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# **3D Real Property Legal Concepts and Cadastre - A Comparative Study of Selected Countries to Propose a Way Forward**

# Outline

- Introduction
- Legal issues examined
- Case studies
- Conclusions
- Further research

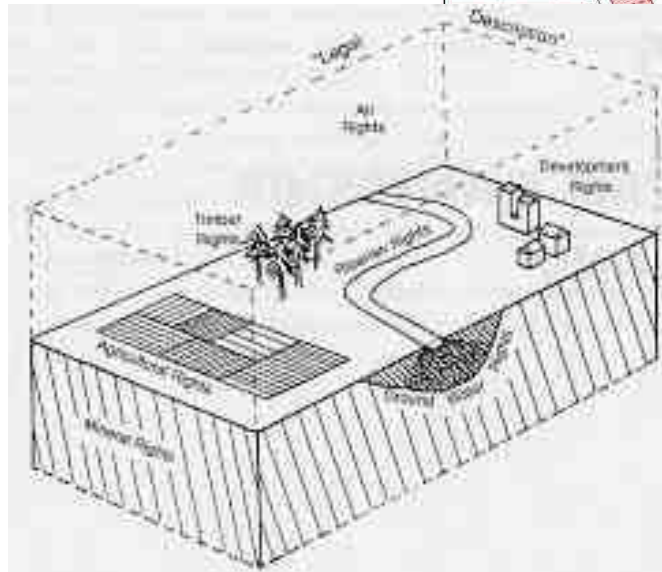


# Introduction (1/2)

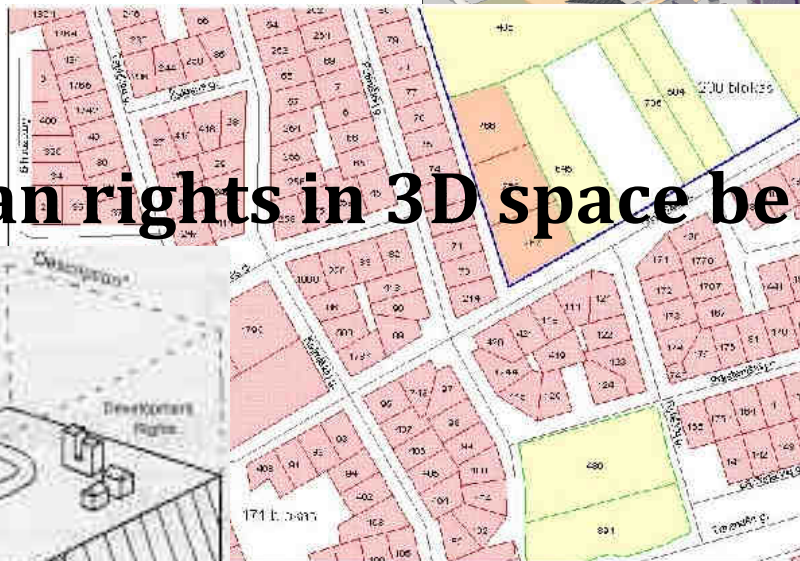
- Role of Cadastre
- Complex RRRs on land
- 3D aspects of RRRs



**How can rights in 3D space be secured?**



Source: Platt, 1991



m/wp-  
source\_OpenStreetMap.png

w.fig.net/resources/monthly\_articles/2013/m  
jpg

- Partition of 3D space
- “Concept” of 3D property

## Introduction (2/2)

This paper

- ✓ Compares and discusses 3D property concepts in selected countries
- Common legal background
- Different stages of 3D Cadastre development

Overview report 4<sup>th</sup> International Workshop on 3D Cadastres – Legal Framework of 3D Cadastres Working Session (Dubai, 2014)

1. Position paper (Paasch and Paulsson, 2014), Results (Paasch, 2014)
2. Building a Modern Cadastre: Legal Issues in Describing Real Property in 3D, «Geodetski Vestnik», Vol. 60, Paasch, J., Paulsson, J., Navratil, G., Vučić, N., Kitsakis, D., Karabin, M. and El-Mekawy, M. (2016)
3. 3D Real Property Legal Concepts and Cadastre - A Comparative Study of Selected Countries to Propose a Way Forward, Kitsakis, D., Paasch, J., Paulsson, J., Navratil, G., Vučić, N., Karabin, M., Carneiro, A. and El-Mekawy, M.

## Legal issues examined (1/2)

### *Selected countries*

- ✓ Austria
- ✓ Brazil
- ✓ Croatia
- ✓ Greece
- ✓ Poland
- ✓ Sweden



Each co-author was asked to provide

- Background data
- Current status of 3D objects recording
- Legal definition and delimitation of 3D objects
- Types of rights registered in 3D

## Legal issues examined (2/2)

- Civil Law jurisdictions
- Administrative differences
- Differences in cadastral infrastructure
- Differences in 3D Cadastre legislation implementation

*Variety of 3D objects*                      *Deeds registration*                      *Title registration*

*Municipal Cadastres*                      *Roman Law based Civil Law*

*Centralised cadastral systems*                      *Nordic Law based Civil Law*

*Introduction of 3D Cadastre legislation under discussion*                      *3D Cadastre legislation*

*Ongoing cadastral survey*                      *Unified Cadastre and Land Registry*

# Case studies (1/5)

## Background

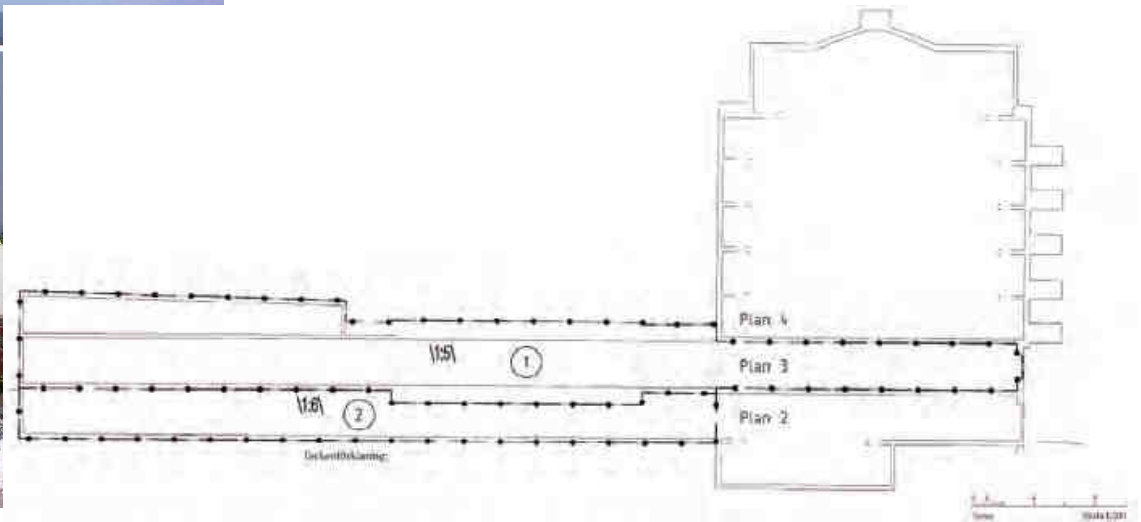
- Austrian Cadastre since 1817
- Brazil Federal rural cadastre, municipal urban cadastres
- Ongoing Hellenic Cadastre

Inscrição/Imobiliária Sequencial	Natureza	Nome Proprietário	Distrito	Sector	Quadra	Face	Unidade	Lote	(...)	Tipologia	Patrimônio Edif.	Regime Ocupação	Usos Imóvel	Est. Conservação		
2231500304037800	023	10190767	P	MARIA	3	2315	003	04	0378	0002	...	APARTAMENTO	1- PARTICULAR	1- PROPRIO	1- RESIDENCIA	3- REGULAR
2231500304037800	023	10190775	P	CARLOS	3	2315	003	04	0378	0003	...	APARTAMENTO	1- PARTICULAR	2- ALUGADO	1- RESIDENCIA	2- BOM
2231500304037800	040	10190783	P	MARTA	3	2315	003	04	0378	0004	...	APARTAMENTO	1- PARTICULAR	1- PROPRIO	1- RESIDENCIA	3- REGULAR



- Similar types of objects recorded (land parcels, buildings, apartments)
- Special cases of real property units

Source:  
<http://geosampa.prefeitura.sp.gov.br>



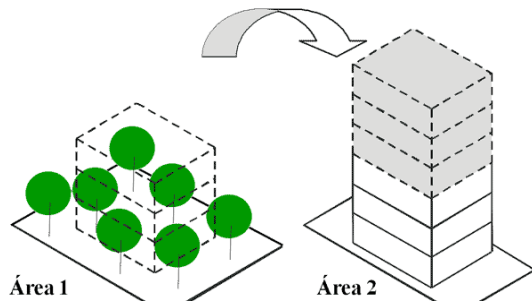
Source: Kitsakis and Dimopoulou, 2014

Source: Lantmäteriet, the Swedish mapping, cadastral and land registration authority

# Case studies (2/5)

## Status

- Roman principles
- Registration as 2D projections
- Descriptive data of 3D objects
- 3D RRRs not registered



Source: Saboya, 2008



Source: Paasch et al., 2016

- ✘ Registration of different object types
- ✘ Ownership - Building rights

## Sweden

- ✓ 3D Cadastre legislation (2004)
- ✓ Condominium legislation (2009)



## Case studies (3/5)

### *Legal definition of 3D objects*

- No legal definition of 3D objects
- Restrictions by Property Law, specific legislation

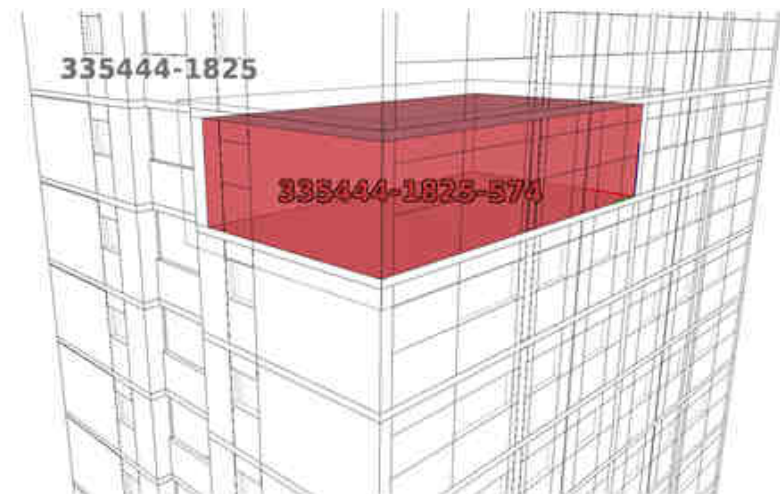
- ✘ Different types of 3D objects nationally
- ✘ 3D characteristics simplified in 2D
- ✘ 3D restrictions not always presented to cadastral maps

Sweden

- ✓ Precise 3D property definition



Source: NCMA, National Mapping and Cadastre Agency, Greece



## Case studies (4/5)

### *Rights that can be registered in 3D*

- No 3D registration of rights
- Registration based on relative 2D objects
- Elevation data on survey plans

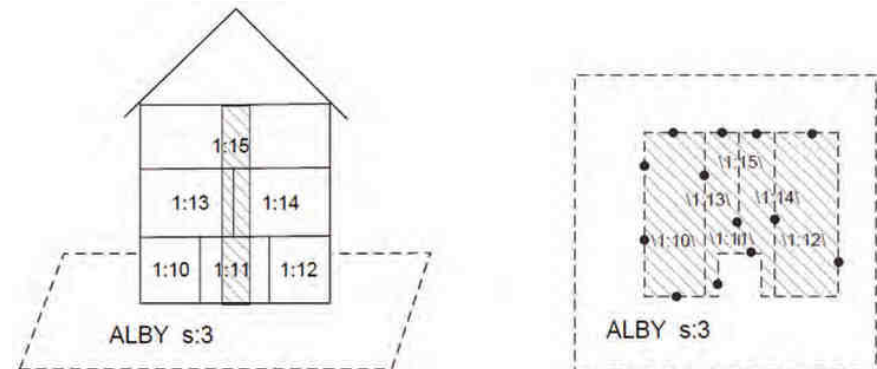
- ✘ Same as in 2D (Croatia)
- ✘ 3D RRRs do not differ from 2D (Sweden)
- ✘ Themed Cadastres (Archaeological, Utilities etc)

### Presentation to cadastral maps

- 2D
- 2.5D
- Separate layers
- Specific symbology



Source: BEV, Federal Office of Metrology and Surveying, Republic of Austria



Source: Lantmäteriet, the Swedish mapping, cadastral and land registration authority (2004)

## Case studies (5/5)

	<i>Background</i>	<i>Status</i>	<i>Rights registered in 3D</i>	<i>Legal definition of 3D objects</i>
<b>Austria</b>	Focus on digitising cadastral archive	Registration of 2D spatial restrictions	✘	✘
<b>Brazil</b>	Urban cadastre under municipalities' authority	Building rights - ownership difference	✘	Parcels identification from unit number based on orthogonal projection
<b>Croatia</b>	No registration of parts of land legally partitioned	Apartment ownership kind of 3D registry	Same as in 2D	Rights on use of limited space registered on a 2D parcel
<b>Greece</b>	2D registration	Significant number of laws regulating objects with 3D characteristics	✘	✘
<b>Poland</b>	2D registration	Registration of land parcels, buildings, apartments	✘	✘
<b>Sweden</b>	Complex RRRs on real property	3D Cadastre legislation	No difference with 2D real property – No limitations in 3D RRRs	✓

## Conclusions (1/2)

High level of variation regarding

- Cadastral administration and infrastructure
- Implementation of 3D Cadastre legislation
  
- No statutory definition for 3D property (except Sweden)
- Condominium
- 2D representation of 3D units
  - ✘ Different 3D objects in each country
  - ✘ Different methods of recording 3D objects

*Still unresolved*

- Management of cross boundary objects
- Relation between 3D real property and constitutional stipulations
- Cooperation with other professionals

## Conclusions (2/2)

Need of

- **Re-defining** real property in 3D space
- Establishment of **legal instruments** to subdivide, consolidate and manage 3D real property
- Introduction of **3D Public Law regulations**
- **3D Cadastral survey** procedures
- **Transition** from 2D real property to 3D

## Further research

- **Legal amendments** required, **departments** or expert fields that should be involved
- Establishment of independent from national legislation **theoretical framework**, based on international **LADM** standard
- **Exploitation** of Building Information Modelling (**BIM**) for 3D cadastral purposes
- Interdisciplinary approach in cooperation with **other professionals**, e.g. lawyers, economists, spatial planners...
- **Extend research** to other countries

# Thank you!

