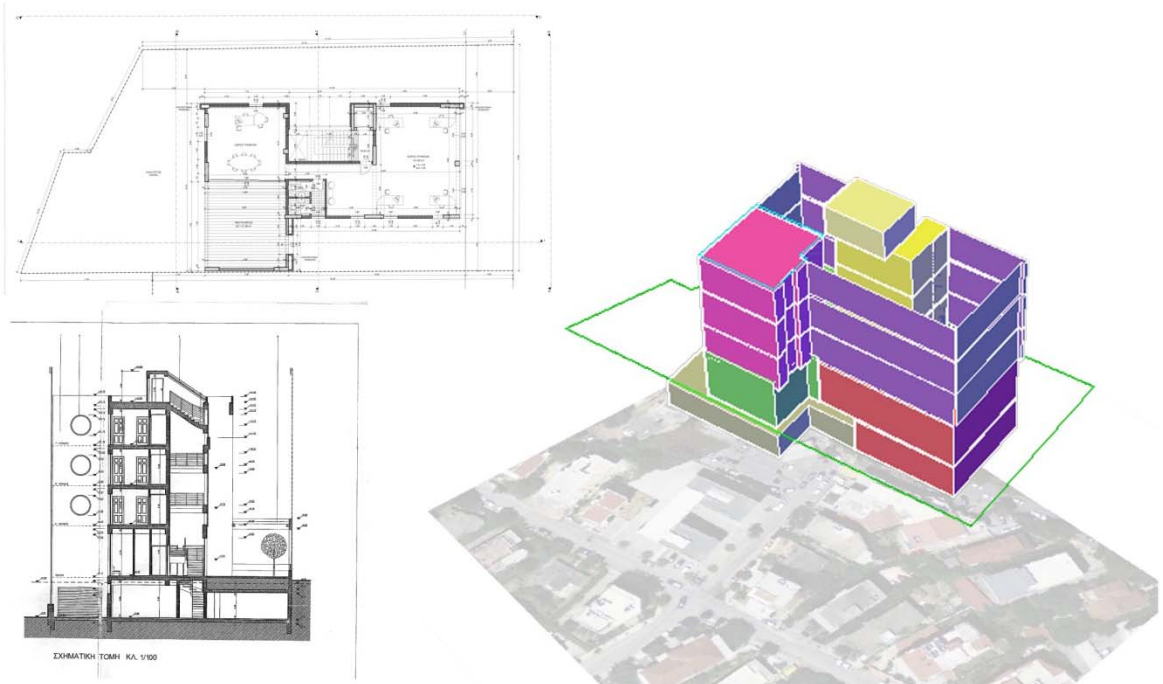
4th International FIG 3D Cadastre Workshop

9-11 November 2014, Dubai, United Arab Emirates



Contribution of Existing Documentation to 3D Cadastre

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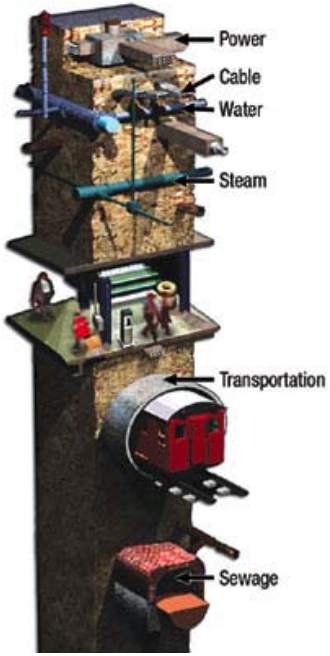
Outline

- Introduction
- 3D Real Property Features in Existing Databases and Registries
- 3D Cadastre Modelling and Standardisation
- Capabilities and Constraints in Generating 3D Cadastral Models from Existing Data
- Case study : Customary Rights
  Apartment Ownership in Urban Area
- Conclusions

❑ Introduction (1/2)

- Vertical accession of real property
- Security, Finance, efficient Land Administration



http://enr.construction.com

Legal amendments, introduction of 3D cadastral systems

Requires topological, semantic, **3D data**

- ✓ Simplified 3D data acquisition
- ✓ Various methods
- ✓ Cost/ time effective

❑ Introduction (2/2)

3D Cadastre modelling
- Extensive urban areas
- Relation to non-constructed 3D space
- Relation to underground constructions

Current 3D data acquisition methods are still costly, time-consuming and are limited by object type and location

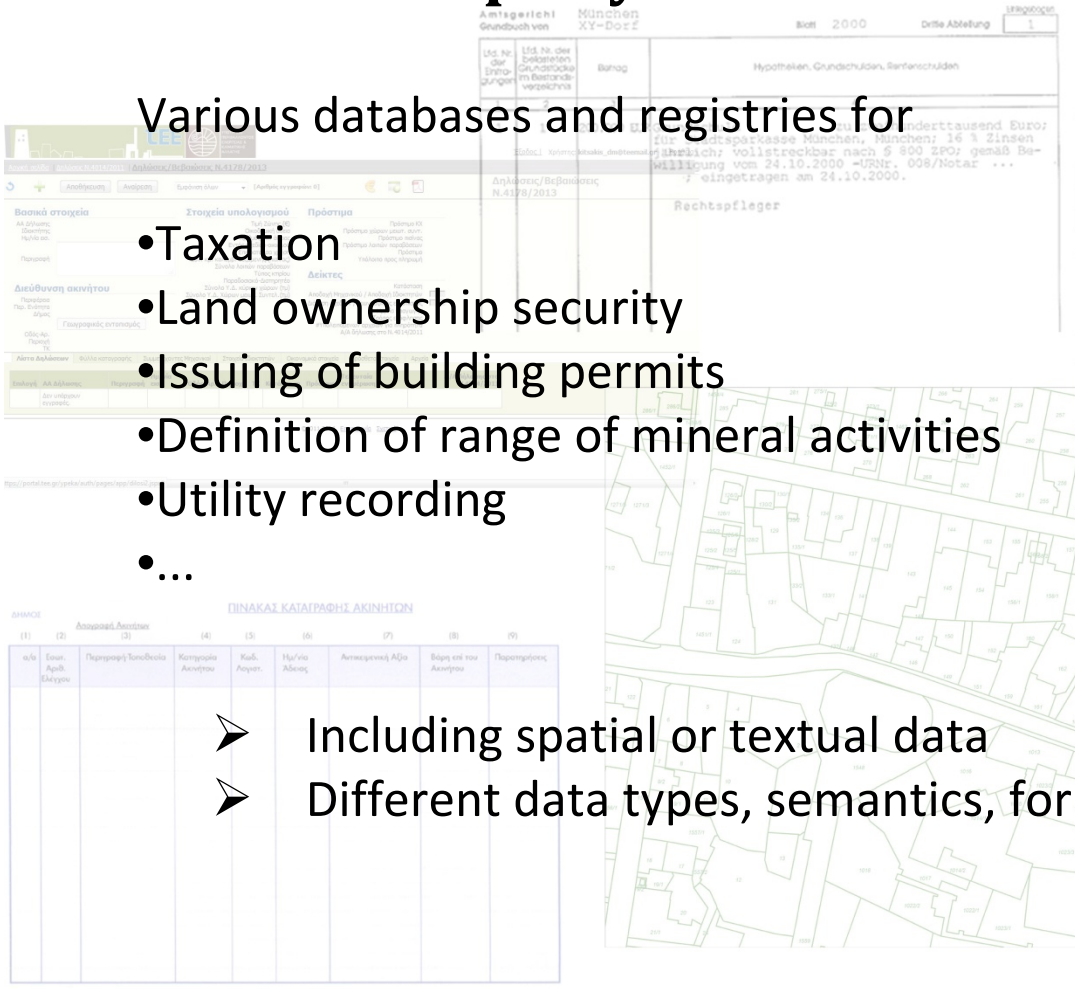
Paper aims

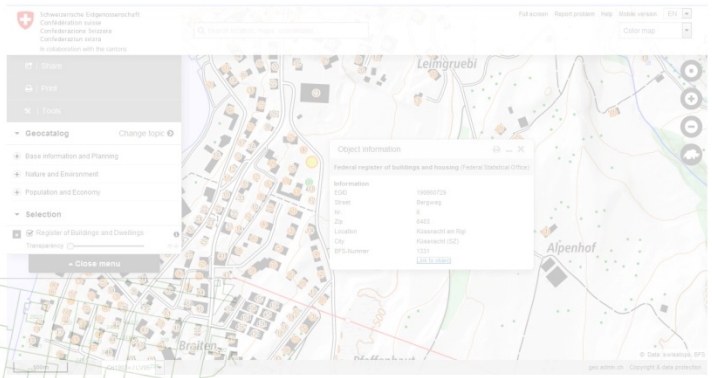
✓ Investigate exploitation of data maintained for various purposes in 3D cadastral modelling

❑ 3D Real Property Features in Existing Documentation(1/2)

Various databases and registries for

- Taxation
- Land ownership security
- Issuing of building permits
- Definition of range of mineral activities
- Utility recording
- …





- Including spatial or textual data
- Different data types, semantics, formats, accuracy

❑ 3D Real Property Features in Existing Documentation (2/2)

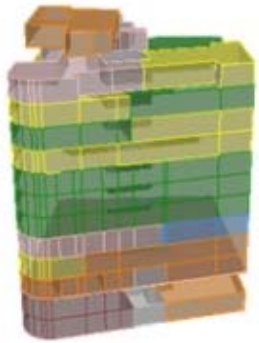
Documentation	Spatial data type	Reference system	Data accuracy
Plans	- horizontal dimensions (floor plans), - vertical dimensions (facades, cross sections, *- 3D coordinates (isometric drawings)*	- no reference system - relation to groundmarks	present the physical objects (buildings) with dimensions
Cadastral maps and databases	- land parcel/ building footprint, horizontal coordinates - elevation data (usually stored but not presented in cadastral maps using orthophotos, LIDAR, DTM / DSM models)	- National or local reference systems - relative heights - absolute heights	Varying accuracy depending on land type (urban, rural), scale and surveying methods (few centimetres to some meters)
Deeds/ titles/ court decisions/ administrative acts	Descriptive data (may refer to drawing or sketch)	Depending on Contract Law requirements	Literal description, except when related to survey plans

Spatial data characteristics included in existing documentation

❑ 3D Cadastre Modelling and Standardisation (1/2)

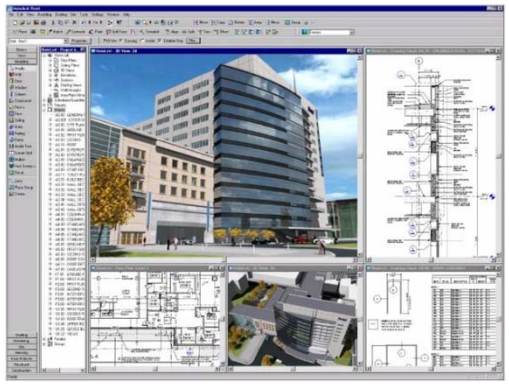
- Spanish Cadastre

Conejo C. and Velasco, A (2007)



v. Oosterom et al. (2011)

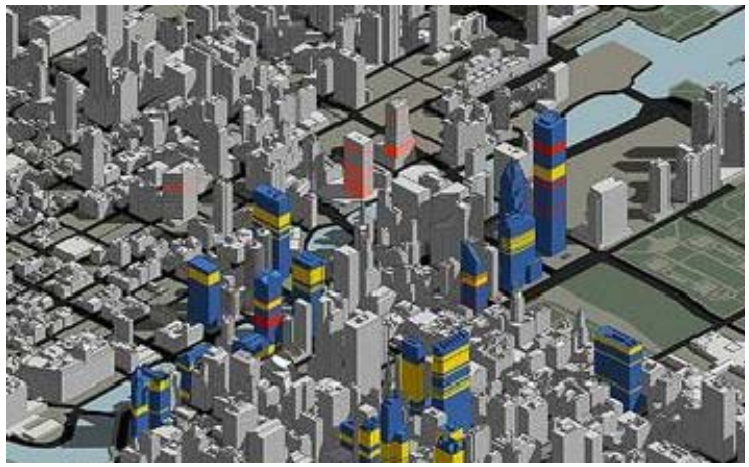
- BIM



http://www.uscost.com/5d-bim-education/

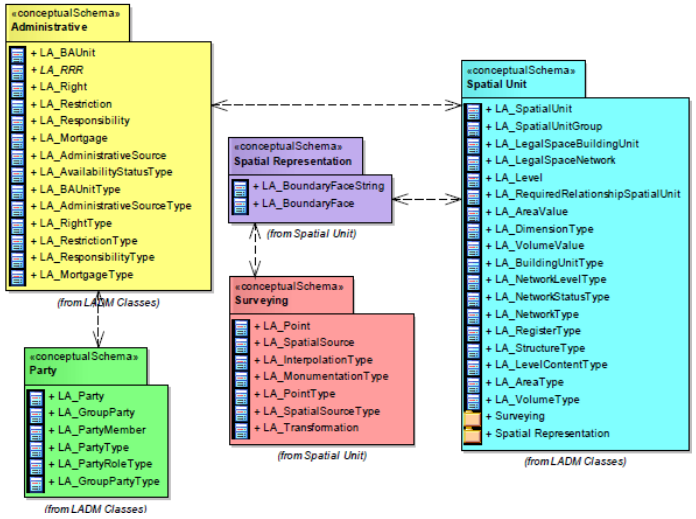
❑ 3D Cadastre Modelling and Standardisation (2/2)

- *CityGML*



http://blog.lidarnews.com/sig-3d-citygml-and-inspire

- *LADM*

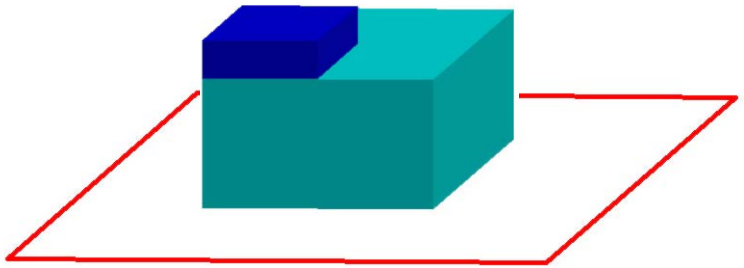


ISO, 2011

❑ Capabilities and Constraints in Generating 3D Cadastral Models from Existing Data (1/2)

Real Property 3D Modelling:

- ✓ parcel boundaries demarcation,
- ✓ demarcation of the object's location,
- ✓ definition of objects' constituent parts
- ✓ elevation or height data concerning real property objects



- ➢ Parcel boundaries, objects location, and objects' constituent parts available in cadastral databases
- ➢ Elevation/ height data in mapping agencies' databases, Urban Planning Departments
- ➢ Isometric plans/ 3d pdf

❑ Capabilities and Constraints in Generating 3D Cadastral Models from Existing Data (2/2)

- ✘ Varying accuracy
- ✘ Scanned or paper drawings
- ✘ Reference systems used/ coordinate availability
- ✘ Data accessibility

- ❖ Fusion of different accuracy data
- ❖ Different data formats
- ❖ Insufficient elevation/ height data

- ➢ Requires efficient interoperable SDI
- ➢ Cannot generate a full 3D Cadastre

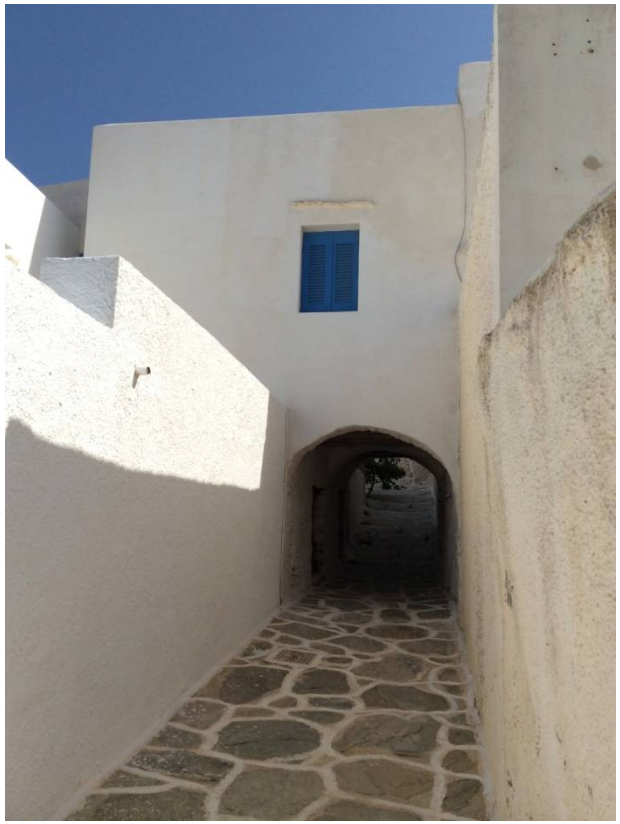
❑ Case Study: Greece (1/8)

➢ Complex legal and organisational framework

- Hellenic Cadastre/ *Mortgage Register Offices/ Cadastre of the Dodecanese*
- Municipal/ Regional Urban Planning Offices
- Utility operators
- Thematic Cadastres (Ministry of Rural Development and Food, Ministry of Environment, Energy and Climate Change, Ministry of Culture and Sports)
- Taxation databases
- Municipal Registers
- Registry of Public Power Corporation
- HMGS
- Hellenic Statistical Authority

❑ Case Study: Greece (2/8)

1. Customary rights in Sikinos Island

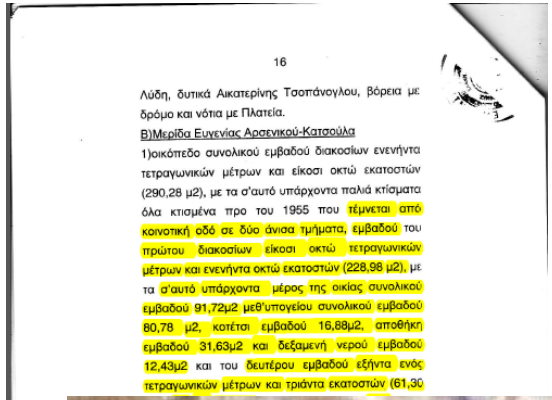


❑ Case Study: Greece (3/8)

1. Customary rights in Sikinos Island

Available data

- Deed of acceptance of succession
- LSO
- Topographic survey plans

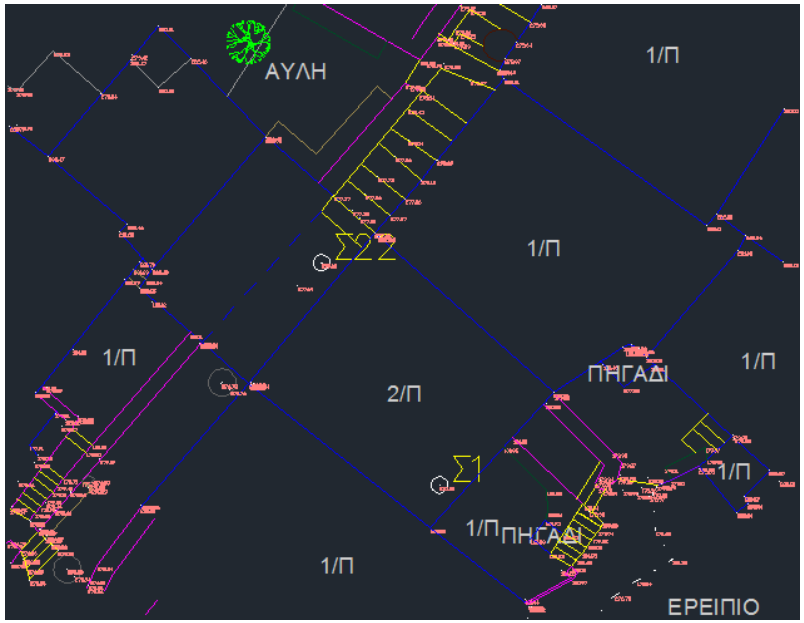


16

Λύδη, δυτικά Αικατερίνης Τσοπάνογλου, βόρεια με δρόμο και νότια με Πλατεία.

Β)Μερίδα Ευγενίας Αρσενικού-Κατσούλα

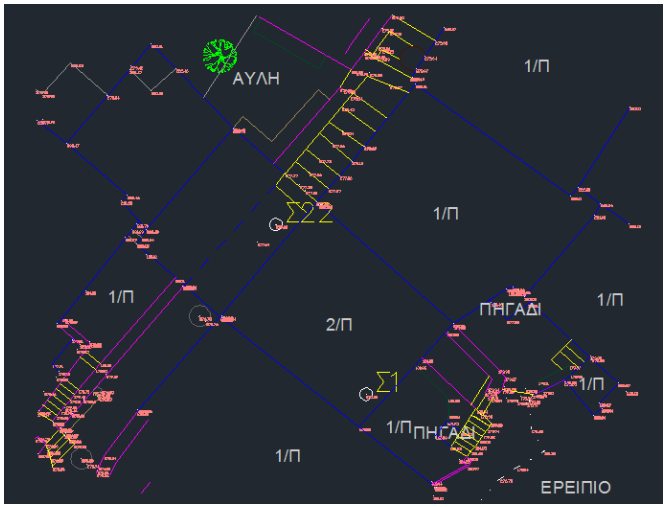
1)οικόπεδο συνολικού εμβαδού διακοσίων ενενήντα τετραγωνικών μέτρων και είκοσι οκτώ εκατοστών (290,28 μ2), με τα σ'αυτό υπάρχοντα παλιά κτίσματα όλα κτισμένα προ του 1955 που τέμνεται από κοινοτική οδό σε δύο άνισα τμήματα, εμβαδού του πρώτου διακοσίων είκοσι οκτώ τετραγωνικών μέτρων και ενενήντα οκτώ εκατοστών (228,98 μ2), με τα σ'αυτό υπάρχοντα μέρος της οικίας συνολικού εμβαδού 91,72μ2 μεθ'υπογείου συνολικού εμβαδού 80,78 μ2, κοτέτσι εμβαδού 16,88μ2, αποθήκη εμβαδού 31,63μ2 και δεξαμενή νερού εμβαδού 12,43μ2 και του δευτέρου εμβαδού εξήντα ενός τετραγωνικών μέτρων και τριάντα εκατοστών (61,30

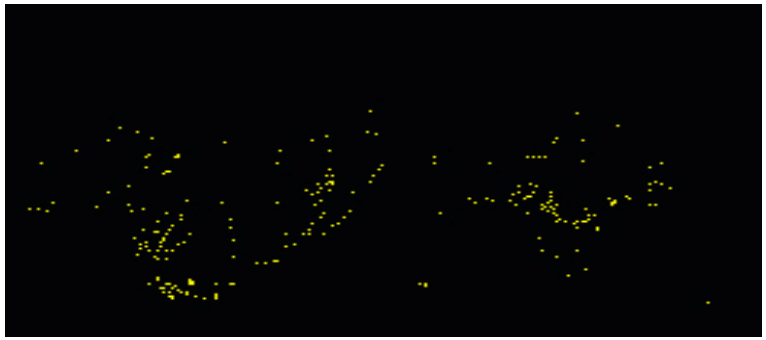


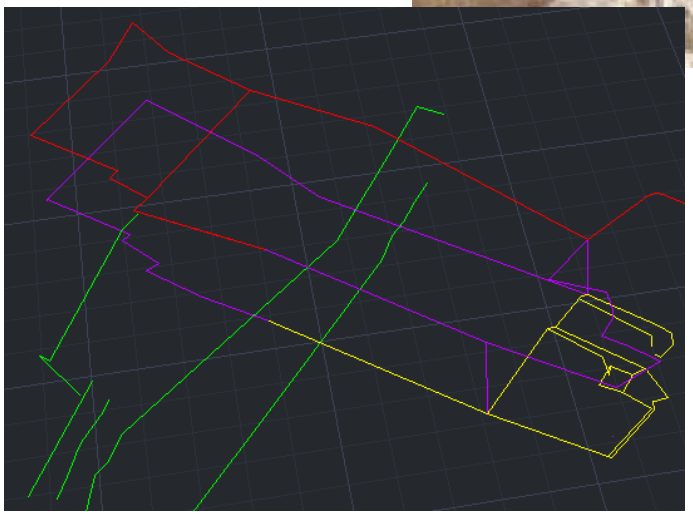
❑ Case Study: Greece (4/8)

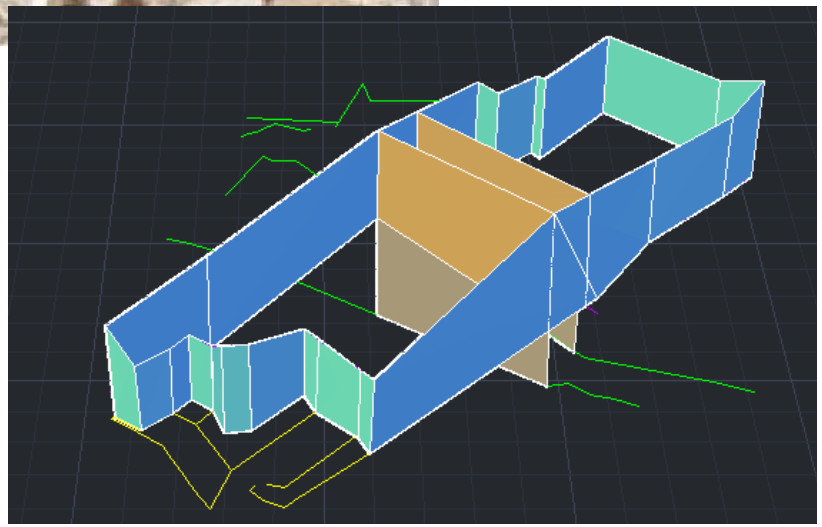
1. Customary rights in Sikinos Island

Data processing



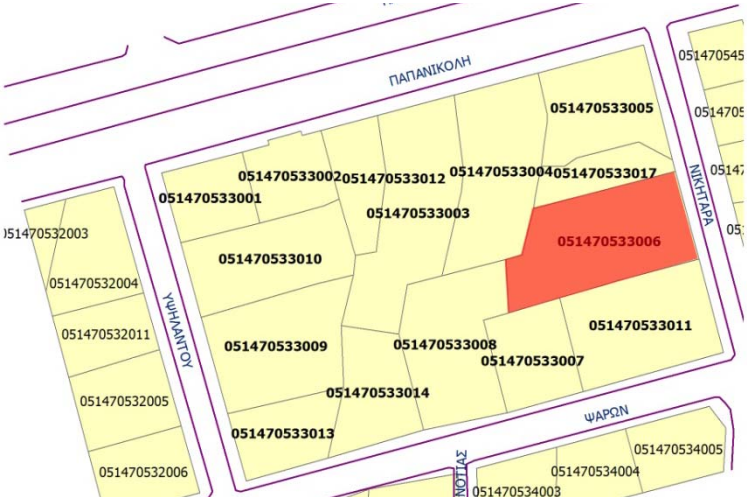






❑ Case Study: Greece (5/8)

2. Apartment units in urban area



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051470533007	00	01	04	01		Δ-1	61,6	265
051470533007	00	01	-1	01		Α	8,72	6

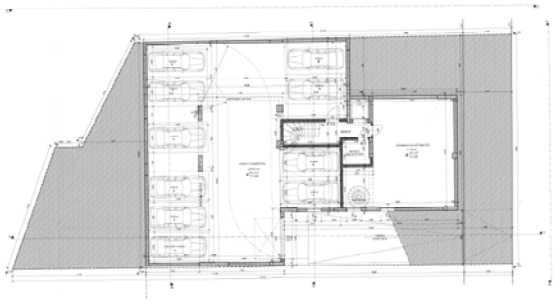
❑ Case Study: Greece (6/8)

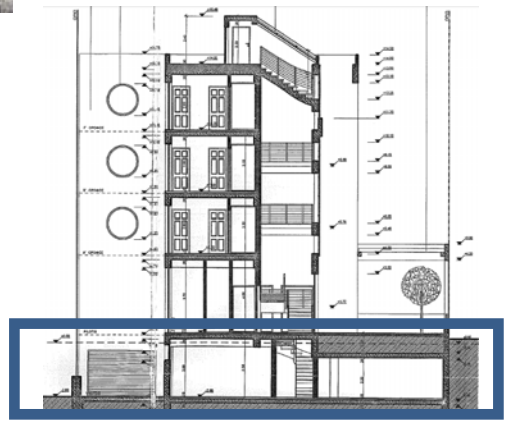
2. Apartment units in urban area

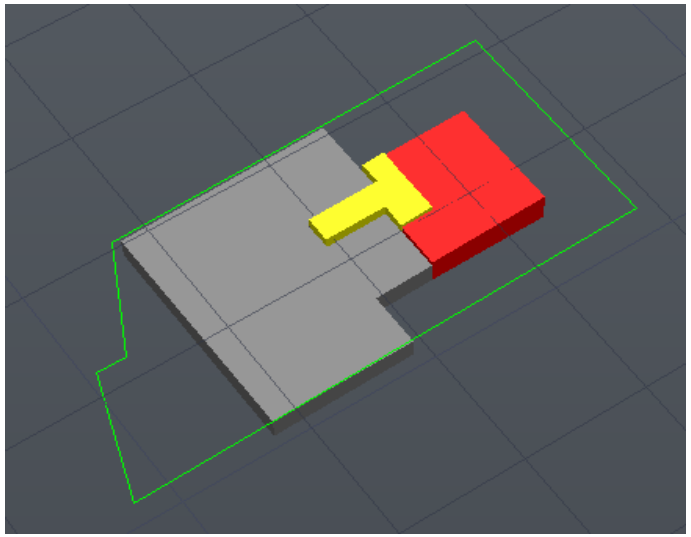
Available data

- VLSO (HC)
- Architecture drawings (Municipal Building Department)

Data processing

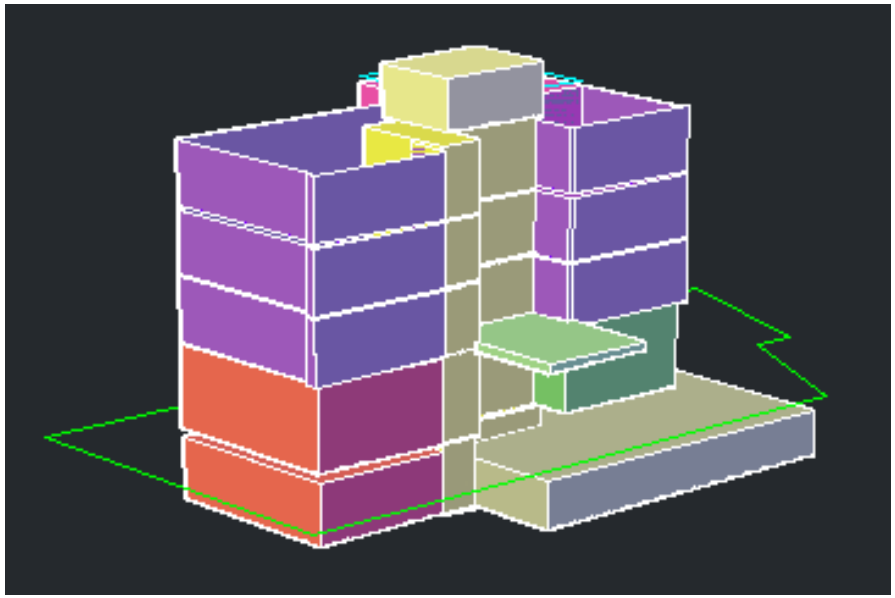






❑ Case Study: Greece (7/8)

2. Apartment units in urban area



❑ Case Study: Greece (8/8)

Case study findings

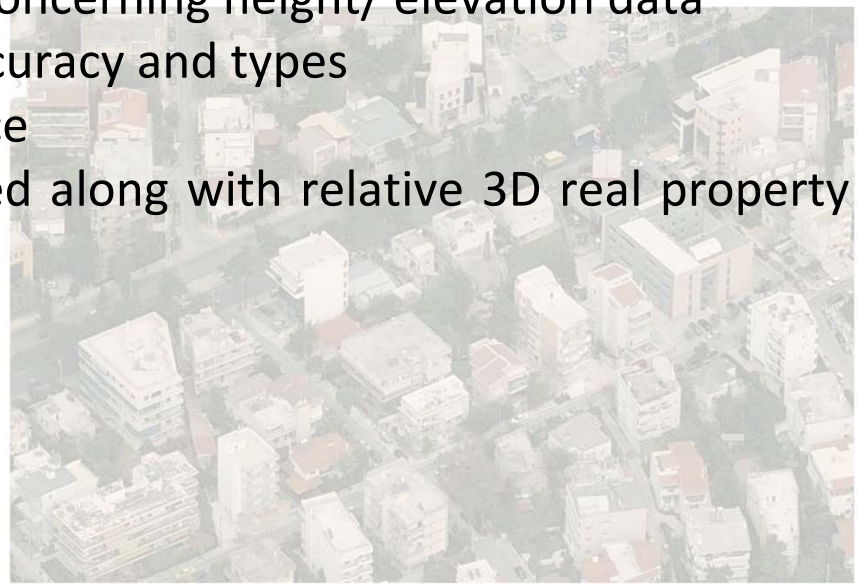
Cannot produce a full 3D cadastre
Can update/ extend existing Cadastre to 3rd dimension

Customary rights	Apartment units
Literal descriptions	Can only be applied to buildings
Refer to different legal status	Cannot accommodate variances between real and planned construction
Insufficient height data	Cannot apply to informal constructions
Need of data transform in case of older survey plans	Easier to accommodate survey plans not using national datum

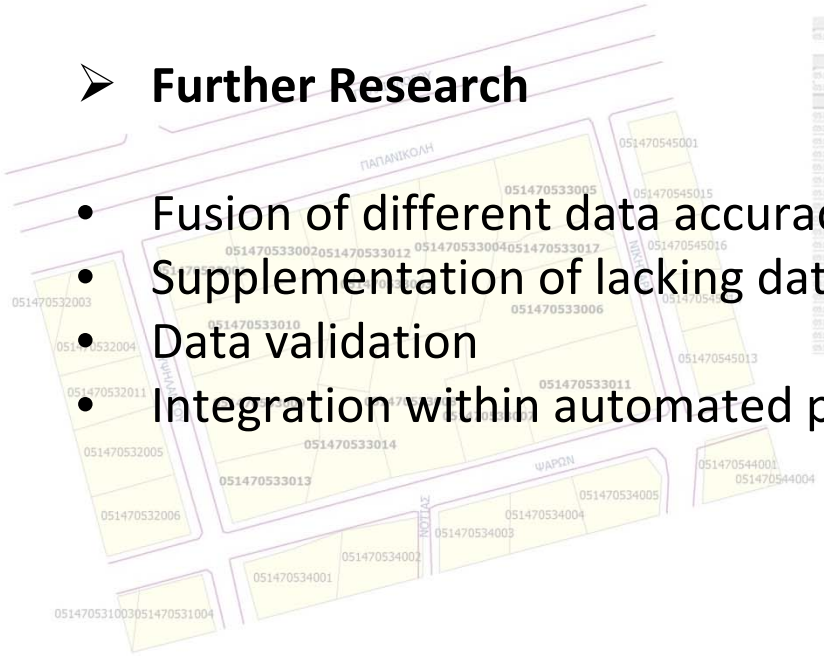
❑ Conclusions (1/2)

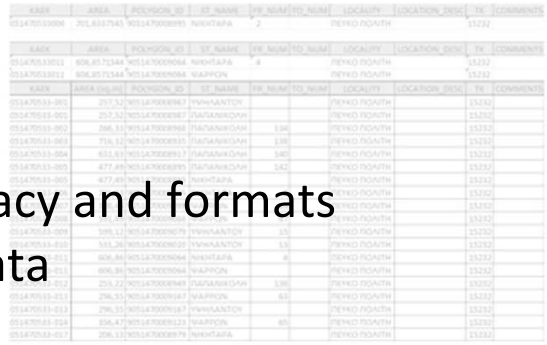
- ✓ Intermediate step to clarify complex real property situations
- ✓ Overcomes cost of acquiring 3D data
- ✓ BIM models (when available) for building level modelling
- ✓ Adjustment of national Land Administration Systems to LADM can simplify the whole procedure

- ✘ Existing documentation is lacking concerning height/ elevation data
- ✘ Need of fusing data of different accuracy and types
- ✘ Strong relation to constructed space
- ✘ Semantic data cannot be processed along with relative 3D real property model

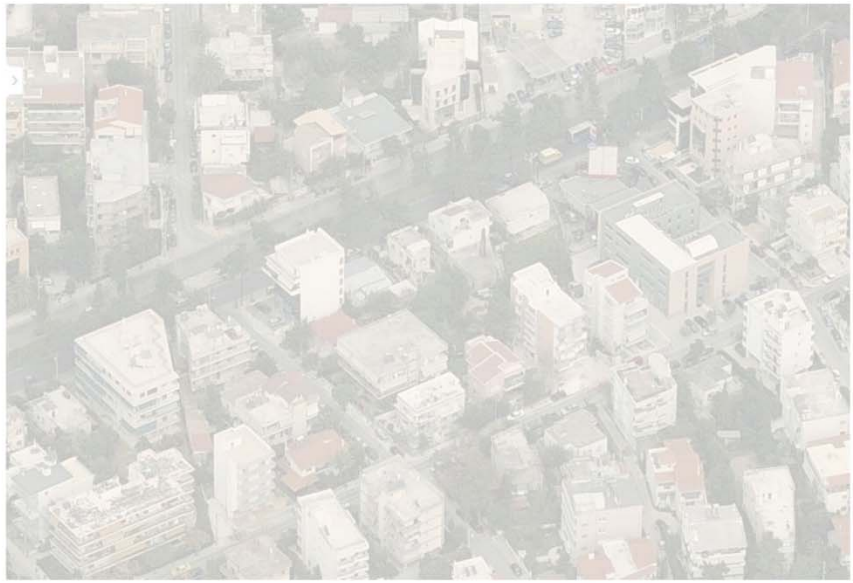


❑ Conclusions (2/2)

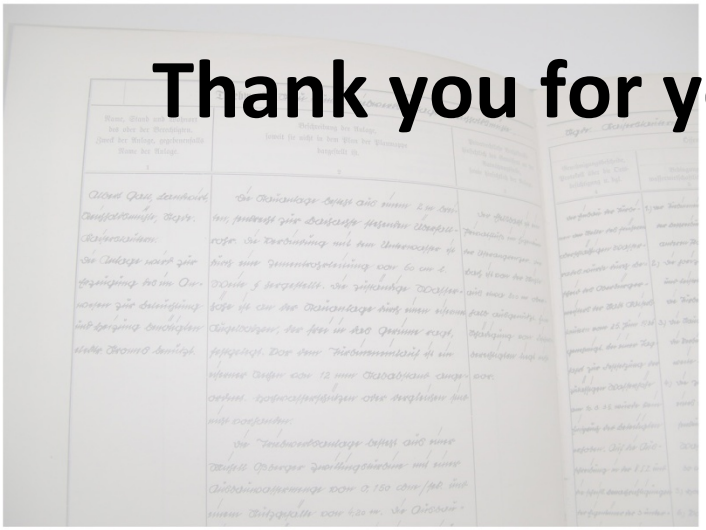


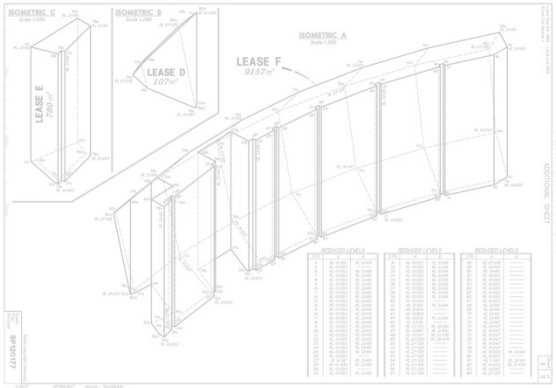


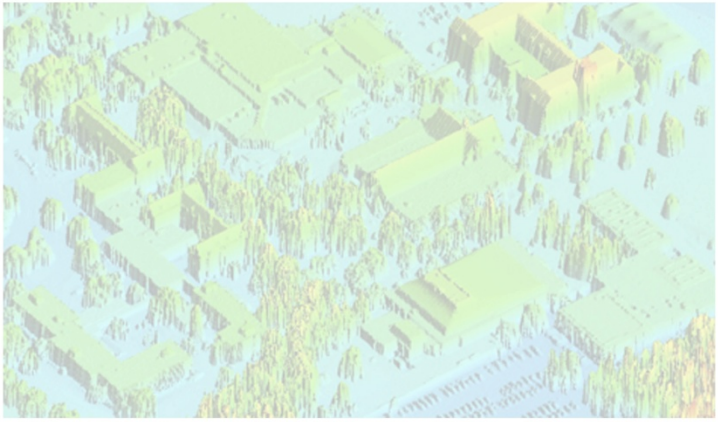
- Fusion of different data accuracy and formats
- Supplementation of lacking data
- Data validation
- Integration within automated process and relative procedural issues

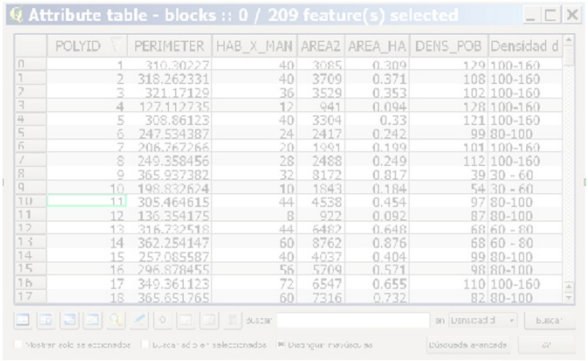


Thank you for your attention !









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4	5	308.86123	40	3304	0.33	121	100-160
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