



The phased 3D Cadastre implementation in the Netherlands

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3D Cadastre implementation in the Netherlands

- Several studies have been carried out by the authors (my PhD defense on 3D Cadastre was in 2004)
- Now actual implementation within legal, institutional, organisational context

Why now?

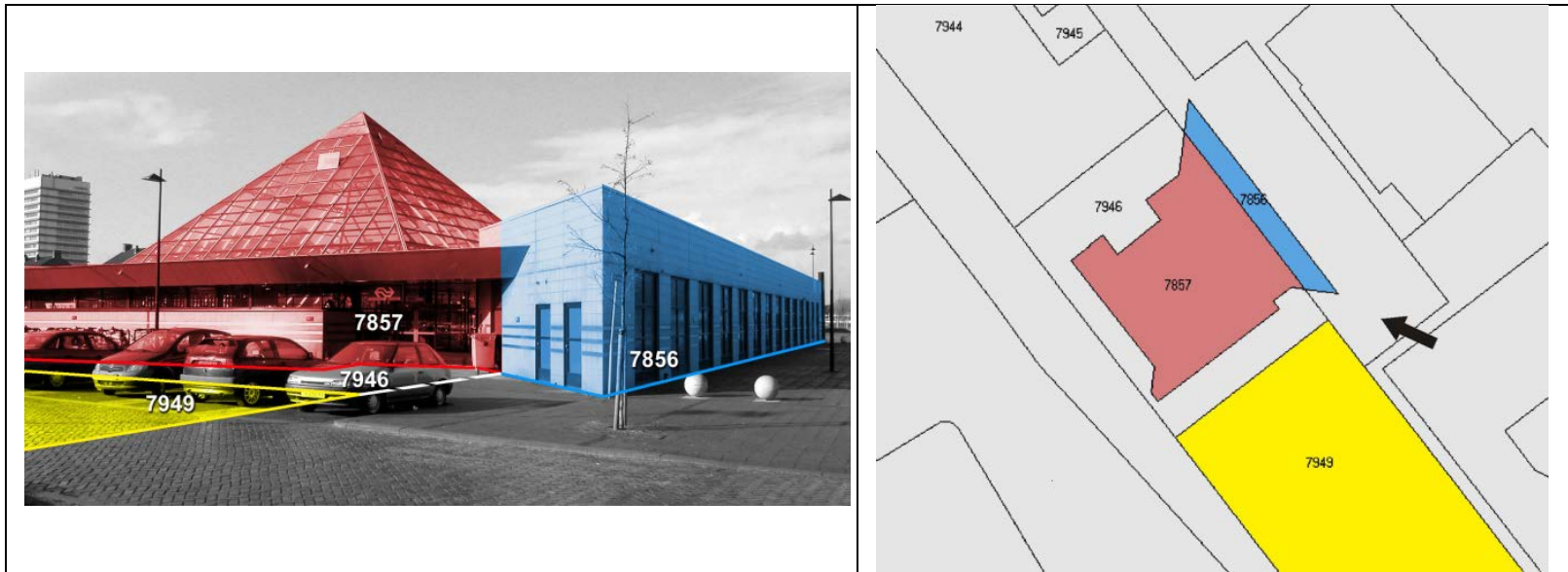
- Technically it has become possible to accept 3D drawings
- Practice has asked for support
- 3D cadastre implementation requires close collaboration between academics and practitioners from several disciplines

Overview

- Current legal and cadastral framework of 3D Cadastre in NL
- Case studies
- Solution
- Conclusions

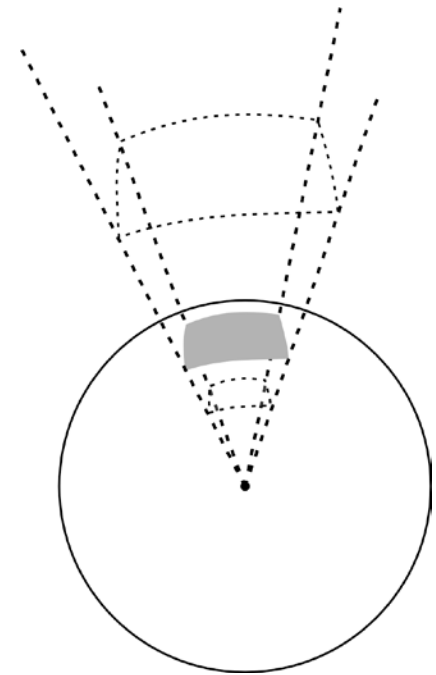
Ownership registration in The Netherlands

- Main registration entity is 2D parcel
- Although it is possible to establish property rights with 3D boundaries

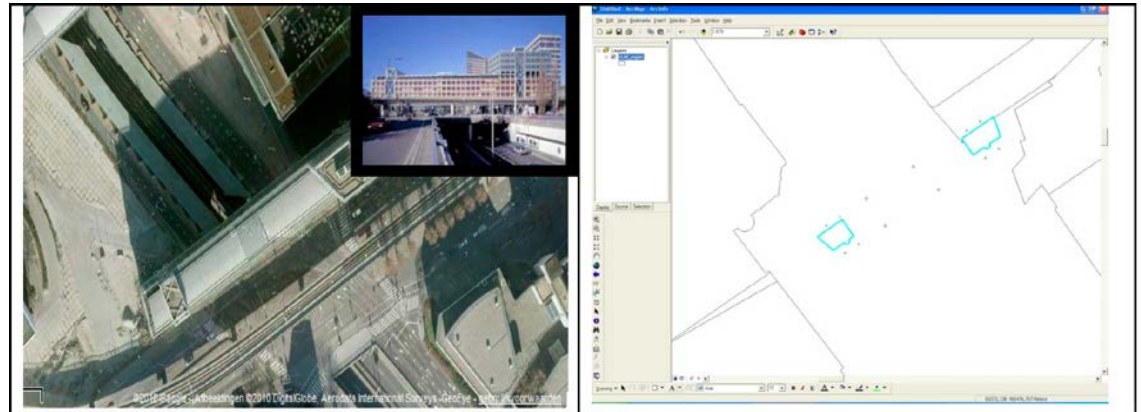
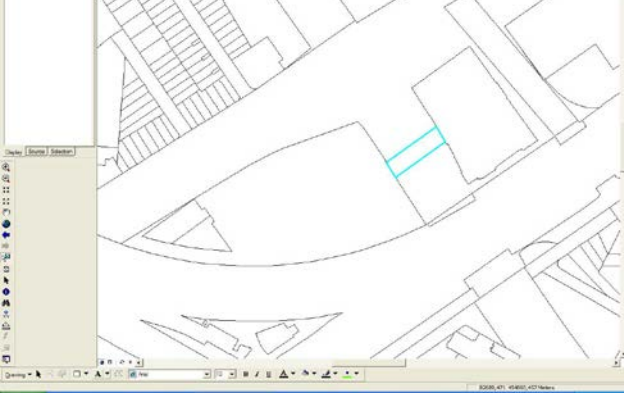


Space of property

- Ownership of the land:
 - Space above and below the surface
 - Property reaches as high/low as user has interest
 - Third parties can use parcel-column as long as user has no reason to object



3D situations occur



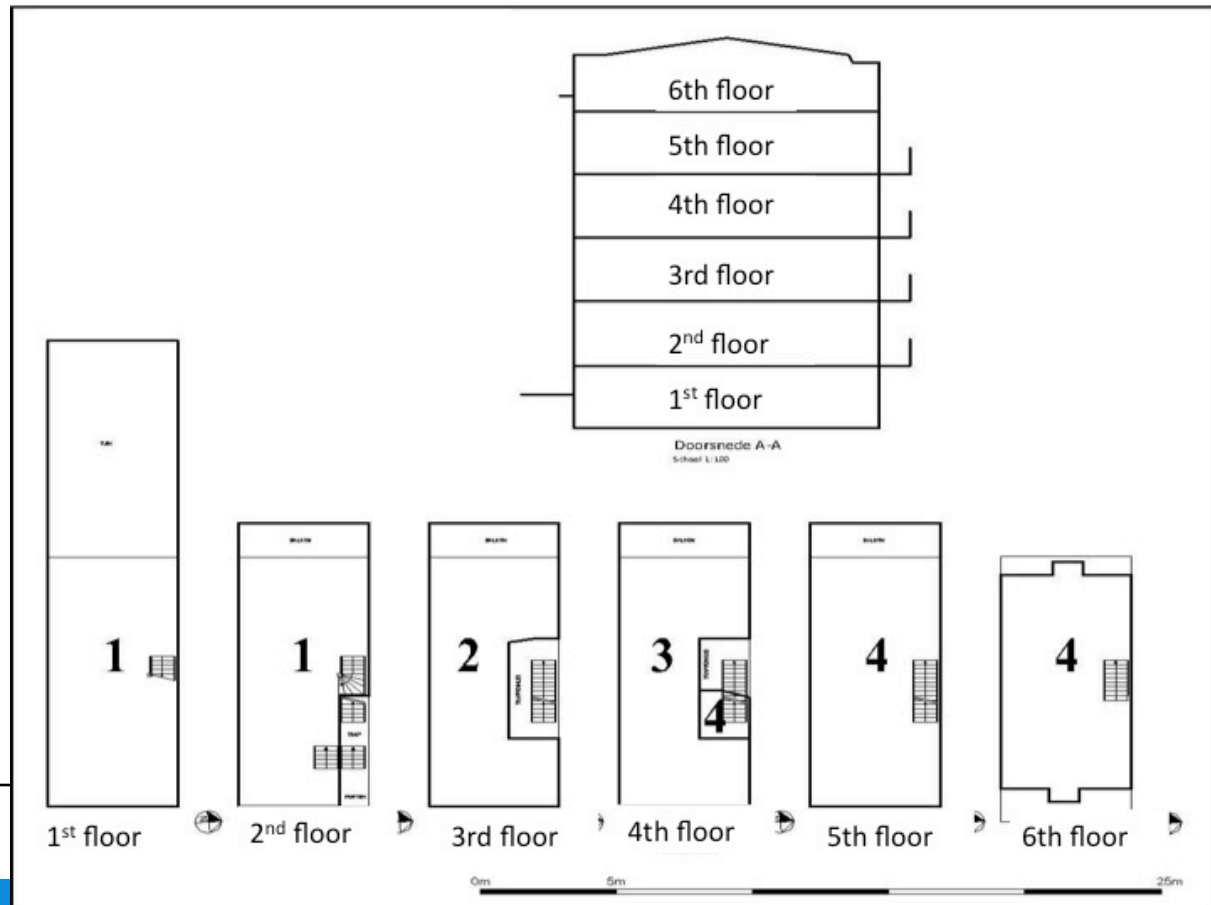
2D registration for a 3D world?

Vertical separation of ownership

- Apartment rights
 - Only appropriate for homogenous units
- Right of superficies
 - Relates to physical construction
- Right of long lease
 - Right may be limited in space
- Easement
 - Also to safeguard line-of-sight and free wind streams
- Cables and pipelines

Boundaries of 3D units in the land administration, apartments

- Requirements for **apartment** units: separate plan per floor
- Mental exercise to understand real world situation



Boundaries of 3D units in the land administration, not apartments

- Property should be “identifiable”
- Deeds may contain:
 - Sketches
 - Detailed drawings (3D PDF, cross sections)
- Description is left to the parties
- In practise: drawings are not legally binding
- Registrar will refuse deed if description of boundaries is missing
- 2D parcels need subdivision if right is established on part of parcel

Conclusion:

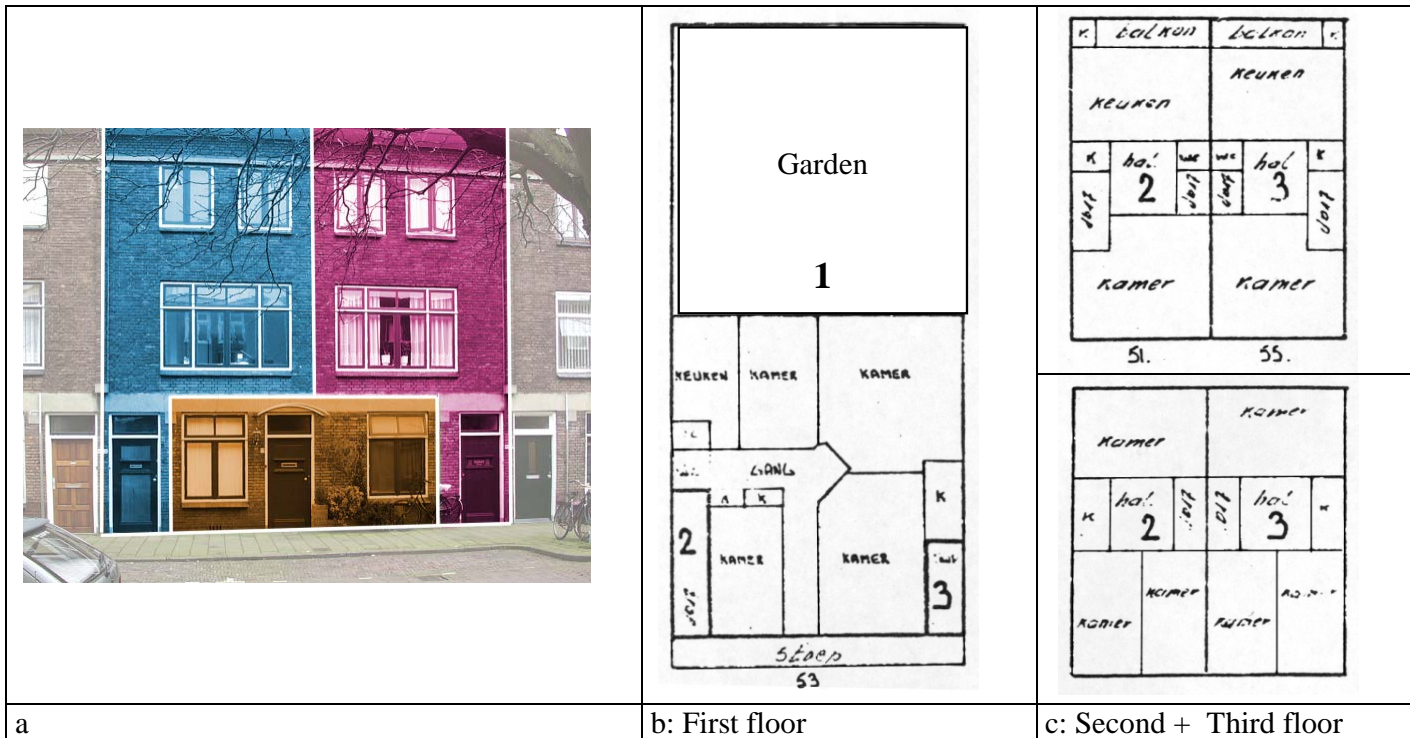
- Legal basis can be diverse
- **3D** in text, sketches, drawings, references to objects,...

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Case 1

- Relatively simple apartment (on multiple floors)



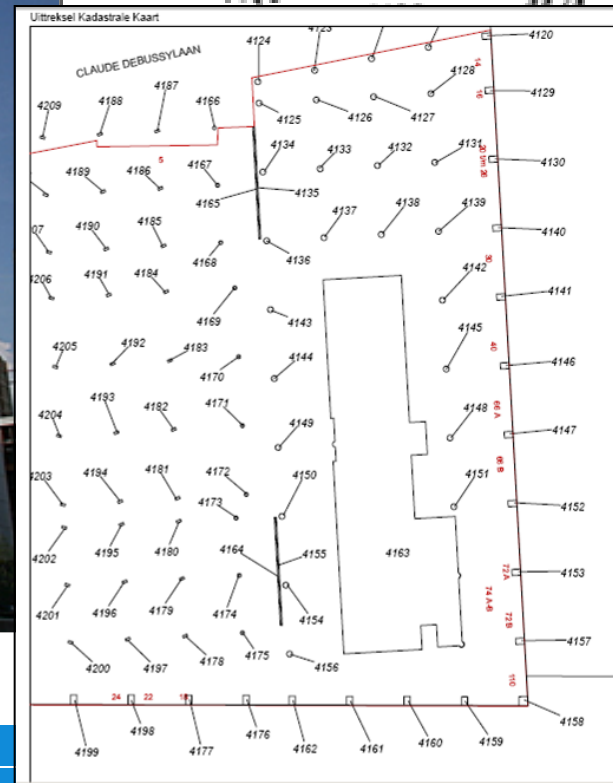
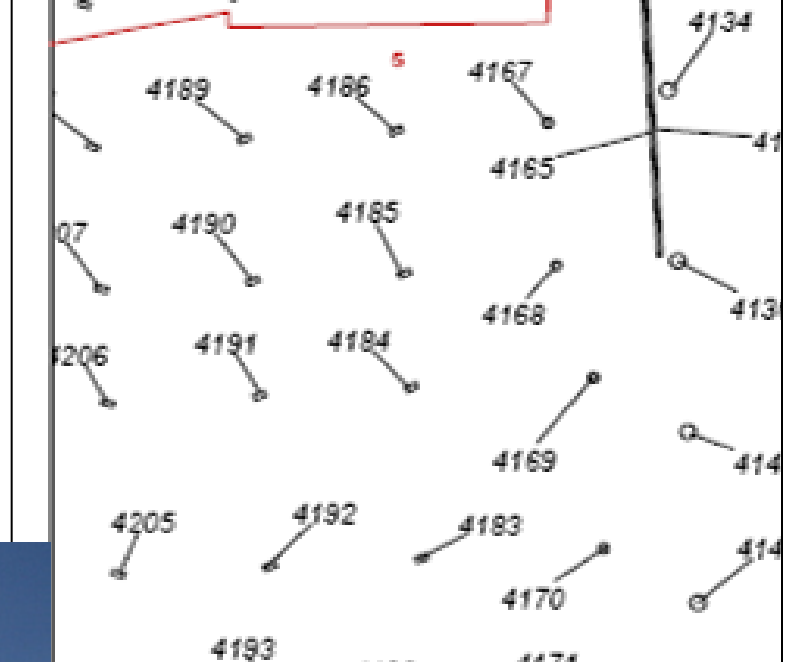
Case 2

- One object, **superficies**
- Note **parcel fragmentation**



Case 3

- Land by municipality
- Two 3D objects, **long lease**:
 1. Parking garage
 2. Office tower on 80 pillars
- Note again **parcel fragmentation**



Findings from the case studies (many more than 3 presented)

- Registration and publication of rights on 3D property is possible
- But:
 1. Registration is not clear:
Hard to understand if more than one object/part is involved
 2. Objects are divided over several parcels:
Hard to maintain

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Solution in two phases

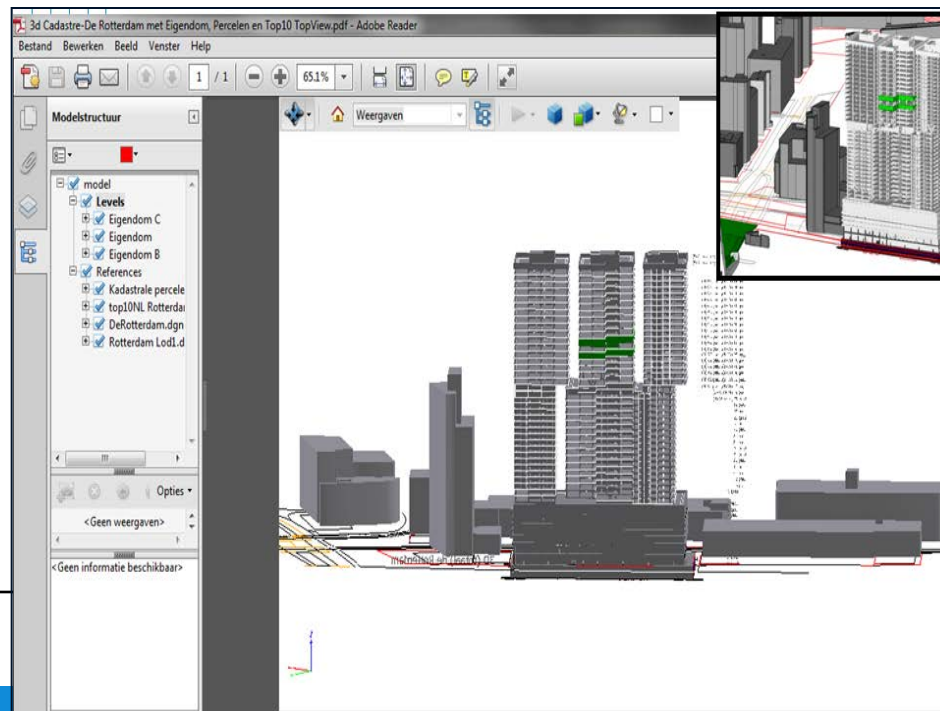
Phase I: Within current cadastral and legal framework

Phase II: Long-term solution

Phase I

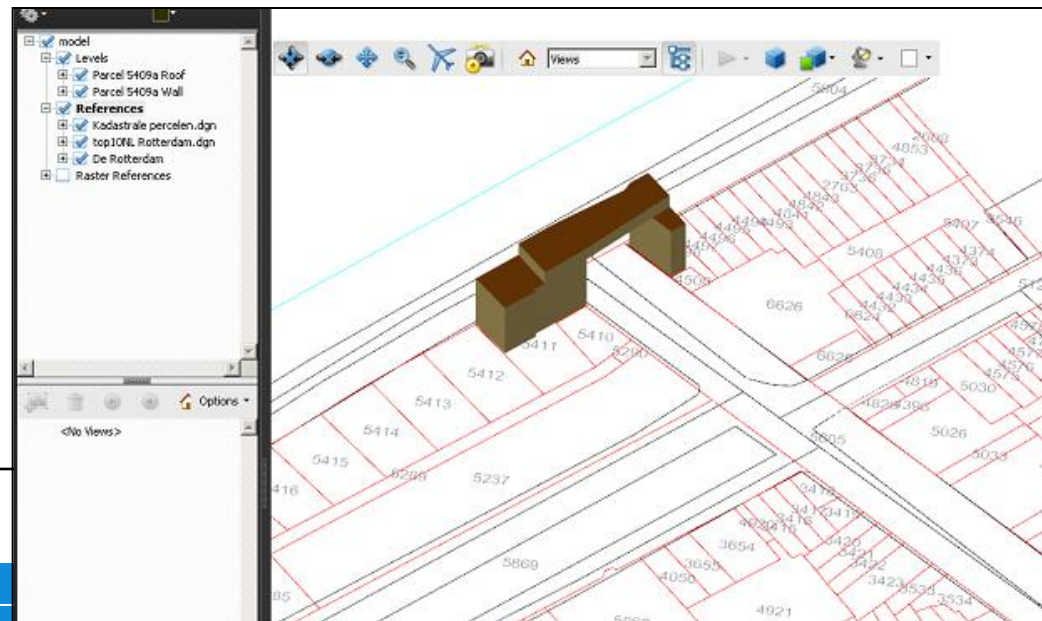
- No dramatic change
- Principle: refuse “fragmented parcel creation”
- Require a registration of 3D representation that reflects the space to which right applies
- **3D PDF** (is already possible!)

Courtesy of Kees van Prooijen, Bentley



Phase I in more detail

- Notification of 3D registration in cadastral map
- Original 2D parcels can be kept; but legal connection should be visible
- Projection 3D representation in separate layer
- Link to 3D drawing
- No 3D parcel in a 3D cadastral map
- Requirements/guidelines for 3D drawing



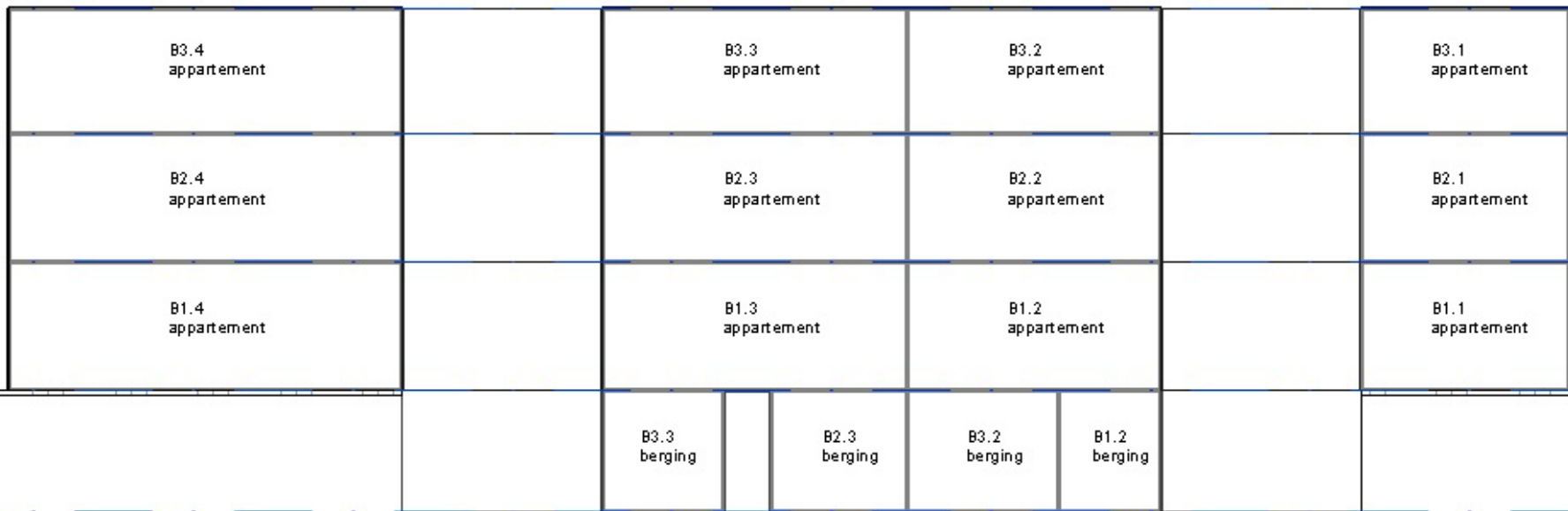
Requirements for content 3D PDF

- 2D ground parcels that overlap with legal volumes
- 3D (graphical) description of legal space:
 - 3D extent and overlap with ground parcels
- Legally required 2D cross sections with accompanying annotations
- Objects needed for reference/orientation in 3D environment:
 - large scale topography
 - 2D geometry of buildings
 - 3D constructions and earth surface (with ground parcels) as reference
- Length/areavolume measures of the legal space
- **Z**: 3D PDF should identify origin in local coordinates (and relate this to national height datum)

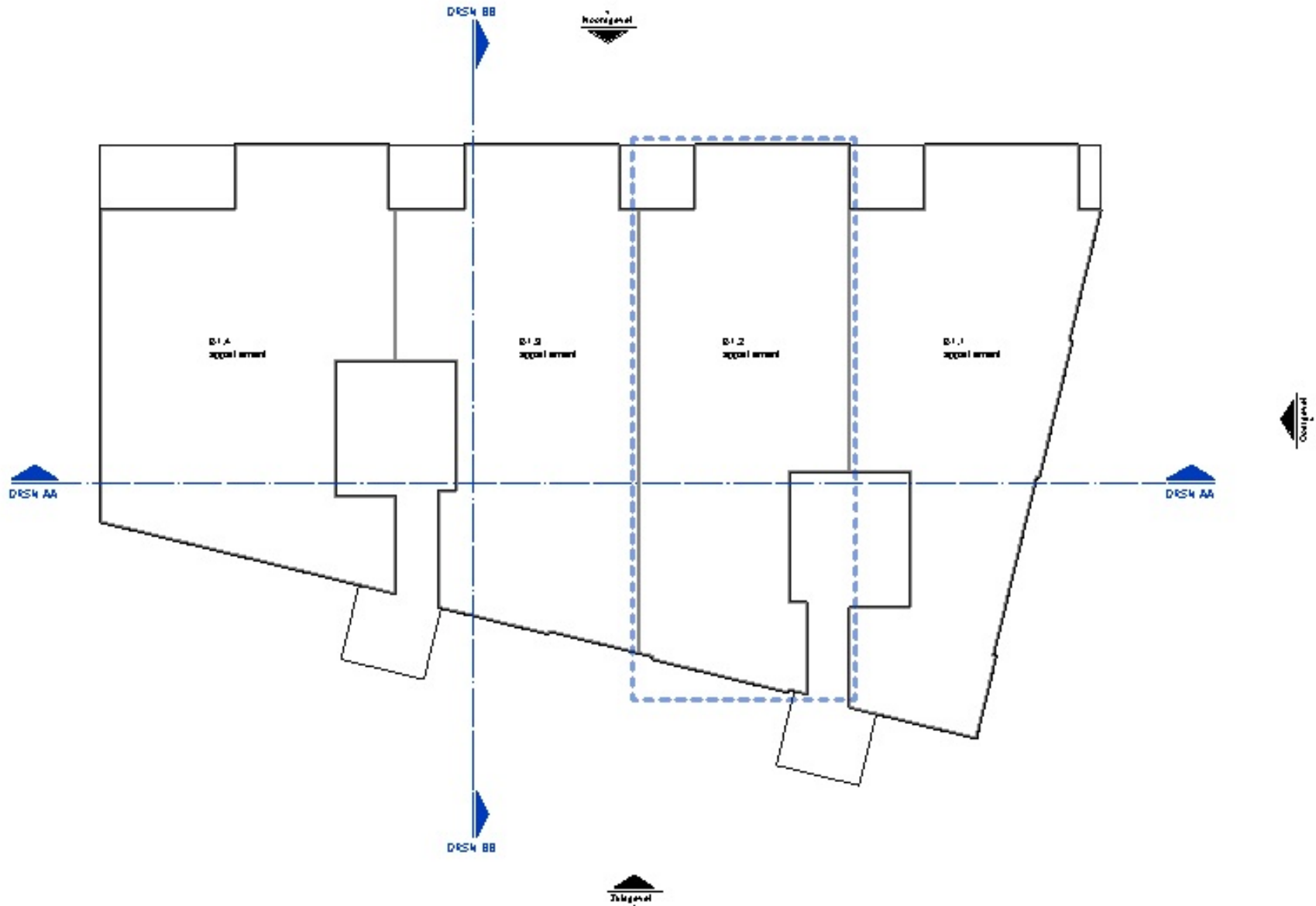
Example 3D PDF by a company: VDNDP Bouwingenieurs



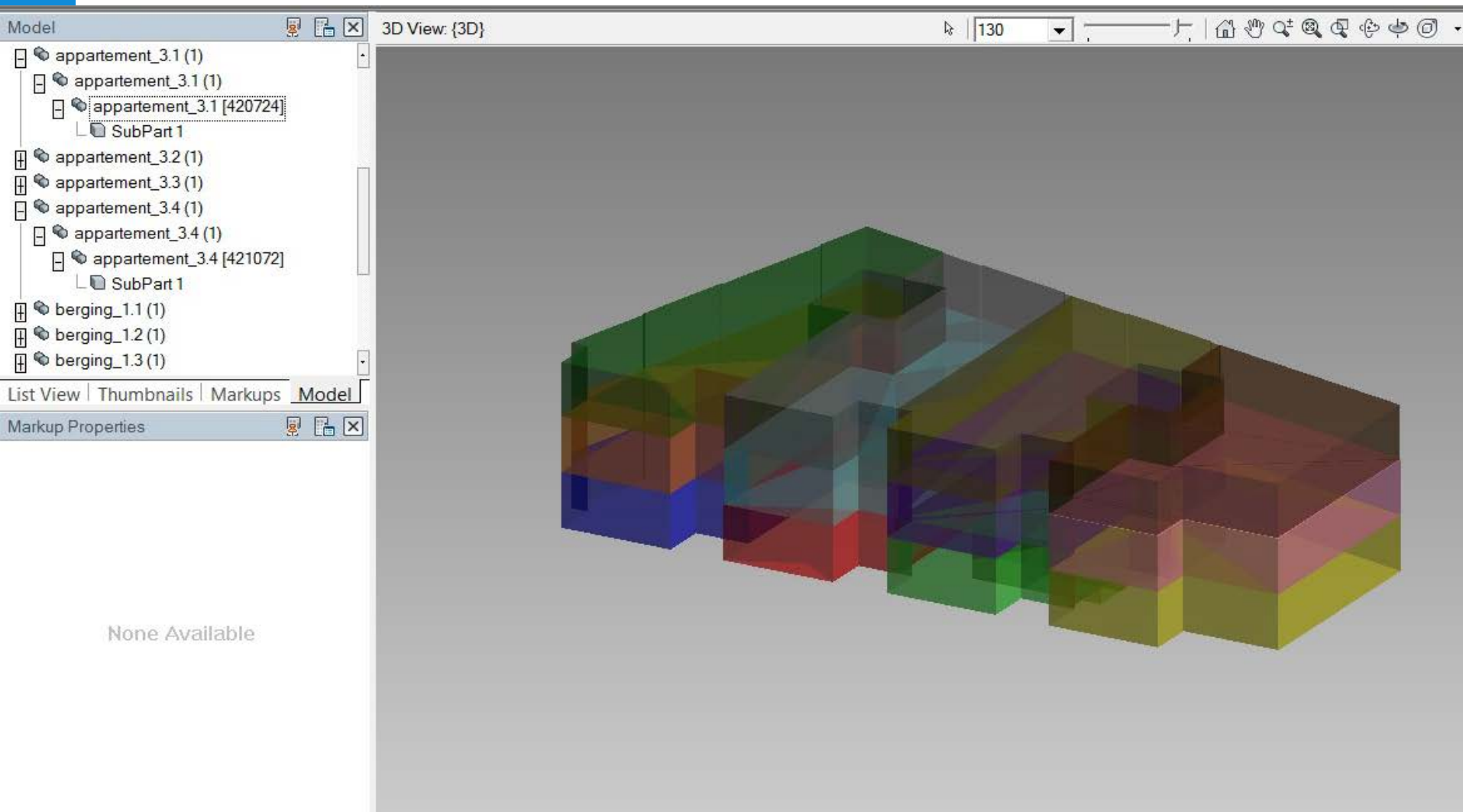
Vertical cross section



Floor plan of 1st floor



3D legal spaces



Assessment Phase I

- Fits within current technical, legal and cadastral framework
- But: is new to notaries
- Also new: encouraging uniformity in consultation with notaries

- Pros:
 - More insight
 - Parcel need not to be subdivided
- Con:
 - “Voluntary”
 - 3D data not available:
 - **No checking possible** (single valid volume, no overlap neighbour)
 - Modifications not easy
 - 3D overview not possible (multiple registrations in one area)

Next, Phase II

- Obligatory in specific situations:
 - Multi-level property; complex property rights; apartments
- Still related to one or more ground parcels
- 3D graphical representation is always required
- 3D data itself: XML-encoding (CityGML, IFC?)
- Kadaster checks on geometry, topology, overlap:
 - Requirements for allowed geometries
- Possible to establish legal space that overlaps several ground parcels with own identification

How to get a 3D representation?

- 3D survey (physical objects - legal spaces)
- Semi-automatic conversion of existing floor plans to 3D units
- Via design files (CAD):
standardised workflow possible via IFC (BIM)

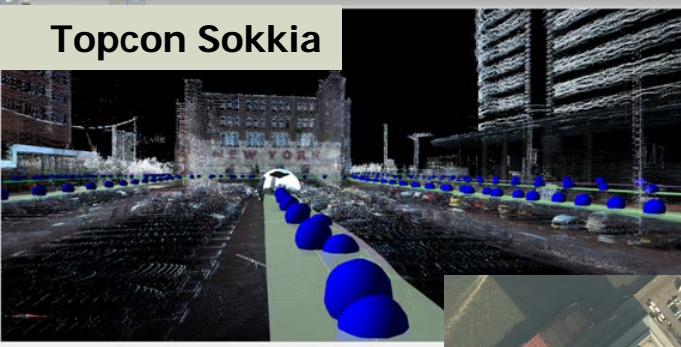
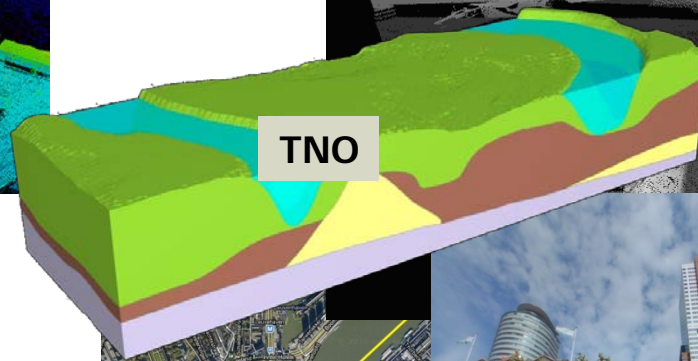
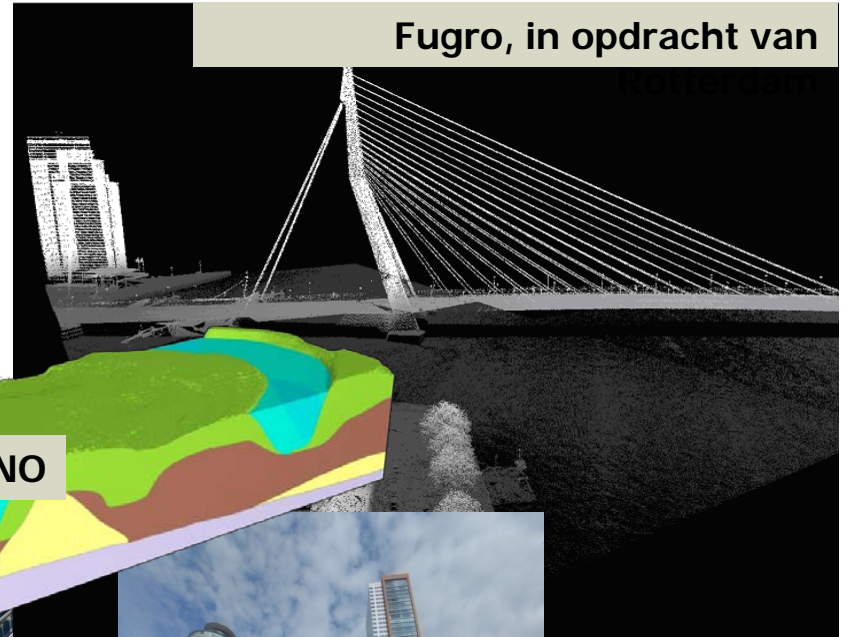
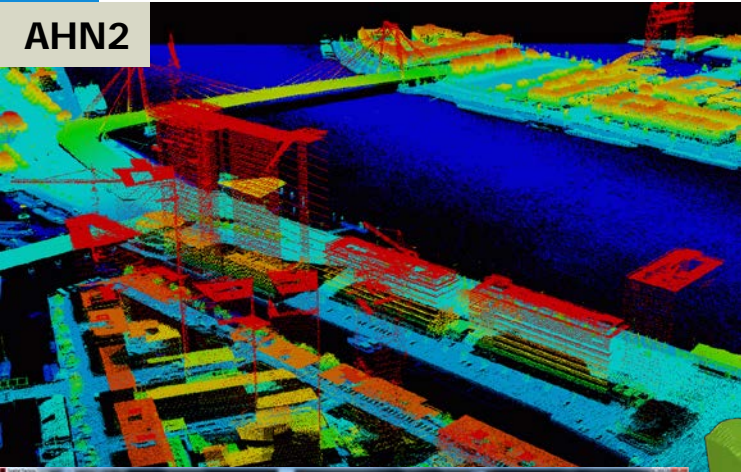
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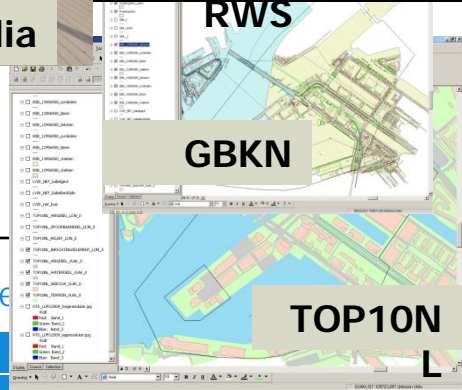
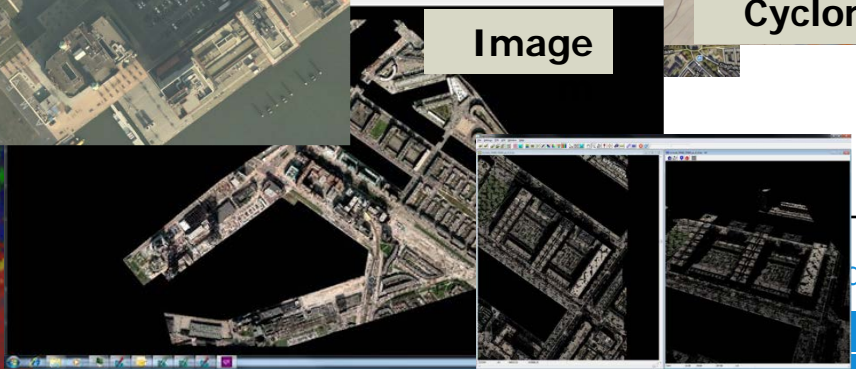
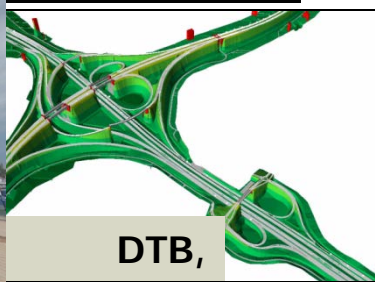
Conclusions and future work

- Conclusion
 - Studying 3D cadastre in theory is different than putting it into practice
 - Implemented phase I: for new objects, cost to generate 3D units in this format are similar to costs for generating the traditionally obliged maps/cross sections
 - Both Phase I and II are LADM compliant
- Future work:
 - Studying 'BIM/IFC to 3D PDF' workflow with architects
 - Based on (near future) experiences, further define Phase II
- Result: 3D registration that extends the frameworks
 - No dramatic changes; but major improvement

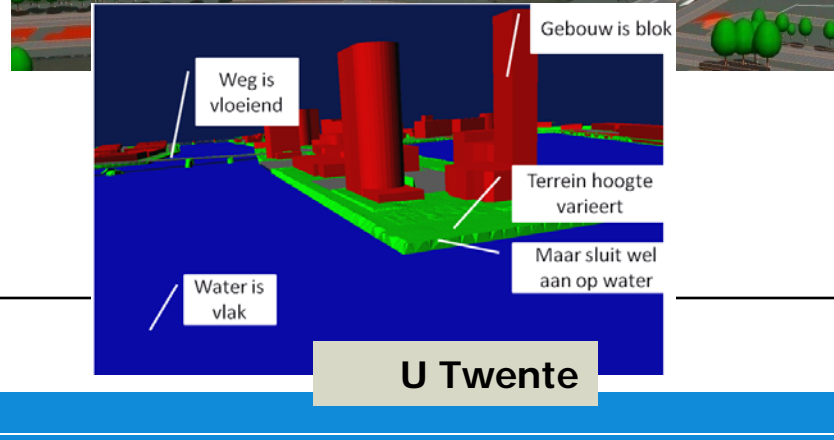
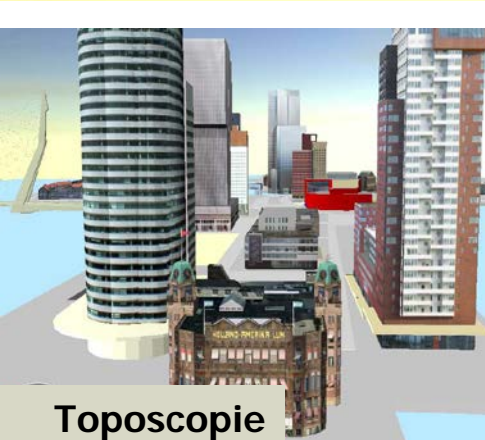
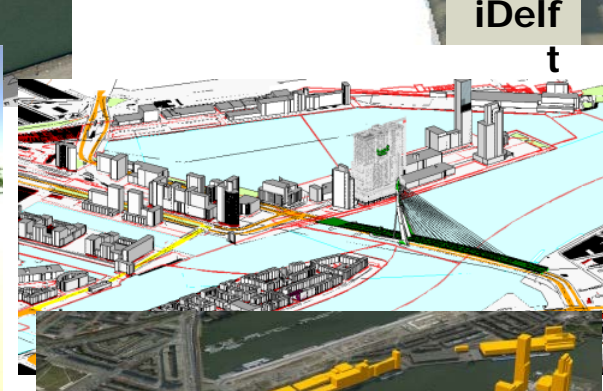
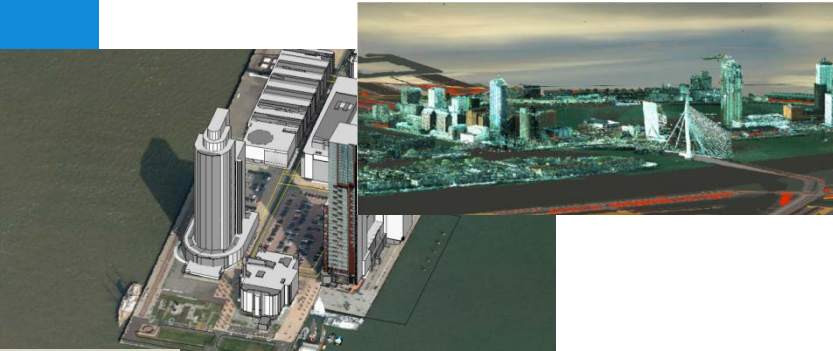
3D topography in The Netherlands



Mobiele laserscanning
Horus Surround Visio



Agreeing on 3D specs in NL



Questions?

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