STANDARDISATION IN THE SPATIAL DEVELOPMENT LIFECYCLE: A FOCUS ON LAND ADMINISTRATION

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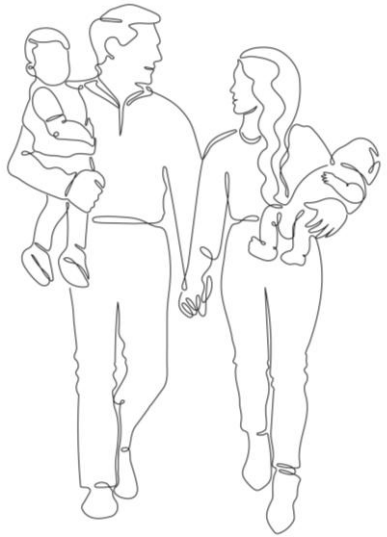
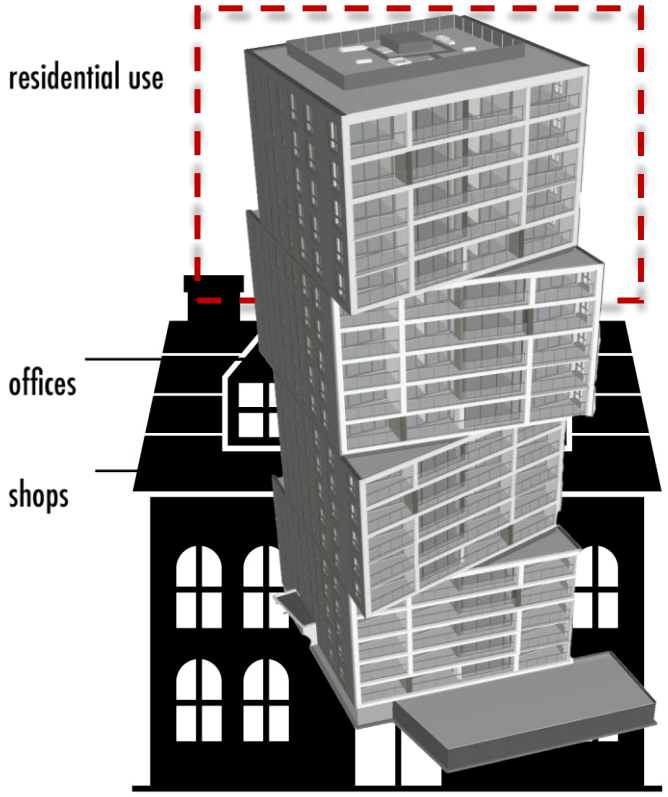
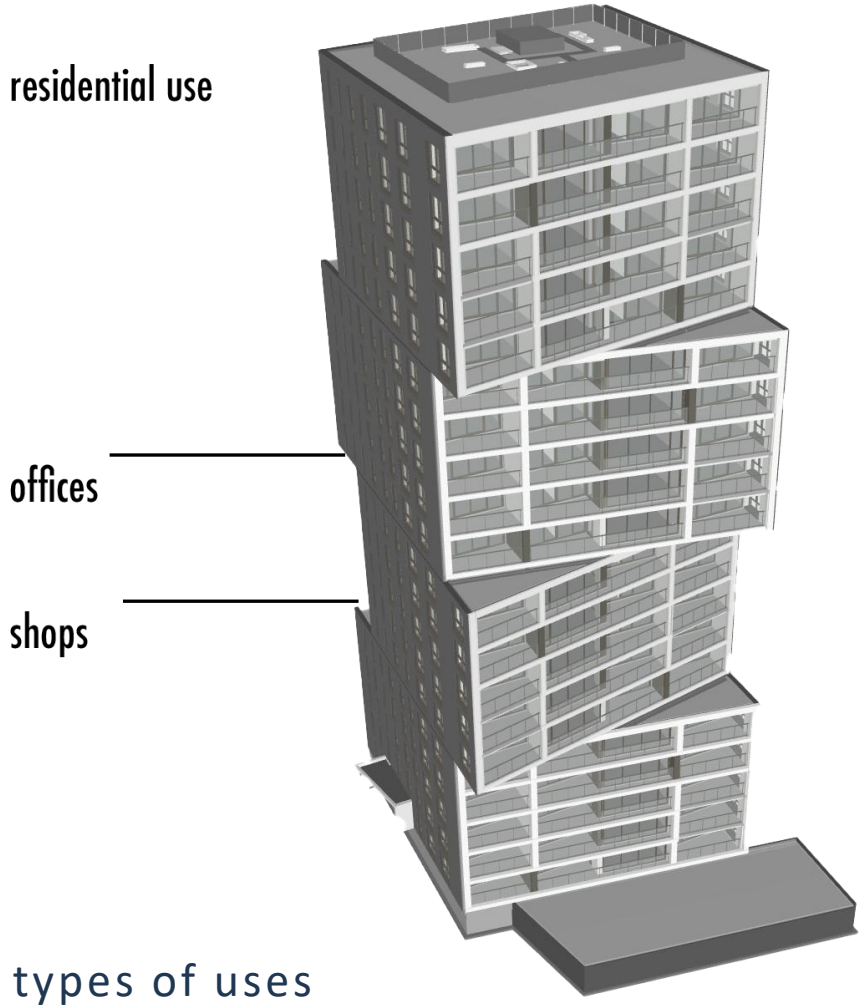
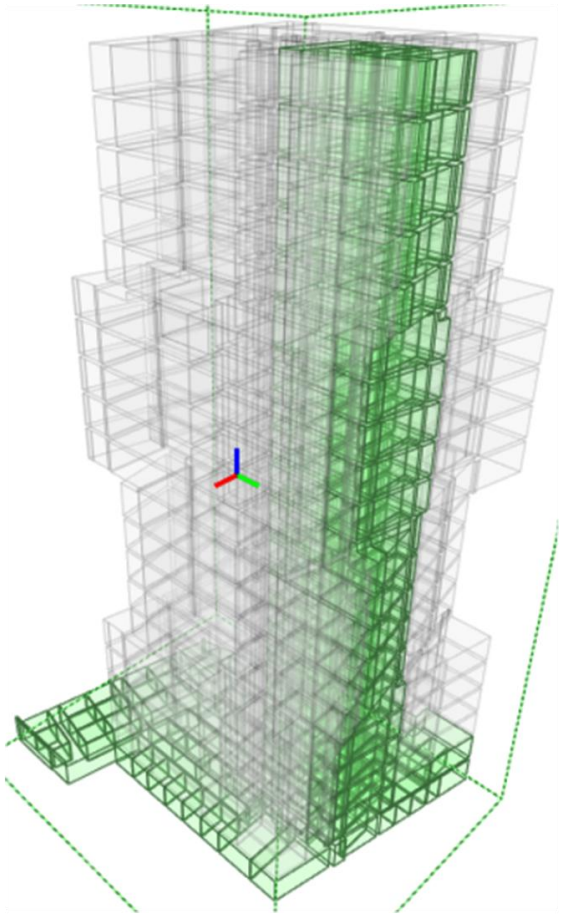


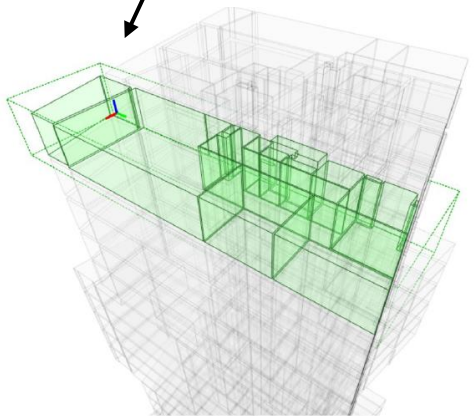

residential use
offices
shops

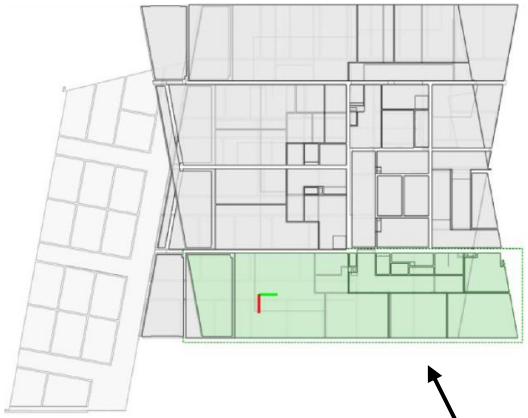


Common spaces



Private spaces in 3D

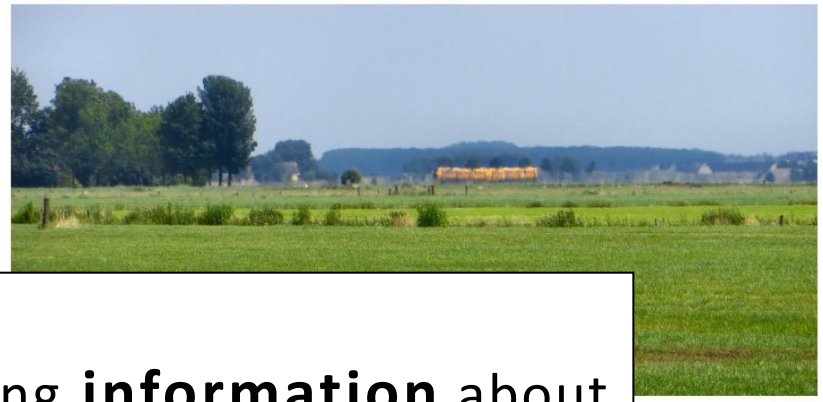




Private spaces in 2D

- ✓ Different types of uses
- ✓ Different types of **R**ights, **R**estrictions and **R**esponsibilities


State
Customary
Dispute
Condominium
Possession
Freehold
Restriction
Informal
Occupation



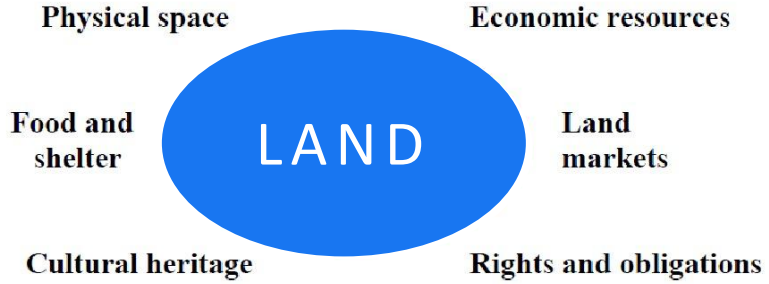
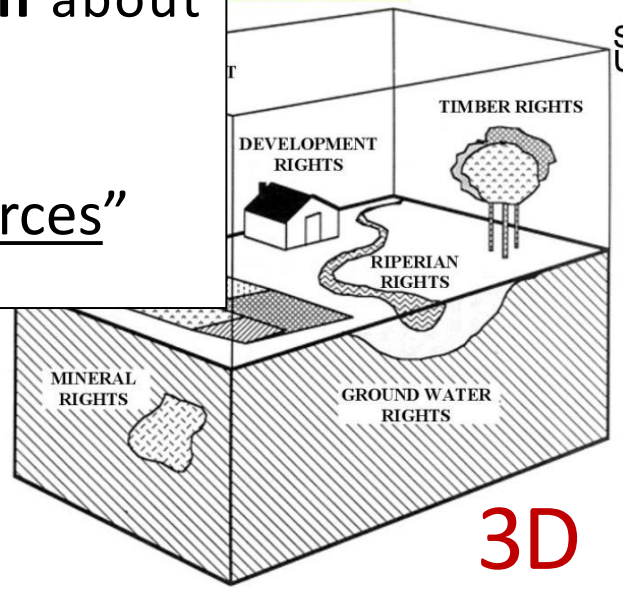


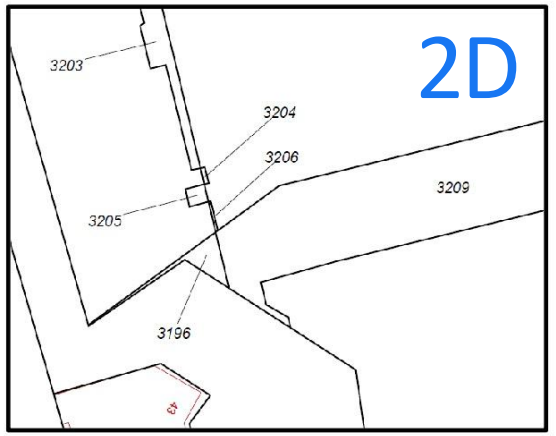
Figure I. Perspectives on land

Source: UNECE, Guidelines on Real Property Units and Identifiers

"‥ the processes of
recording and disseminating **information** about
- the ownership,
- value
- and use of land and its associated resources"



Source: Dale and McLaughlin, Land Information Management (1988)

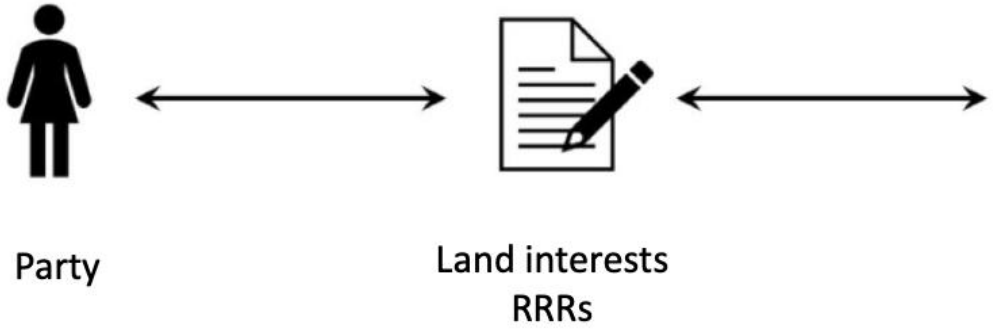


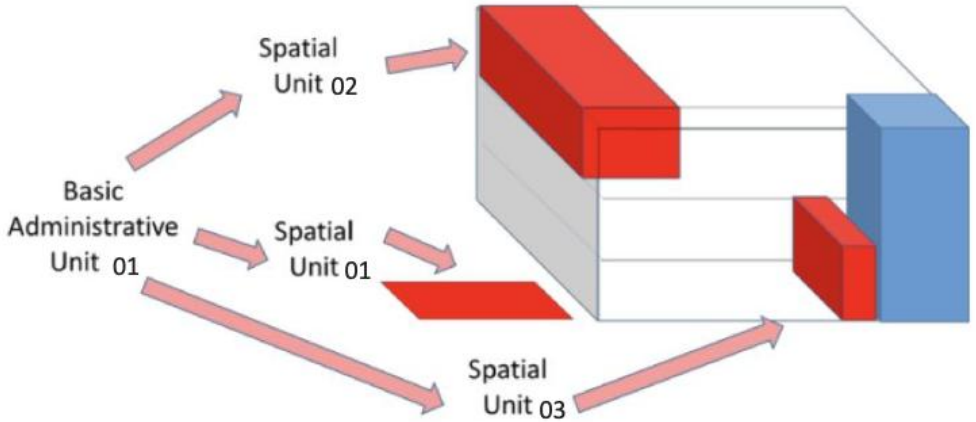
Source: Kadaster, cadastral map Delft

[UN-ECE report, 1996]

Land Administration

People-to land relationships

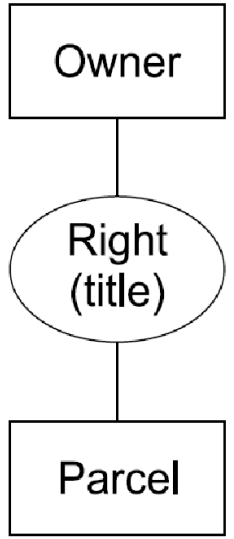




LAND ADMINISTRATION SYSTEMS

Legal Information

Spatial Information

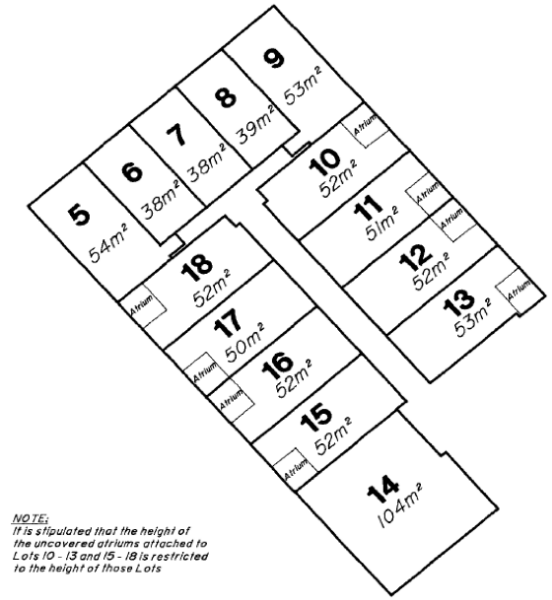


Who?

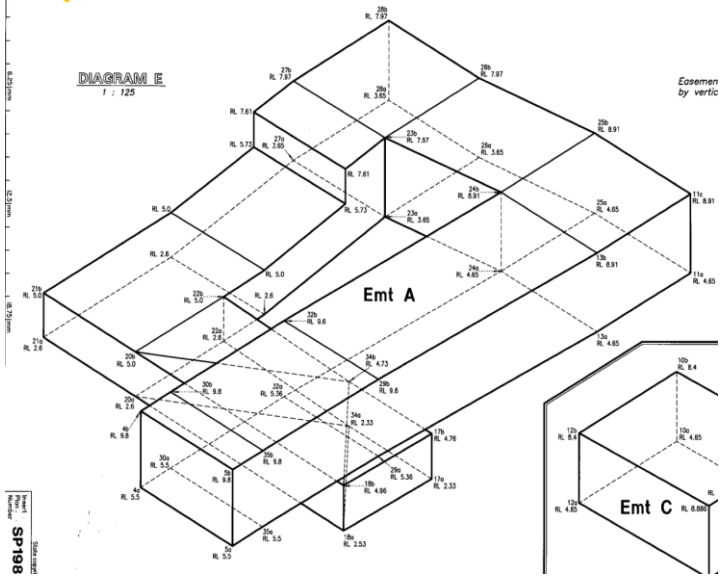
How?

Where?
How much?

Zevenbergen, 2009

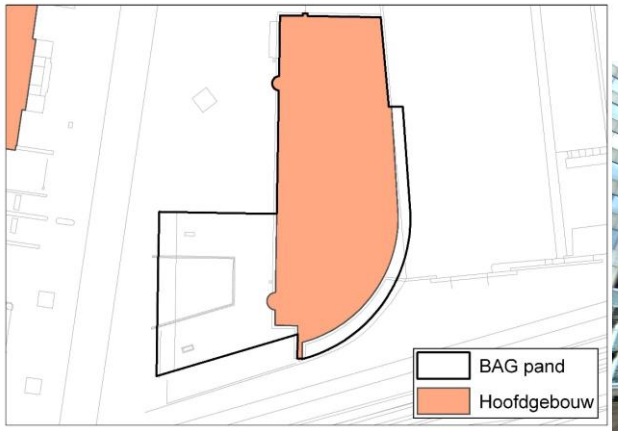


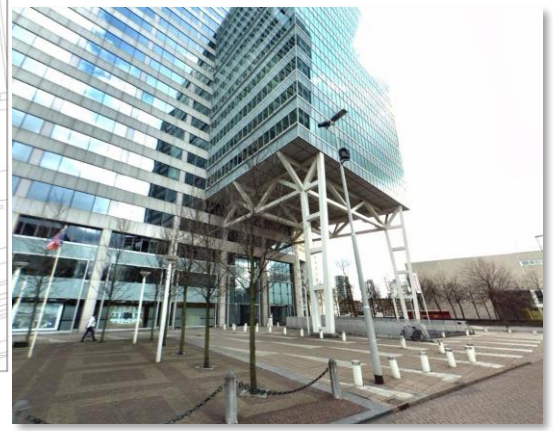
Queensland



Greece

Netherlands



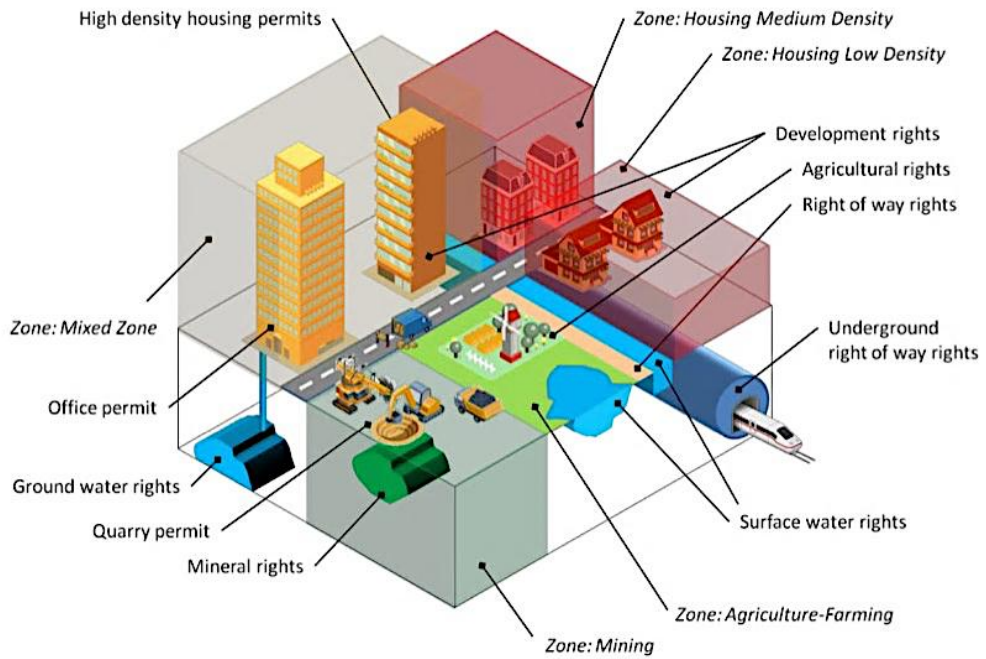


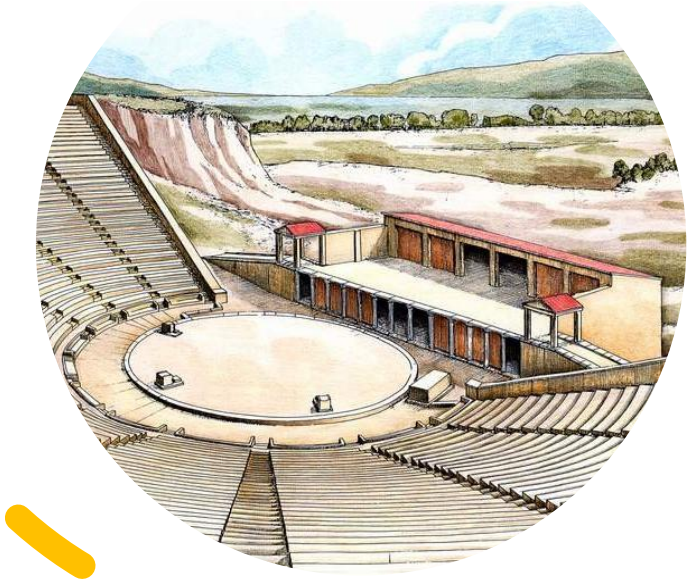
2D

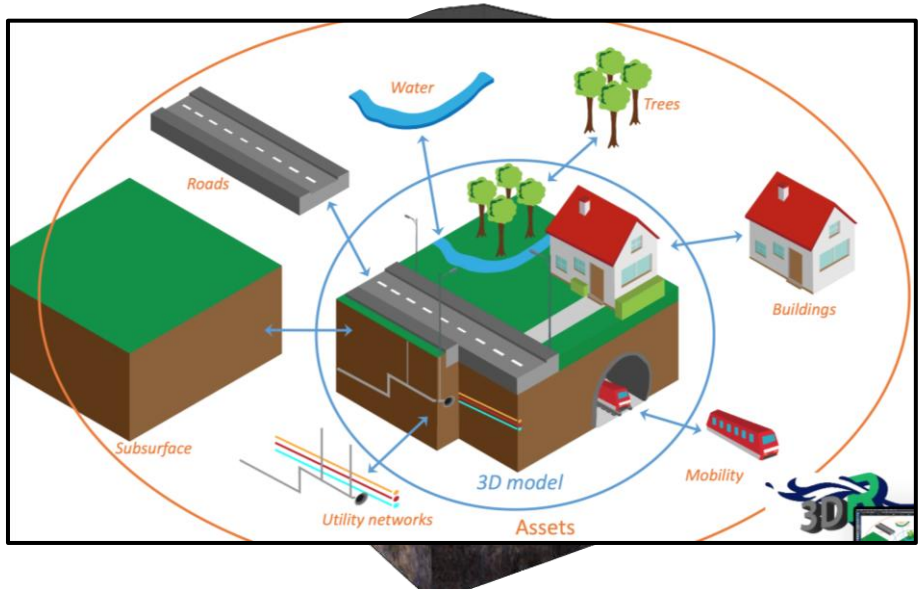
Reality in 3D

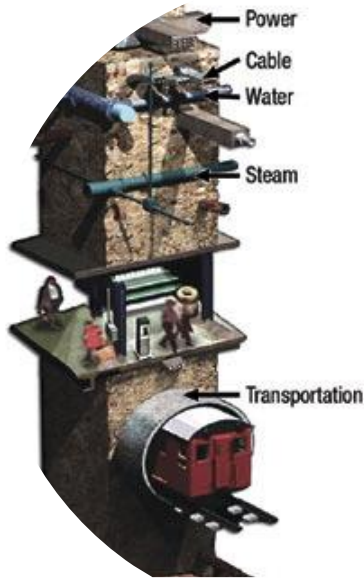
Basic “building block” in 3D Land Administration Systems and 3D Spatial Planning

Dale and McLauglin (1999), van Oosterom & Stoter (2010)









37 states responded

Country (- State)	2010	2014	2018	2022
Argentina	2010	2014	2018	2022
Australia				
AUS - Queensland	2010	2014	2018	2022
AUS - Victoria	2010	2014	2018	2022
AUS - NSW			2018	2022
AUS - Western Australia				2022
Austria	2010			2022
Bahrain	2010			2022
Brazil	2010	2014		2022
Canada - Québec	2010	2014	2018	2022
China	2010	2014	2018	2022
Costa Rica		2014	2018	
Croatia	2010	2014	2018	2022
Cyprus	2010	2014	2018	2022
Czech Republic		2014	2018	2022
Denmark	2010	2014		2022
Finland	2010	2014	2018	2022
France	2010			
Germany	2010	2014	2018	
Greece	2010	2014	2018	2022
Hungary	2010	2014	2018	
Iceland				2022
India	2010	2014	2018	
Indonesia	2010		2018	2022
Israel	2010	2014	2018	2022
Italy	2010			
Kazakhstan	2010			
Kenya	2010	2014	2018	2022
Macedonia	2010	2014		
Malaysia	2010	2014	2018	2022
Montenegro				2022
Nepal	2010			2022
The Netherlands	2010	2014	2018	2022
New Zealand			2018	2022
Nigeria	2010	2014	2018	
Norway	2010	2014		
Poland	2010	2014	2018	2022
Portugal		2014	2018	2022
Russian Federation	2010			
Serbia		2014	2018	2022
Singapore		2014	2018	2022
Slovenia			2018	2022
South Korea	2010	2014	2018	2022
Spain	2010	2014	2018	2022
Sweden	2010	2014	2018	2022
Switzerland	2010	2014	2018	2022
Trinidad and Tobago	2010	2014	2018	2022
Turkey	2010	2014	2018	2022
United Kingdom				2022
England and Wales	2010			
Scotland			2018	2022

4th Questionnaire on 3DLand Administration: status December 2022 and expectations for 2026

3D Land Administration

FIG

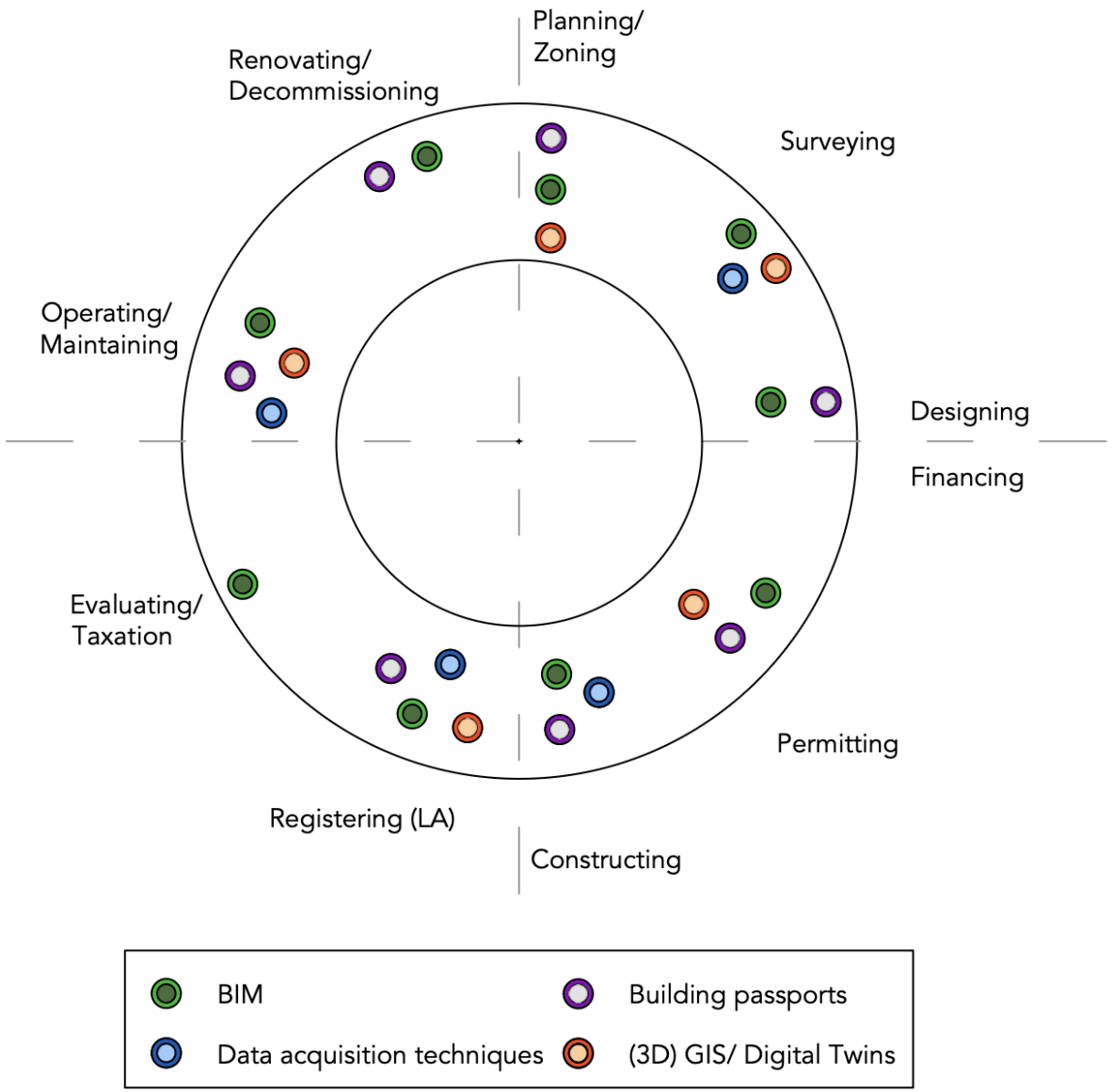
FIG joint commission 3 and 7 Working Group on the Land Administration Domain Model/3D Land Administration (LADM/3D LA)

Priority axes for 2022-2026 in the field of 3D LA

#	Countries reported their top priorities for 2026	Priorities axes
8	Cyprus	• technical approaches for data capture, • data model design, • managing the cost of implementation.
9	Czech Republic	• sourcing 3D data for 3D parcels (e.g., using BIM), • demonstrating the benefits of 3D parcels through visualization, • addressing legislative needs.
10	Finland	• development of 3D right-of-use units (spatial units that define specific RRRs).
11	Kenya	• formalising an LADM profile for 3D systems, • harmonising coordinate systems for cadastral data, • creating guidelines for implementing a digital 3D cadastre.
12	Malaysia	• addressing data availability and legal aspects.
13	Montenegro	• raising awareness about the need for 3D cadastres despite existing research on possible solutions.
14	Nepal	• establishing a strong legal framework, • improving technical capabilities for 3D data acquisition,

1. Legal aspects: specifically related to the provision of legislation that can support 3D in LA.
2. Organisational 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.

DIGITAL TECHNOLOGIES THROUGH SDL



DATA CIRCULARITY

A life-cycle thinking approach to **share & reuse** the same data related to technical, legal, administrative, environmental & social issues

Standardisation

INTEROPERABILITY

Standardisation bodies in the field of geographic information systems

TC211 – Τεχνική Επιτροπή 211

Open Geospatial Consortium

buildingSMART International

KHRONOS GROUP

RICS

IHO International Hydrographic Organization

International Level

CEN

CEN/TC 287 - GEOGRAPHIC INFORMATION

[based on ISO]

INSPIRE

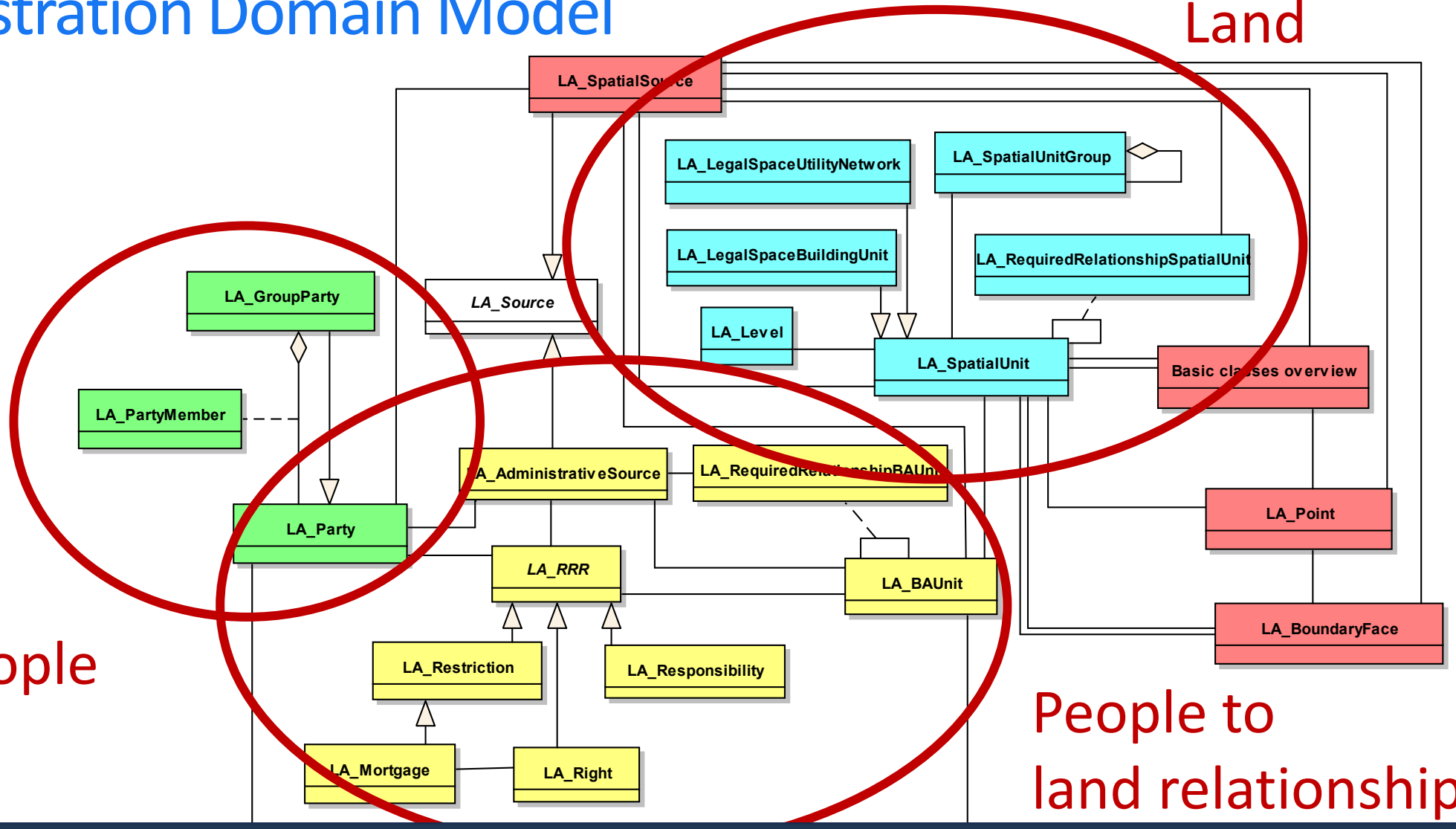
European Level

ΕΛΟΤ Ελληνικός Οργανισμός Τυποποίησης

nen connect

National Level

ISO19152:2012
Land Administration Domain Model



LADM country profiles/ implemer

Scotland

Indonesia

Colombia

Mozambique

Malaysia

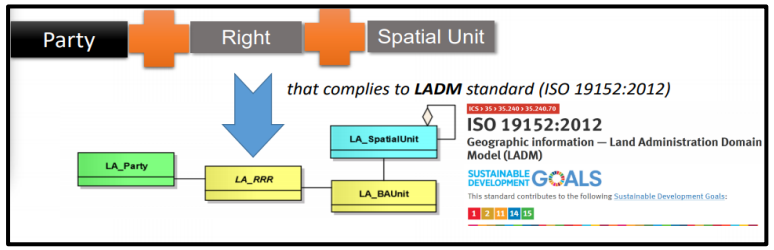
Montenegro

Honduras

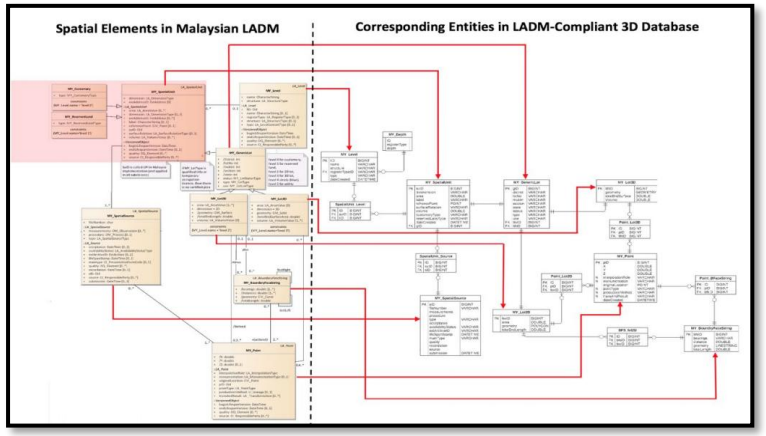
Serbia

Albania

Uganda



Aditya et al., 2019



Rajabifard et al., 2019

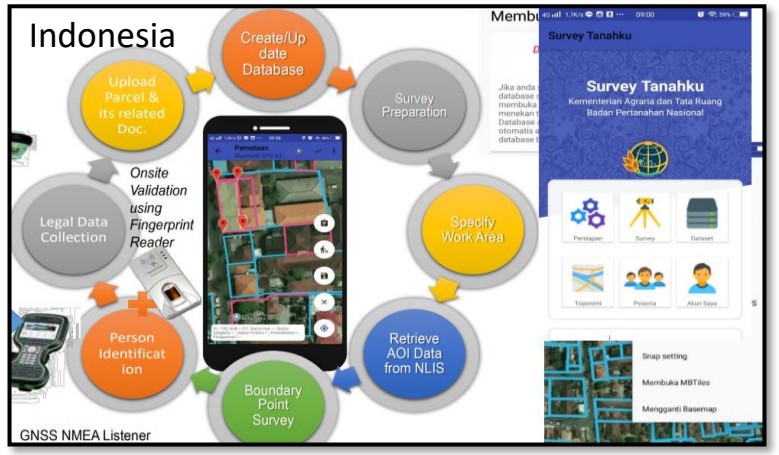


TABLE 4.2 An inventory of LADM Edition I-based country profiles

#	Country/ Jurisdiction	Relevant publications	Focus
1	Albania	World Bank (2019)	initial steps towards LADM adoption; nationwide
2	Bénin	Mekking et al. (2020)	initial steps towards LADM adoption; nationwide
3	Brazil	Dos Santos et al. (2013)	nationwide
		Paixao et al. (2015)	indigenous tribes' land rights
		Purificação et al.,2019	nationwide; technical implementation
4	Cape Verde	Andrade et al. (2013)	nationwide
5	Chile	Flores-Rozas (2024)	nationwide
6	China	Guo et al. (2011)	nationwide
		Guo et al. (2013)	nationwide; focus on 3D
		Zhuo (2013)	nationwide
		Zhuo et al., 2015	nationwide
		Yu et al. (2017)	immovable property
		Xu et al. (2019)	natural resources
		Zhuo et al. (2020)	farmland
		Xu et al. (2022)	rural homesteads
7	Colombia	Jenni et al. (2017)	nationwide
		Guarín et al. (2017)	nationwide
		Morales et al. (2019)	nationwide; technical implementation
		FAO (2020)	nationwide
8	Croatia	Vučić et al. (2013)	nationwide
		Mađer et al. (2015)	nationwide; linking various registers
		Vučić et al. (2017)	nationwide
		Mađer et al. (2018)	nationwide
		Flego et al. (2021)	marine
		Tomić et al., 2021	nationwide; focus on valuation (LADM Edition II – Part 4)
		Vučić et al. (2022)	nationwide; revision of initial country profile
9	Cyprus	Elia et al. (2013)	nationwide
		Demetriades et al., 2023	nationwide; focus on valuation (LADM Edition II – Part 4)
10	Czech Republic	Janečka et al. (2016)	nationwide
		Janečka et al. (2017)	nationwide; focus on 3D
11	Ecuador	Atapuma et al. (2020)	nationwide
12	Estonia	Batum, 2024	nationwide; focus on spatial planning (LADM Edition II – Part 5)
13	Ethiopia	Kebede et al., 2018	nationwide
14	Finland	Niukkanen, 2023	nationwide

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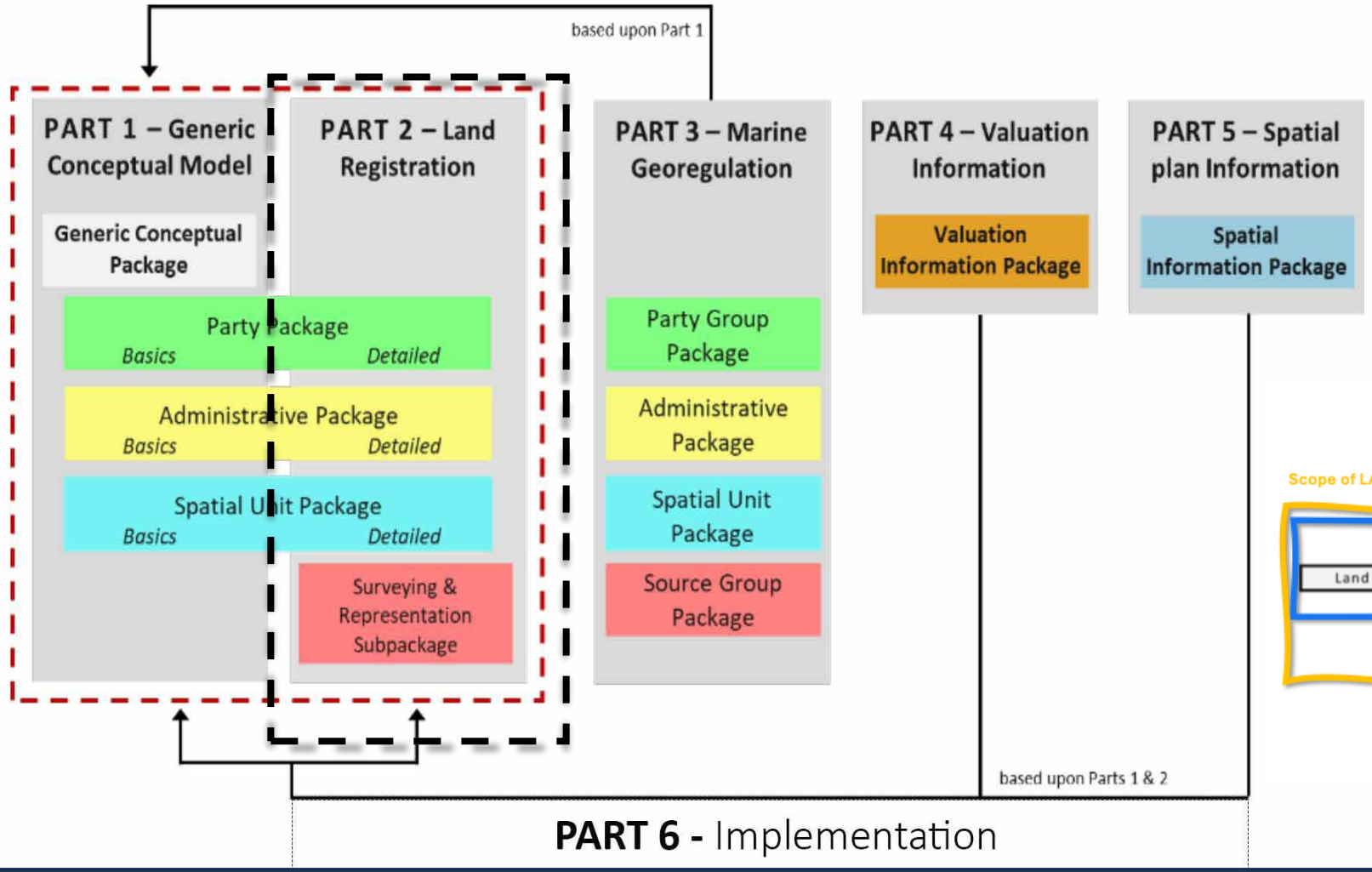
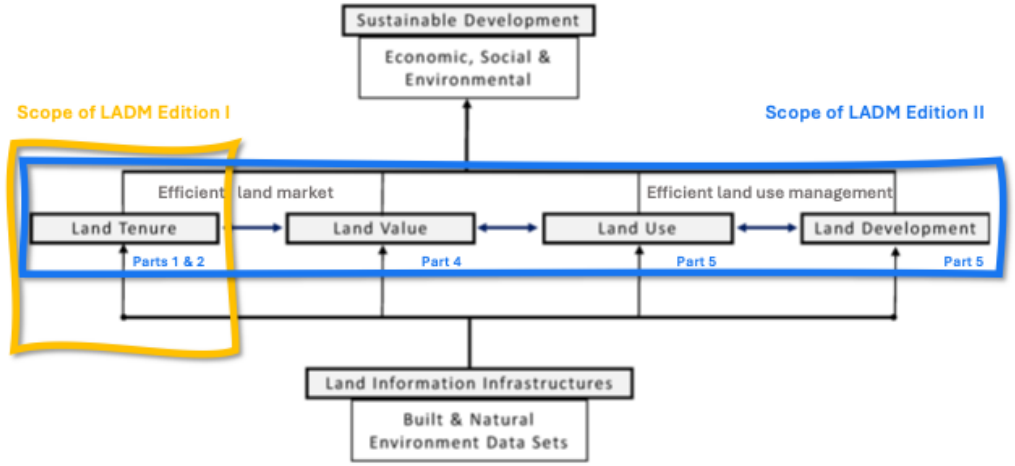
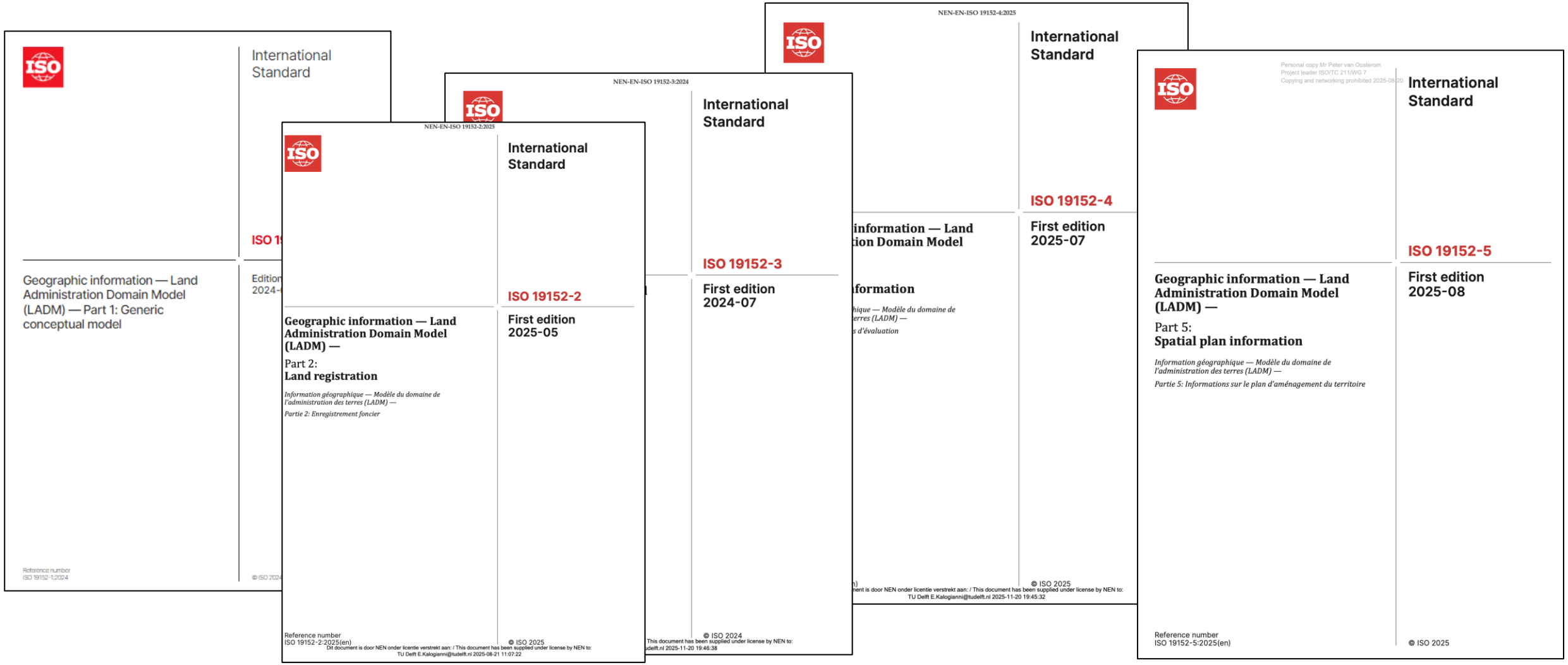
ISO 19152 LADM Edition II





ISO 19152 LADM Edition II



Conclusions

- Standardisation is essential for coherence and interoperability across the entire spatial development lifecycle.
- Adoption of models such as **LADM** ensures consistent data structures, terminology, and processes from planning to long-term land management.
- Harmonised standards enable **seamless data exchange**, reduce ambiguity, and support automation of key land administration workflows.
- Improves **institutional coordination**, strengthening governance and enabling more transparent, evidence-based decision-making.
- Enhances the **quality, reliability, and reusability** of spatial and legal information across sectors.
- Provides a robust foundation for **resilient, efficient, and citizen-centric** land administration systems.

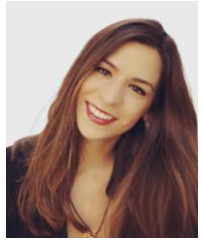
The Land Administration Domain Model

An Overview

Christiaan Lemmen

Peter van Oosterom

Abdullah Kara



Eftychia Kalogianni

LADM:

- information model for land administration
- land and sea
- land tenure, land value and planned land use
- language, common vision
- system development – interoperability
- GIS and DBMS providers
- developed by FIG, ISO and OGC and others

Available at:
https://www.fig.net/resources/publications/figpub/pub84/figpub84.asp

THANK YOU!