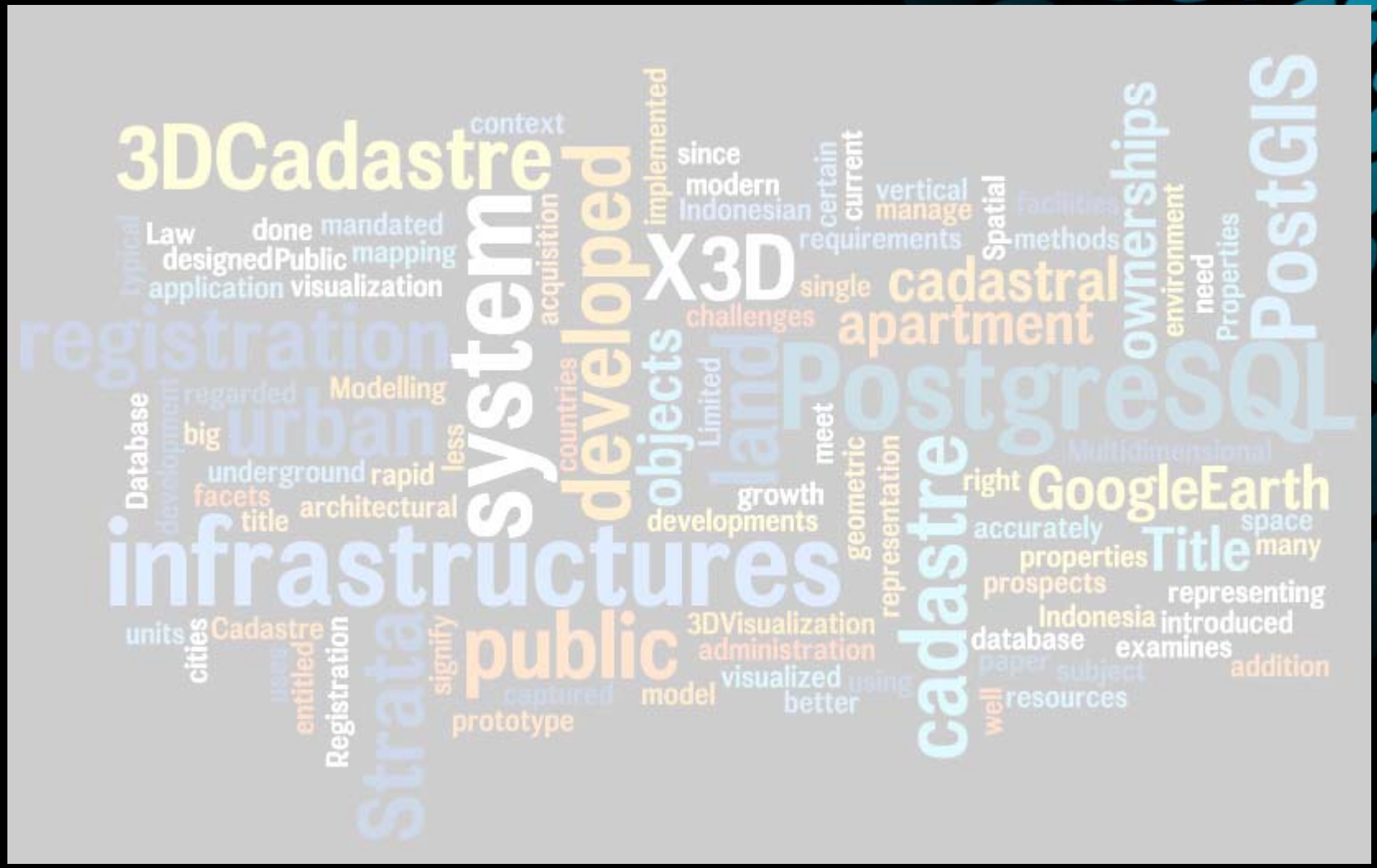
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