Initial analysis of the second FIG 3D-Cadastres questionnaire: Status in 2014 and expectations for 2018

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FIG

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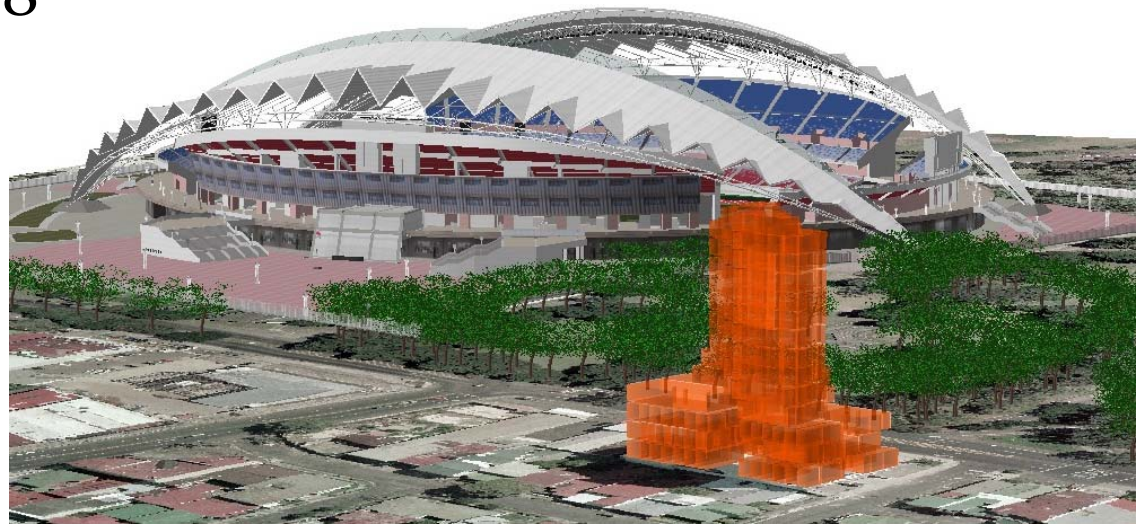
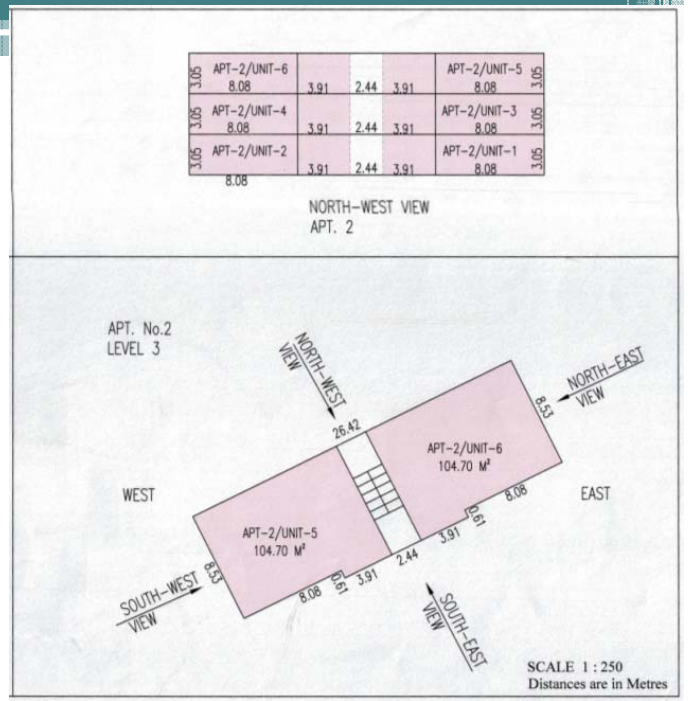
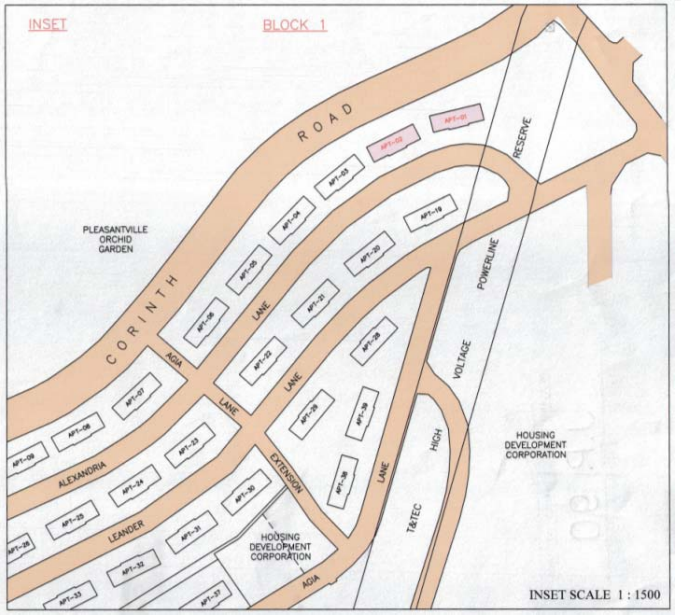


1. Introduction

- Review and update of current 3D Cadastre developments
- All relevant issues incorporated
- Keep track of development worldwide
- Assist researchers etc. with snapshot of past and current





2.1 Design and modification of Questionnaire

- As similar as possible to the first one – enable to track changes over time

- Understanding data distribution
- Numerical analysis - benchmark
- Expected vs. realised development

Existing

1. General/applicable 3D real-world situations
2. Infrastructure/utility networks
3. Construction/building units
4. X/Y Coordinates
5. Z Coordinates/height representation
6. Temporal Issues
7. Rights, Restrictions and Responsibilities
8. DCDB (The Cadastral Database)
9. Plans of Survey (including field sketches)

New

10. Dissemination of 3D Cadastral information
11. Statistical information
12. Reflection

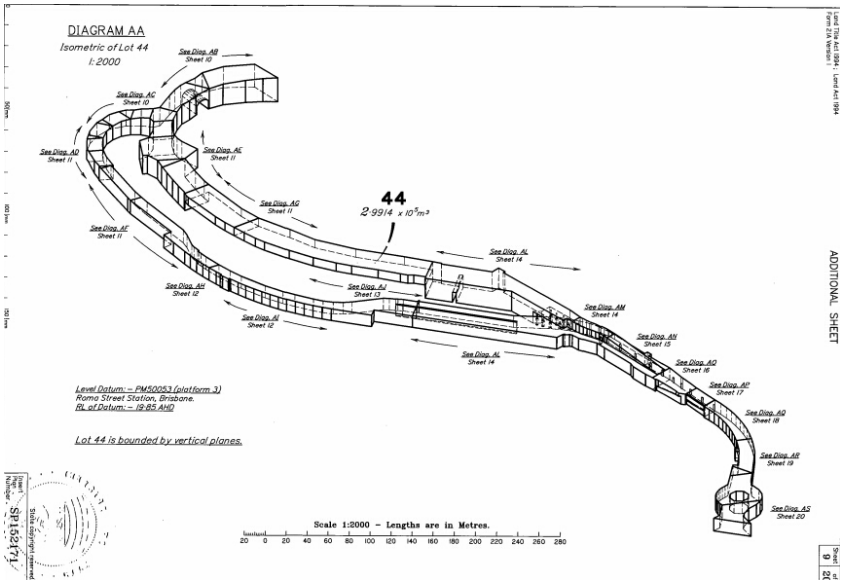
2.2 Participation – both phases

- New countries participated – showing global awareness
- For many – possibly not much changes

Questionnaire completed	Countries, Jurisdictions
Both 2010-2014 and 2014-2018	Australia/Queensland, Brazil, Canada/Quebec, China, Croatia, Cyprus, Denmark, Finland, Germany, Greece, Hungary, India, Israel, Kenya, Macedonia, Malaysia, Nigeria, Norway, Poland, South Korea, Spain, Sweden, Switzerland, Trinidad and Tobago, Turkey
Only 2014-2018	Costa Rica, Czech Republic, Portugal, Serbia, Singapore
Promised 2014-2018	Argentina, Ecuador, The Netherlands
Only 2010-2014	Austria, Bahrain, France, Indonesia, Italy, Kazakhstan, Nepal, Russia, United Kingdom

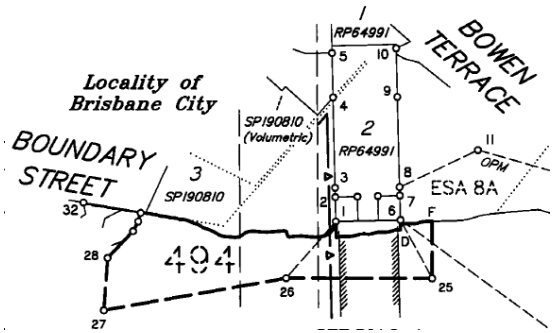
3. Potential Limitations

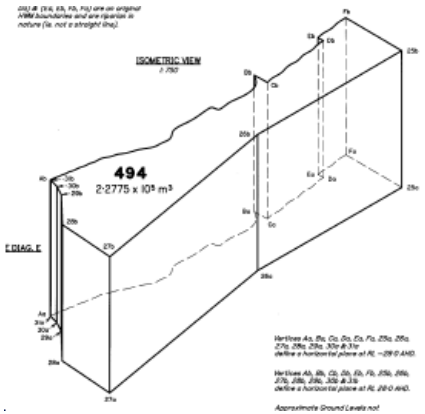
- Difficult to design a clear questionnaire
- Number of responses
- Time spent on it by respondents
- Expert knowledge of respondents
- Homogeneity in terms across jurisdictions



4.1 General applicable 3D real-world situations

- Most cases related to construction – some exceptions
- No consensus on whether a multi-part is allowed
- Natural resources part of land-administration - not shown as 3D



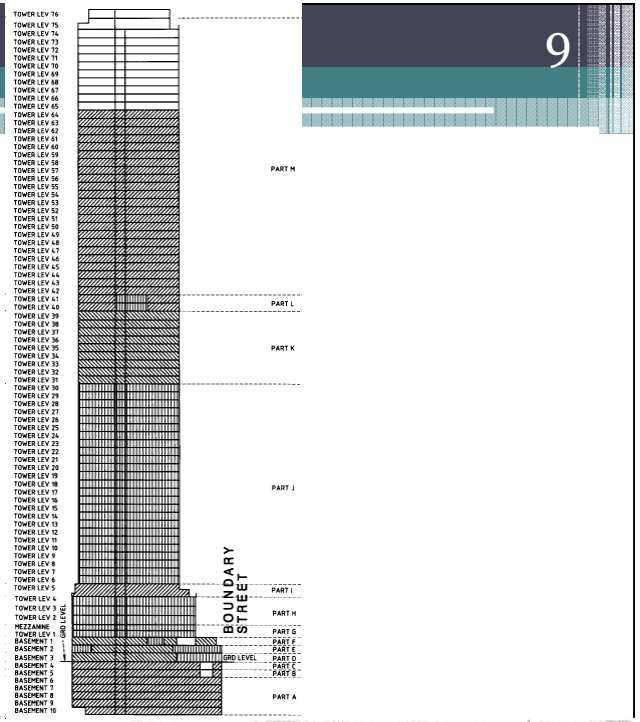


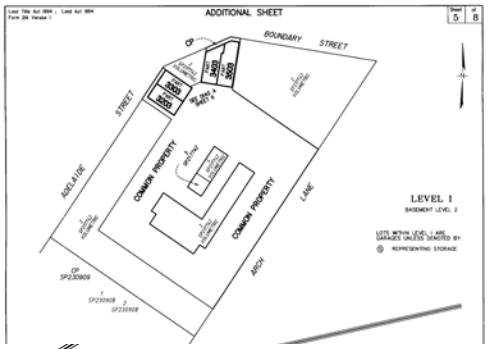
4.2 Infrastructure/utility network

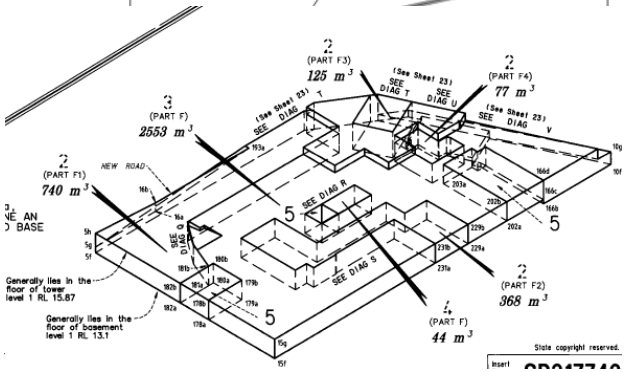
- Most cases network not part of cadastre – Queensland registers as volumetric parcel
- Many show utility network lines on the cadastral map

4.3 Construction/building units

- Most constructions registered - apartments/condominium
- Units often defined by actual walls and structure of building

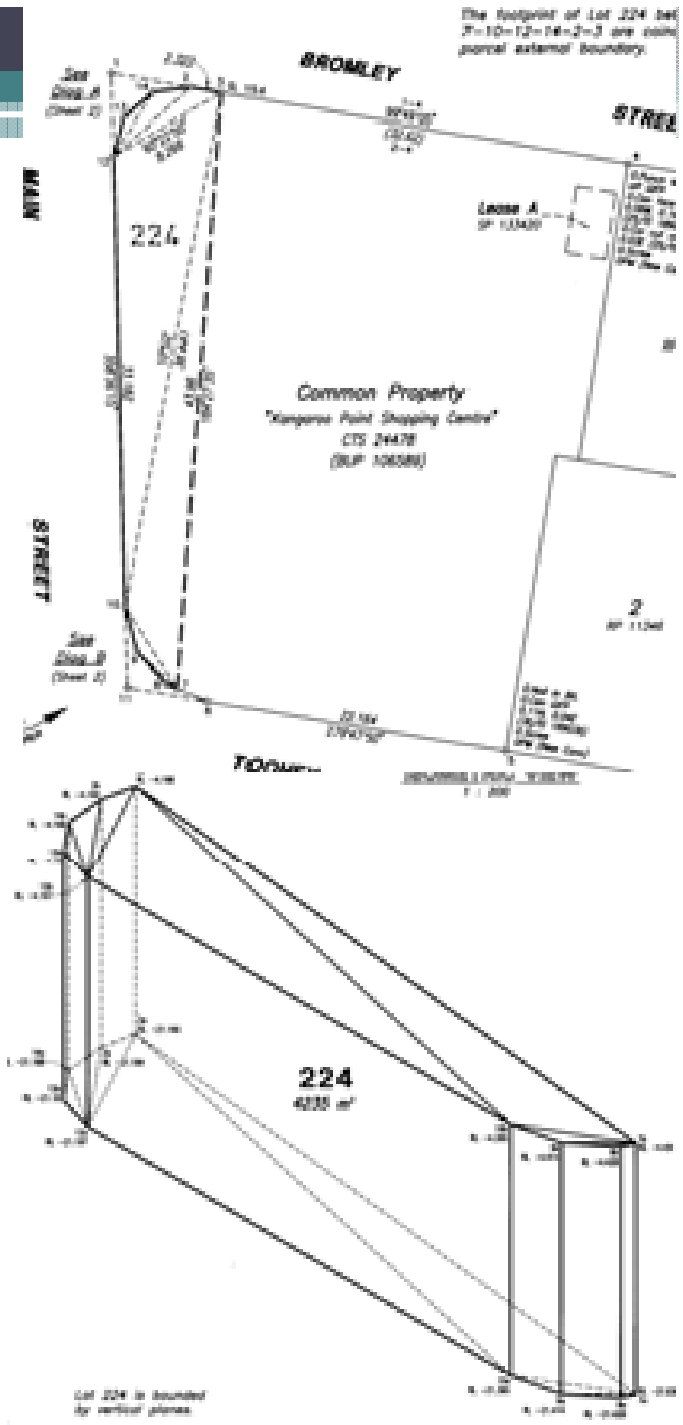






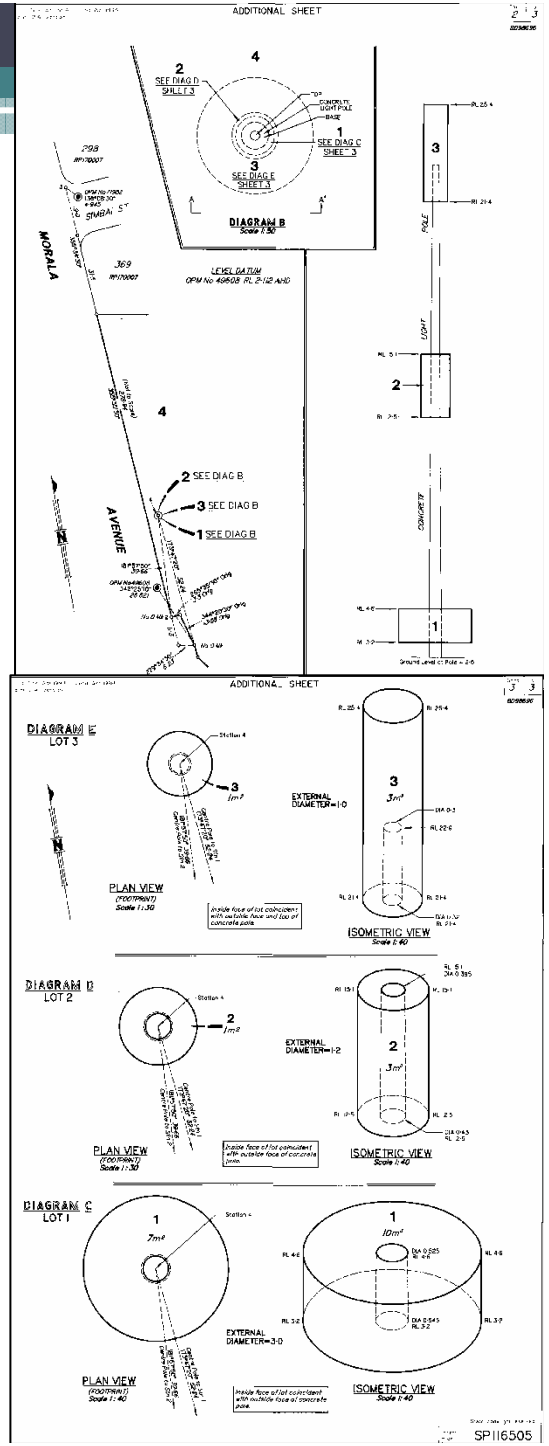
4.4 X/Y Coordinates

- Most do not guarantee x/y coordinates with some exceptions
- Many accommodate parcels without geometry – e.g. apartments

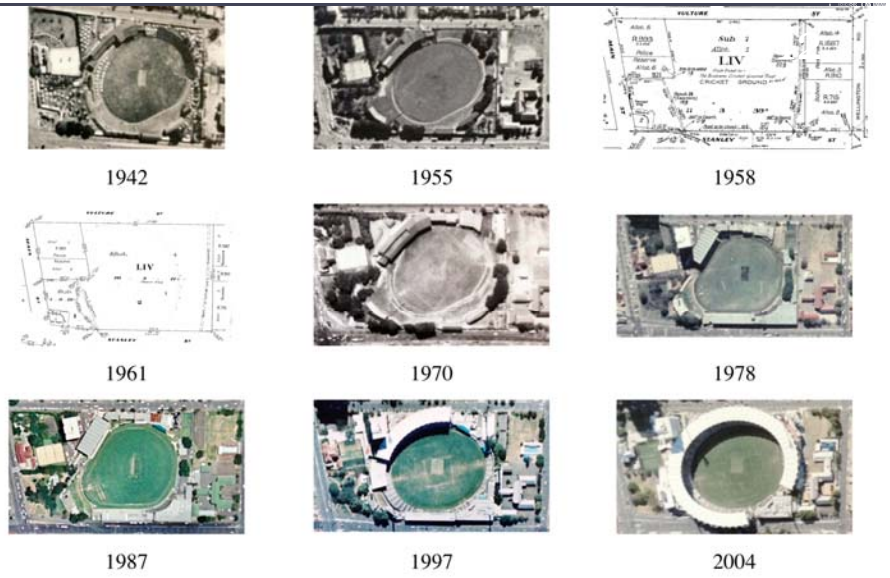


4.5 Z Coordinates/height representation

- Z value available in many – either local height or reduced to a datum
- Some store height surface of the whole country



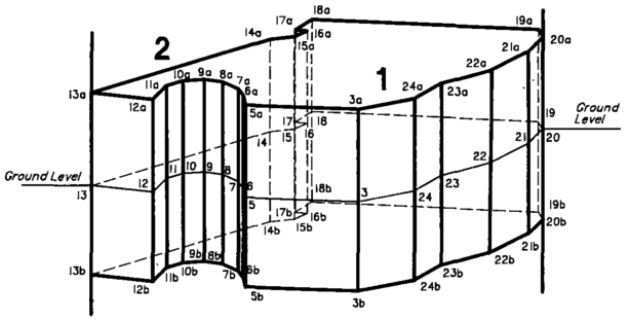
4.6 Temporal Issues



- Not very prominent in any jurisdiction
- Generally temporal aspects not part of parcel definition
- No integration of space/time for a single 4D representation

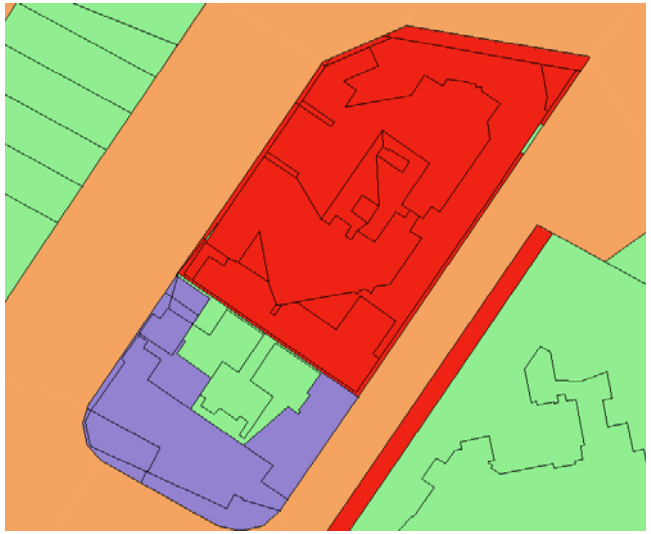
4.7 Rights, Restrictions and Responsibilities

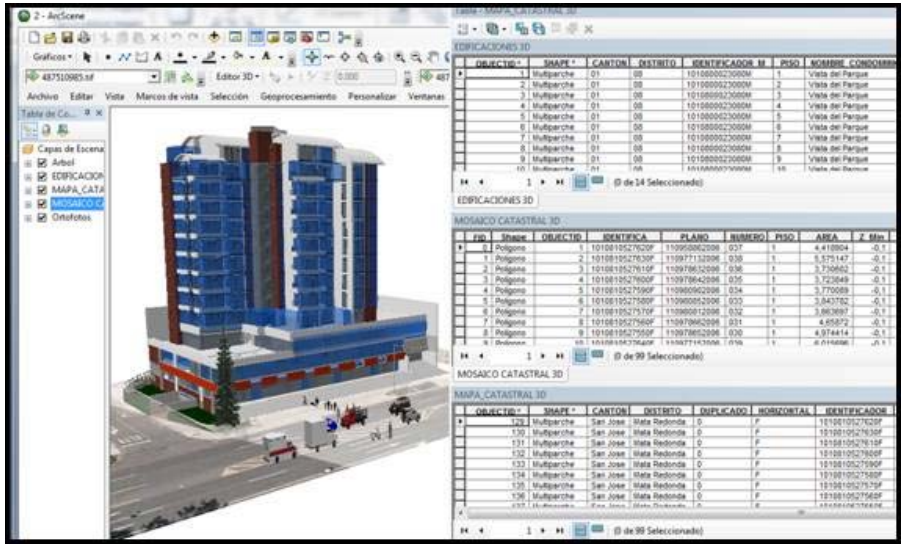
- Most cases cadastral records held in land registry office
- Land registry office responsible for data correctness in most cases – (ex surveyors)
- Paper-based proof of ownership supplied in most cases – 3D information textual in many cases



4.8 DCDB (The Cadastral Database)

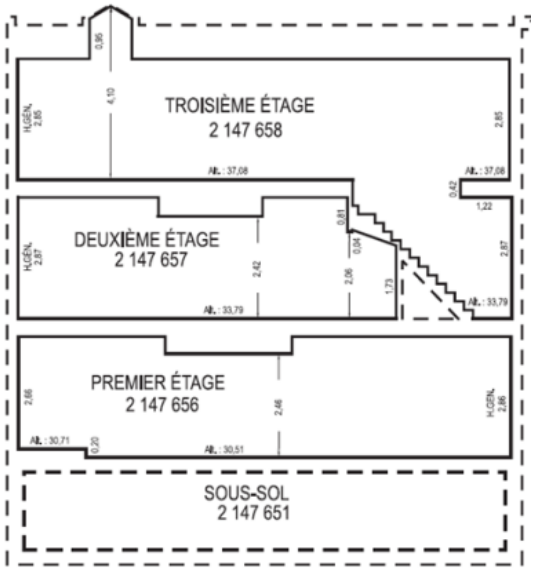
- Not many aligned with ISO 19152 LADM – (some compatible)
- 3D stored in DCDB in China and Costa Rica
- 3D not validated inside DCDB in most





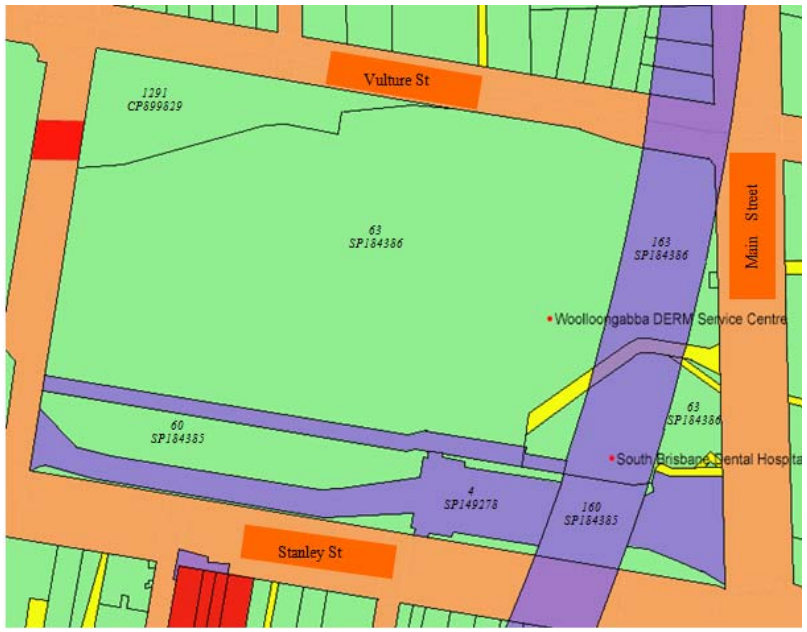
4.9 Plans of Survey

- Some jurisdictions show 3D on cadastral plan
- Apartments are registered in many without a 3D cadastral plan
- 3D not yet supported in some jurisdictions
- Not many 3D surveying and mapping guidelines



4.10 Dissemination of Cadastral Information

- Variety of formats for data dissemination
- Cadastral data disseminated via a portal in some cases
- Variety of cartographic styling rules



4.11 Statistical Information

- Smallest and largest 2D/3D parcels
- Significant variation in year of 3D in cadastre
- Ratios – 3D urban vs. rural, types of 3D, 2D/3D surface area
- Other general statistics – size of jurisdiction, population, no. of 2D and 3D

4.12 Reflection and Comparision to 2010 – (1)

- Development (2010 – 2014)
  - Legal Framework – (Greece, Macedonia)
  - Mode of progress – (Kenya 2D to 3D)
  - Limited to Academic interest – (Portugal)
  - Difficulties in changing from 2D to 3D – (S. Korea)
  - Large 3D infrastructures – (Sweden)
  - Change in data capture techniques – (Switzerland)

4.12 Reflection and Comparision to 2010 – (2)

- Slower than expected (2010 – 2014)
  - Digital lodgement – (Queensland)
  - Law and policy – (China, Switzerland)
  - Registration of public utility infrastructure – (Croatia)
  - Government funding and governance – (Nigeria)
  - Academic interest not converted to legislation – (Poland)
  - Focus on visualisation – (S. Korea)

4.12 Reflection and Comparision to 2010 – (3)

- 3D Land Administration (2010 – 2014)
  - Increase in 3D registration – (Croatia, Queensland)
  - Land mortgage market stimulation – (Greece)
  - New registration possibilities – (Macedonia)
  - Infrastructure progress – (Israel)
  - Access to digital data – (Sweden, Switzerland)
  - No change – (many including Quebec)

5.1 Top three challenges

Country	Challenge 1	Challenge 2	Challenge 3
Australia/Queensland	3D ePlan submission	Validation	Storage mechanism
Australia/Victoria	3D data acquisition	3D data visualisation	3D data maintenance
Brazil	Improvement of 2D land administration	Training of professionals with expertise in 3D	Integration of data
Canada/Quebéc	Spatial representation for any kind of overlapping properties	Integrated strategy for immatriculated and not immatriculated real estate	
Croatia	Land policy Real property taxation	The resolution of legal uncertainty inherited from past	
Cyprus	Political decision	Technical approach for data capture	Data model design
Denmark	Modelling 3D ownership/parcels		
Finland	Buildings		
Greece	Modelling 3D legal situations	Modelling new rules/ business procedures	Defining 3D surveying requirements
India	Political will	Administrative Hurdles	Technical Manpower
Israel	Development of appropriate legal framework		
Macedonia	Introducing 3D properties in all 3D situations	Defining procedures for administrating 3D properties	Visualisation of 3D property
Nigeria	Awarenes	Investment by government	Capacity building
Poland	Formal definitions of 3D cadastral objects	Pilot project	Creating circulars for 3D cad surveys
South Korea	Visualization	3D Surveying	3D Geo-database
Spain	Change current data model and tools (if needed)		
Sweden	To further the formation	Creating 3D ownership	

5.2 Perspective for 2018

- Limited responses – so Australia as representative case
- 2010 – 3D parcels constrained within 2D – constraints removed
- Expected in 2018 - 3D defined in LandXML – digital submission
- 2014 - Further examples in dealing with network
- (2010-14) 3D stored as 2D projection – 2018 expected to be stored in DCDB
- Currently open data policy – expect 3D in 2018

5.3 Lessons Learnt

- No country has a fully functional 3D yet – functionality always limited in some way
- Overall no strong indication of 3D in DCDB
- Clarification of some questions needed for next phase
- Wish list for many include 3D pdf and LandXML
- List of challenges provide interesting overview of current status

6. Conclusion

- Significant progress in the last 4 years
- More countries have legal provisions for registration of 3D data
- Many have 3D information on cadastral plans – isometric views, vertical profiles, textual
- Most register apartments
- Some examples of 3D DCDB
- Use of building construction plan for cadastre

Questionnaire Participants

- Agnieszka Bieda, Amalia Velasco, Andrea F.T. Carneir, Andrés Hernández Bolaños, Anita Kwartnik-Pruc, Cemal Biyik, Charisse Griffith-Charles, Dabiri O. Thomas, Dave Raphael, David Siriba, Davood Shojaei, Dimitrios Kitsakis, Efi Dimopoulou, Esben Munk Sørensen, Fatih Doner, Gjorgji Gjorgjiev, Gyula Ivan, Hamed Olfat, Helena Åström Boss, Jacynthe Pouliot, Jani Hokkanen, Jarosław Bydłosz, Jason Matthews, Jesper M. Paasch, José Miguel Olivares, José-Paulo Elvas Duarte de Almeida, Joseph Forrai, Karel Janecka, Louis-André Desbiens, Magni Busterud, Markus Seifert, Miodrag Roić, Neil Coupar, Osman Demir, Paul McClelland, Per Sörbom, Peter Wiström, Pradeep Khandelwal, Rajica Mihajlovic, Renzhong Guo, Shen Ying, Tarun Ghawana, Teng Chee Hua, Vanco Gjorgjiev, Youngho Lee.

Many, many thanks for completing the questionnaires!