



Presented at the FIG Working Week 2023,
28 May - 1 June 2023 in Orlando, Florida, USA

FIG WORKING WEEK 2023

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Protecting
Our World,
Conquering
New Frontiers

3D Land Administration:

Current Status (2022) and Expectation for the Near Future (2026) – initial analysis

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Contents

- Introduction
- Questionnaire design
- Questionnaire response
- Main trends
- Conclusion



Introduction

- Review and update of current 3D Cadastre developments
- All relevant issues incorporated, different sections in questionnaire
- Keep track of development worldwide
- Assist researchers etc. with snapshot of past and current
- 4th questionnaire compare to the earlier editions, every 4 years
- Submission via off-line word doc by email or google form (new)
- All completed questionnaires on-line at <http://www.gdmc.nl/3DCadastres/participants/>

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Questionnaire design

- As similar as possible to the first one – enable to track changes over time
- Understanding data distribution
- Numerical analysis - benchmark
- Expected vs. realised development
→ 2026 and 2022 in this case

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)
10. Dissemination of 3D Cadastral information
11. Statistical information
12. Reflection
13. Contact details

Few new questions added (without changing the numbering)

- **Question 1.23 (General/applicable 3D real-world situations):**
Has there been developed any country profile based on LADM ISO19152?
 - a) Does it support 2D spatial units?
 - b) Does it support also 3D spatial units?
 - c) Is there any provision to include/ align with the new LADM developments of the second Edition of the standard (inclusion of valuation information, marine spaces, spatial plans, interoperability/ reuse of BIM/IFC, ..)?

Few new questions added, continued

- **Question 3.14 (Construction/building units):** Are there any mandates that set specifications on the delivery of design/ construction drawing of properties in BIM-based format, when registering new 3D parcels (from design)?
- **Question 3.15 (Construction/building units):** Are there any operational or in prototype stage platforms. implementations that reuse BIM information from design as cadastral/ land administration input?
- **Question 5.8 (Z Coordinates/height representation):** Are there any 3D City Model/ Digital Twin developments carried out at a national or city level that can be used for orientation or reference purposes?
- **Question 6.10 (Temporal Issues):** Are there object classes in the registration that require both real-world (or valid) times and database load (or system) times, i.e. bi-temporal support?

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37 states completed the 4th Questionnaire of 3D Land Administration: current status of 2022 and expectations for 2026





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Country (- State)	2010	2014	2018	2022	Participants
Argentina	2010	2014	2018	2022	Diego Alfonso Erba, Ramiro Alberdi
Australia					Ali Aien, Behnam Atazadeh, Ben Cowie, Murray Dolling, Mohsen Kalantari, Sudarshan Karki, Davood Shojaei, Rod Thompson, Adrian White
AUS - Queensland	2010	2014	2018	2022	
AUS - Victoria	2010	2014	2018	2022	
AUS - NSW			2018	2022	
AUS - Western Australia				2022	
Austria	2010			2022	Rainer Feucht, Gerhard Muggenhuber, Gerhard Navratil
Bahrain	2010			2022	Neeraj Dixit, Ammar Rashid Kashram, Eleni Tziortzioti
Brazil	2010	2014		2022	Andréa Flávia Tenório Carneiro, Suzana Daniela Rocha Santos e Silva
Canada - Québec	2010	2014	2018	2022	Francois Brochu, Louis-André Desbiens, Guillaume Devost, Marc Gervais, Pierre Giguere, Alain Gregoire, Christian Lord, Jacynthe Pouliot, Francis Roy
China	2010	2014	2018	2022	Renzhong Guo, Zhang Ning, Shen Ying
Costa Rica		2014	2018		Andres Hernández Bolaños
Croatia	2010	2014	2018	2022	Miodrag Roic, Nikola Vucic
Cyprus	2010	2014	2018	2022	Elikkos Elia, Andreas Hadjiraftis
Czech Republic		2014	2018	2022	Karel Janecka
Denmark	2010	2014		2022	Lars Bodum, Jesper Paasch, Esben Munk Sørensen
Finland	2010	2014	2018	2022	Jani Hokkanen, Arvo Kokkonen, Markku Markkula, Tarja Myllymäki
France	2010				Claire Galpin, Hervé Halbout
Germany	2010	2014	2018		Markus Seifert
Greece	2010	2014	2018	2022	Efi Dimopoulou, Eftychia Kalogianni, Panagiotis Lolonis
Hungary	2010	2014	2018		Gyula Iván
Iceland				2022	Katrín Hólm Hauksdóttir
India	2010	2014	2018		Tarun Ghawana, Pradeep Khandelwal
Indonesia	2010		2018	2022	Trias Aditya, S. Subaryono
Israel	2010	2014	2018	2022	Yerach Doytsher, Joseph Forrai, Kseniya Khasanshina, Gili Kirschner, Yoav Tal
Italy	2010				Diego Navarra, Bruno Razza, Enrico Rispoli, Fausto Savoldi
Kazakhstan	2010				Natalya Khairudinova
Kenya	2010	2014	2018	2022	David Siriba
Macedonia	2010	2014			Gjorgji Gjorgjiev, Vanco Gjorgjiev
Malaysia	2010	2014	2018	2022	Teng Chee Hua, Alias Abdul Rahman
Montenegro				2022	Aleksandra Radulovic
Nepal	2010			2022	Babu Ram Acharya, Susheel Dangol, Tanka Prasad Dahal
The Netherlands	2010	2014	2018	2022	Rohan Bennett, Benedict van Dam, Eric Hagemans, Chrit Lemmen, Hendrik Ploeger, Martijn Rijdsdijk, Martin Salzmann, Jantien Stoter, Eva-Maria Unger, Jaques Vos
New Zealand			2018	2022	Trent Gulliver
Nigeria	2010	2014	2018		Thomas Dabiri
Norway	2010	2014			Lars Elsrud, Olav Jenssen, Lars Lobben, Tor Valstad
Poland	2010	2014	2018	2022	Jaroslaw Bydlosz, Marcin Karabin
Portugal		2014	2018	2022	José Paulo Elvas Duarte de Almeida, João Paulo Fonseca Hespanha de Oliveira, Mateus Magarotto
Russian Federation	2010				Sergey Sapelnikov, Natalia Vandysheva link to Pilot 3D Cadastre in Russia
Serbia		2014	2018	2022	Rajica Mihajlovic, Aleksandra Radulovic, Nenad Visnjevac
Singapore		2014	2018	2022	Wu Defu, Victor Khoo, Kean Huat Soon
Slovenia			2018	2022	Anka Lisec, Jernej Tekavec
South Korea	2010	2014	2018	2022	Youngho Lee
Spain	2010	2014	2018	2022	Amalia Velasco
Sweden	2010	2014	2018	2022	Magdalena Andersson, Peter Ekbäck, Jesper Paasch, Jenny Paulsson
Switzerland	2010	2014	2018	2022	Helena Aström Boss, Robert Balanche, Laurent Niggeler
Trinidad and Tobago	2010	2014	2018	2022	Charisse Griffith-Charles
Turkey	2010	2014	2018	2022	Mustafa Aslan, Cemal Biyik, Fatih Döner
United Kingdom					Alan Howie, Marguerite le Riche, Gareth Robson, Carsten Rönsdorf
England and Wales	2010				
Scotland			2018	2022	



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Compare to previous editions

#					Countries/ Jurisdictions that participated	Number of countries that participated
	2010	2014	2018	2022		
1	√	√	√	√	Argentina, Queensland and Victoria from Australia, Quebec from Canada, Shenzhen provincial city from China, Croatia, Cyprus, Finland, Greece, Israel, Kenya, Malaysia, Poland, South Korea, Spain, Sweden, Switzerland, The Netherlands, Trinidad and Tobago, Turkey	19
2				√	Argentina, Queensland, New South Wales, Western Australia and Victoria from Australia, Austria, Bahrain, Brazil, Quebec from Canada, Shenzhen provincial city from China, Croatia, Cyprus, Czech Republic, Denmark, Finland, Greece, Iceland, Indonesia, Indonesia, Israel, Kenya, Malaysia, Montenegro, Nepal, New Zealand, Poland, Portugal, Scotland, Serbia, Singapore, Slovenia, South Korea, Spain, Sweden, Switzerland, The Netherland, Trinidad and Tobago, Turkey	37
3	√	√	√	NO	Germany, Hungary, Delhi State from India, and Delta State from Nigeria NGA	4
7				√	Hong Kong, Iceland, Montenegro, Philippines, new countries	4

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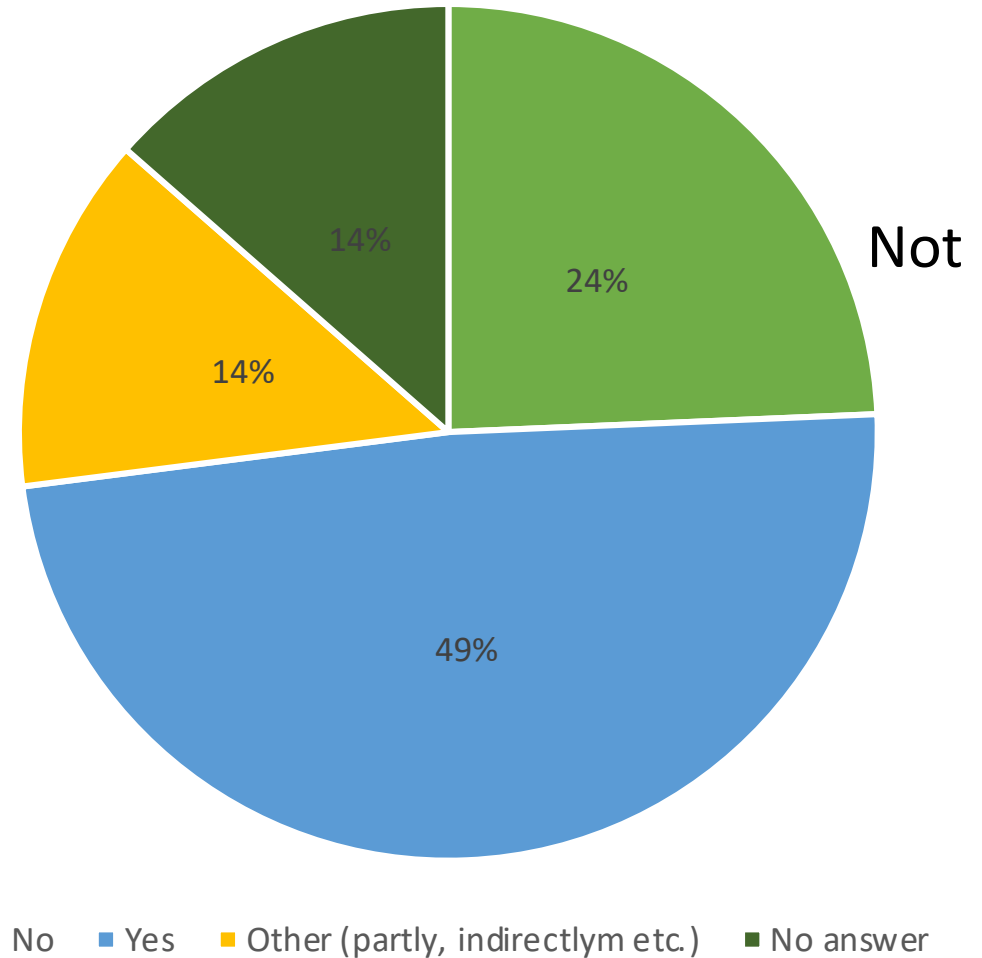
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#	Countries reported the statistics of parcels	Size of county/ jurisdiction in sq km	Number of 2D parcels	Number of 3D parcels	Population (last data available)
1	Argentina	2.780.000	About 20 millions	0	47,4 millions
2	AUS - NSW	809.444	4.5 million	100.000+	8,1 millions
3	AUS – Queensland	1.730.648	2.252.878	3.069 (volumetric) & 274.095 (building format)	5.296.098
4	AUS – Victoria	-	-	-	-
5	AUS – Western Australia	2.642.753	1.1 million	479	2,8 millions
6	Bahrain	786,5	255.436 (with 3D aspects)		1.463 million
7	Brazil	8.510.345,538	-	-	207 million
8	Canada-Quebec	~ 1,7 millions	~3.900.000	~ 620.5000	8,7 millions
9	Croatia	56.594 land & 31.067 water	14.5 million	-	3,87 millions
10	Cyprus	9.252	~ 1.600.000	~162.000	~. 865.000
11	Czech Republic	78.866	22.712.065	0	10,52 millions
12	Finland	6.182	738.000	171.390	16
13	Greece	131.944	~12.000.000	0	10,43 millions
14	Iceland	137.264	79.087	0	386.639
15	Montenegro	13.812	-	-	619.211
16	Nepal	-	31.895.591		29.136.808
17	New Zealand	268.021	2+ million	145.000+	~5 millions
18	Poland	312.680	38.102.232	0	37.827.000
19	Serbia	88.499	18.948.505	0	6.844.000
20	Singapore	721.5	1.7+ million	-	5,61 millions
21	South Korea	-	45 million	-	55 millions
22	Spain	505.990	53.097.474	~20.000.000	47.420.000
23	Sweden	808	165.130	492	1.918.068
24	Switzerland	41.285	4.000.000	~1.400.000	8.740.000
25	The Netherlands	33.883 land & 7.643 water	~ 9.000.000	~2	~ 17.500.000
26	Trinidad and Tobago	~ 5.000	~ 500,000	many condominiums	~ 1.5 million
27	Turkey	784.000	58.7 million	-	84.7 millions

Existence of legislation for the description of 3D parcels

Question 1.9.

Is there legislation (law and/or regulations) for 3D descriptions of parcels?



LADM and 3D

- 4 countries answered that ISO19152:2012 LADM is used as the formal model for the 3D parcels: **China (Shenzhen), Finland, Malaysia and Scotland**
- 35% of the total countries that participated, declared that their cadastral database is (partially) based on LADM

Top priorities for 2026

1. **Legal aspects:** specifically related to the provision of legislation that can support 3D in land administration
2. **Organisation aspects** related to capacity building on the personnel for 3D LAS, the engagement of private sector and stakeholders, as well as the development of clear guidelines
3. **Technical aspects:** interoperability; usage of the latest technologies (VR, AR) and specific support for the 3D data capture

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Conclusion

- Down-under is hot: a lot of developments in NZ and AUS states
- LADM share is quite significant and in 4 countries including 3D
- Design sources (BIM/IFC) are being used more: general boundaries approach for apartments
- Question: merge this questionnaire and the cadastral template?

11th International Workshop

on Land Administration Domain Model and 3D Land Administration

The FIG logo consists of the letters 'FIG' in a white, bold, sans-serif font, centered within a red rectangular background.

University of Gävle
in corporation with Lantmäteriet

11-13 October 2023
Gävle, Sweden

The Workshop addresses developments in the following areas:

- 3D Land Administration System operational experiences (analysis, LADM based, learn from each other, discover gaps)
- 3D LAS cost effective workflow for new / updated 3D parcels = 4D (part of whole spatial development lifecycle: from planning / design / permit in 3D, to registration / use in 3D)
- 3D LAS web-based dissemination (usability, man-machine interfaces, including mobile/AR)
- Remote sensing/LiDAR and artificial intelligence (AI) for efficient 3D cadastral boundary extraction
- Legal aspects for 3D LAS, best legal practices in various legislation systems



- Focus on large cities, including developing countries
- 3D in the revision of ISO 19152, the Land Administration Domain Model
- Proposals for (and evaluations of) LA (remote) sensing information models (CD 19152-2) and data processing workflows (CD 19152-6), in the context of the revision of LADM

Working sessions

- Urban development / plan information LADM part 5 (Chair: Karel Janecka, Czech Republic, Peter van Oosterom, The Netherlands)
- 3D legal building models/BIM (Chair: Vučić Nikola, Croatia, Abdullah Alattas, Saudi-Arabia)
- Legal aspects of 3D LA (Chair: Jenny Paulsson, Jesper M. Paasch, Sweden)
- Valuation Information / LADM part 4 (Chair: Jaap Zevenbergen, The Netherlands, Abdullah Kara, Turkey)



More information

Deadlines:

11 June 2023	Extended abstract (500-1000 words)
15 July 2023	Reviewing
19 September 2023	Final version of full paper
11-13 October 2023	Workshop

Website: <http://www.gdmc.nl/3dcadastres/workshop2023/>

Conference fee: 2300 SEK (approx. 195 Euro)

Co-chairs: Jesper Paasch (local) / Peter van Oosterom (programme)



LANTMÄTERIET



OGC meeting, DWG Land Administration on 6 June 2023, 8:00am-9:30am (CDT), Huntsville AL, USA / online

1. Opening Christiaan Lemmen
2. Progress LADM Edition II, Peter van Oosterom
3. Developments in the Social Tenure Domain Model (STDM), Eva-Maria Unger & John Gitau
4. Standardisation of Cadastral Processes, Josip Križanović, University of Zagreb
5. **OGC LADM Standards Working Group**, Scott Simmons, OGC
6. Discussion

Big thanks to the participants!!!

Thanks for listening!

Any questions?