TU Delft

NATIONAL TECHNICAL UNIVERSITY OF ATHENS

3D CADASTRE AND LADM:
NEEDS AND EXPECTATIONS
TOWARDS LADM REVISION

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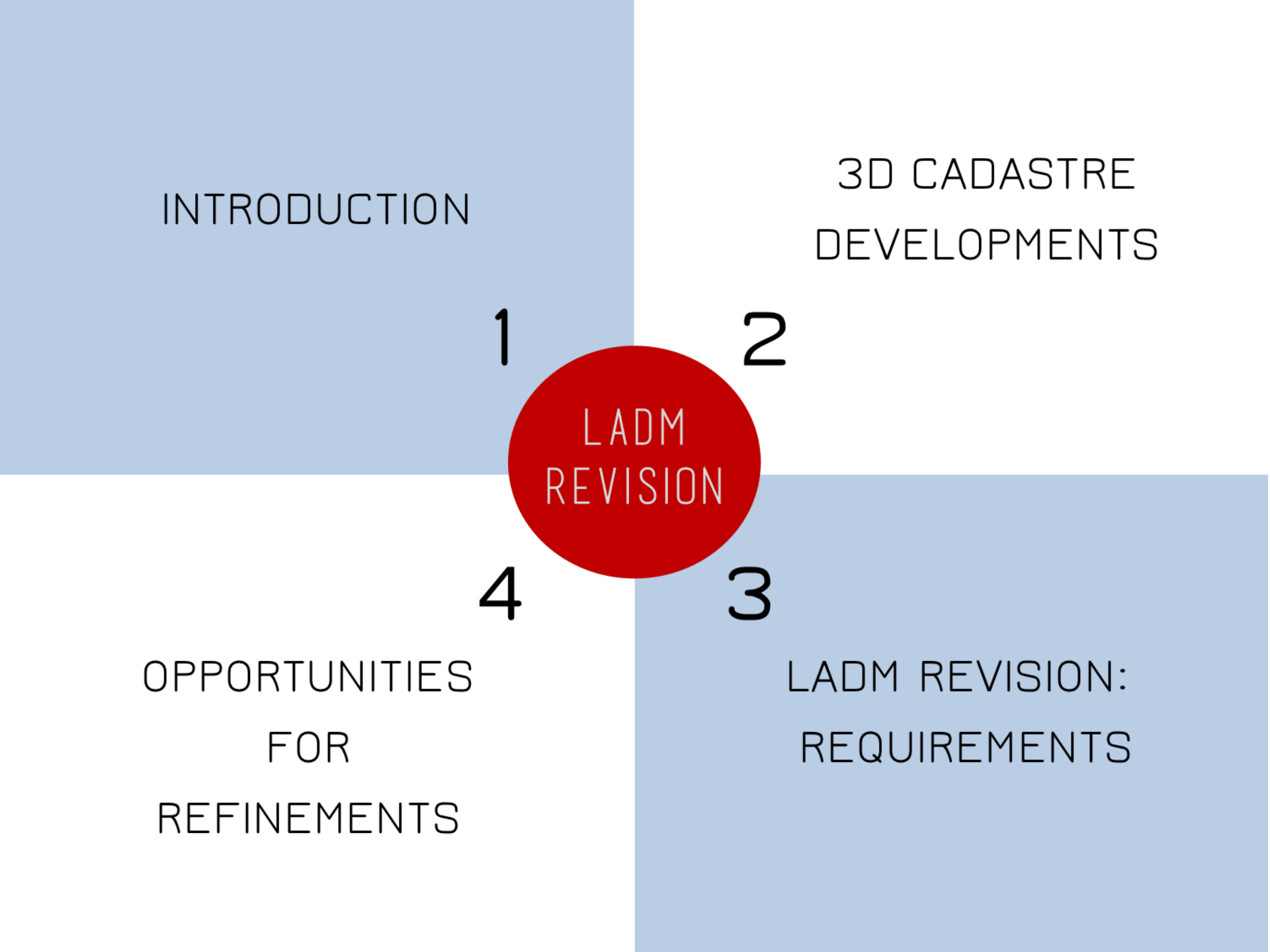
- April 12, 2018

Zagreb, Croatia

7th LAND ADMINISTRATION DOMAIN MODEL 2018 WORKSHOP

FIG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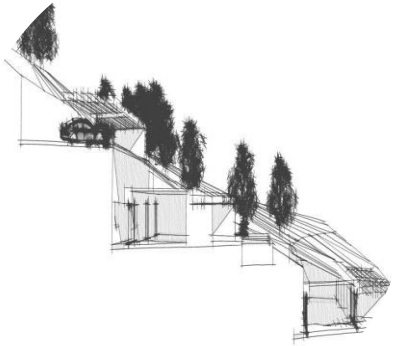
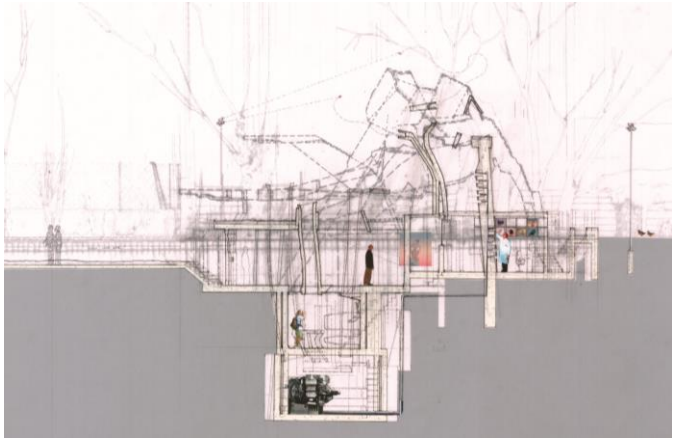
1 INTRODUCTION

MOTIVATION

APPROACH



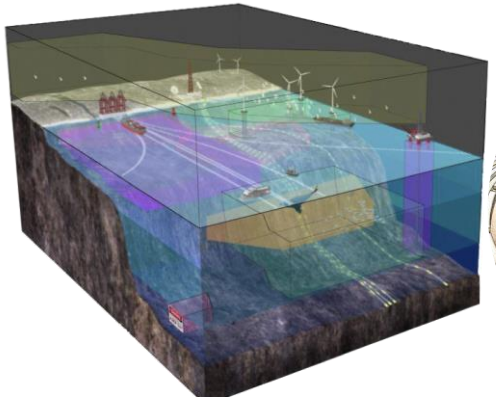
http://www.asmecbg.com/projects.html



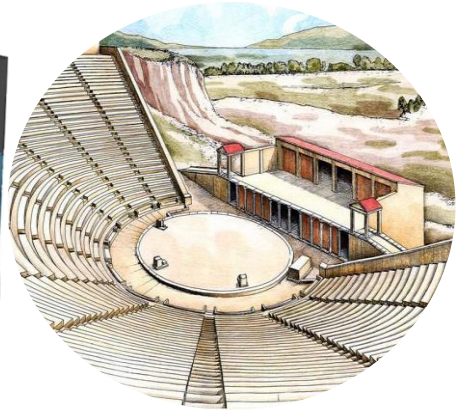
https://www.pinterest.com/Storpweber/

https://www.tap-ag.com/

Kitsakis and Dimopoulou, 2014

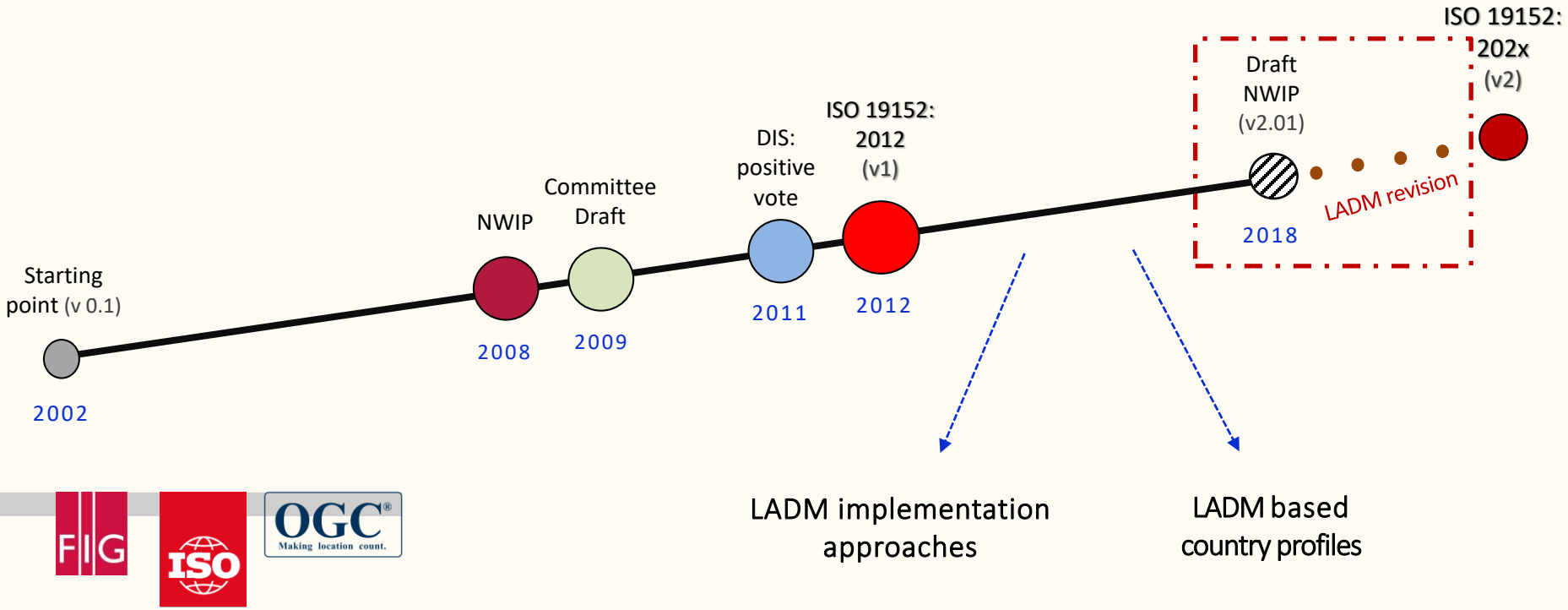


https://marinecadastre.gov/



Need for MULTI purpose dimensional management of RRRs attached to land/water/air → 3D Cadastral Information Systems

LADM INCREMENTAL DESIGN



Land Administration Domain Model

Version 2

→ Identified Trends

7th Land Administration Domain Model Workshop

Zagreb, Croatia, 12-13 April 2018

→ First results expected!

New Working Item Proposal for LADM v2

AMBITION: go beyond just a conceptual model by providing steps towards implementations (e.g. more specific profiles, technical model in various encodings, etc.)

3D CADASTRES DEVELOPMENT

Significantly increasing number of 3D parcel registration

HOWEVER

Today, **NO** country has a complete & fully operational 3D Cadastral Information System

In terms of

- ✓ 3D legislation
- ✓ 3D survey/ data acquisition techniques
- ✓ 3D RRRs registration
- ✓ Management, validation & dissemination of 3D parcels
- ✓ Correspondence to parcel's physical counterparts

! There are countries that already successfully implement 1 or a combination of 2 or more of those aspects in the context of **3D Cadastral Information Systems**

GAP between LADM conceptual model and its technical implementation → Multiple implementation approaches according to user needs, end product, available data and technologies → Interoperability issues !

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* Land administration is treated as an isolated activity, not as part of the whole chain of spatial development activities

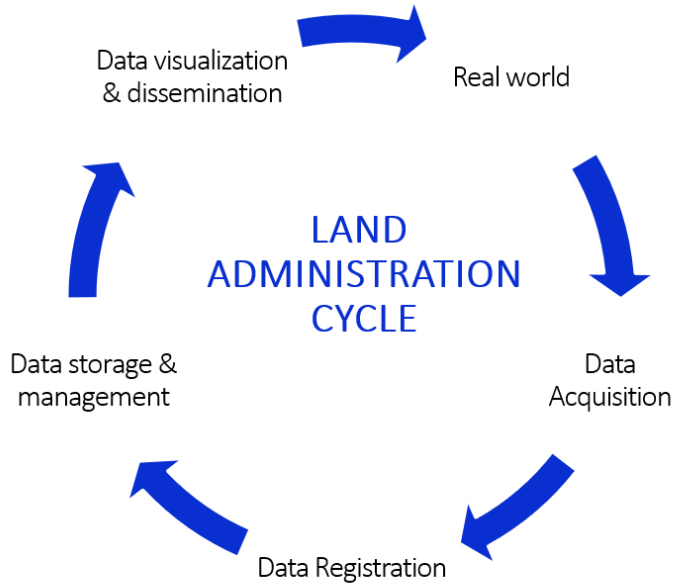
APPROACH

1 identify current possibilities of LADM v1 - in terms of 3D support - derived from LADM experience

2 explore the needs and prospects towards further 3D modelling of LADM v1

3 estimate the LADM user requirements need to be updated in the context of the upcoming revision

3D CADASTRES WITHIN THE SPATIAL DEVELOPMENT CHAIN



Zoning,

Designing,

Permitting,

Surveying,

Registering,

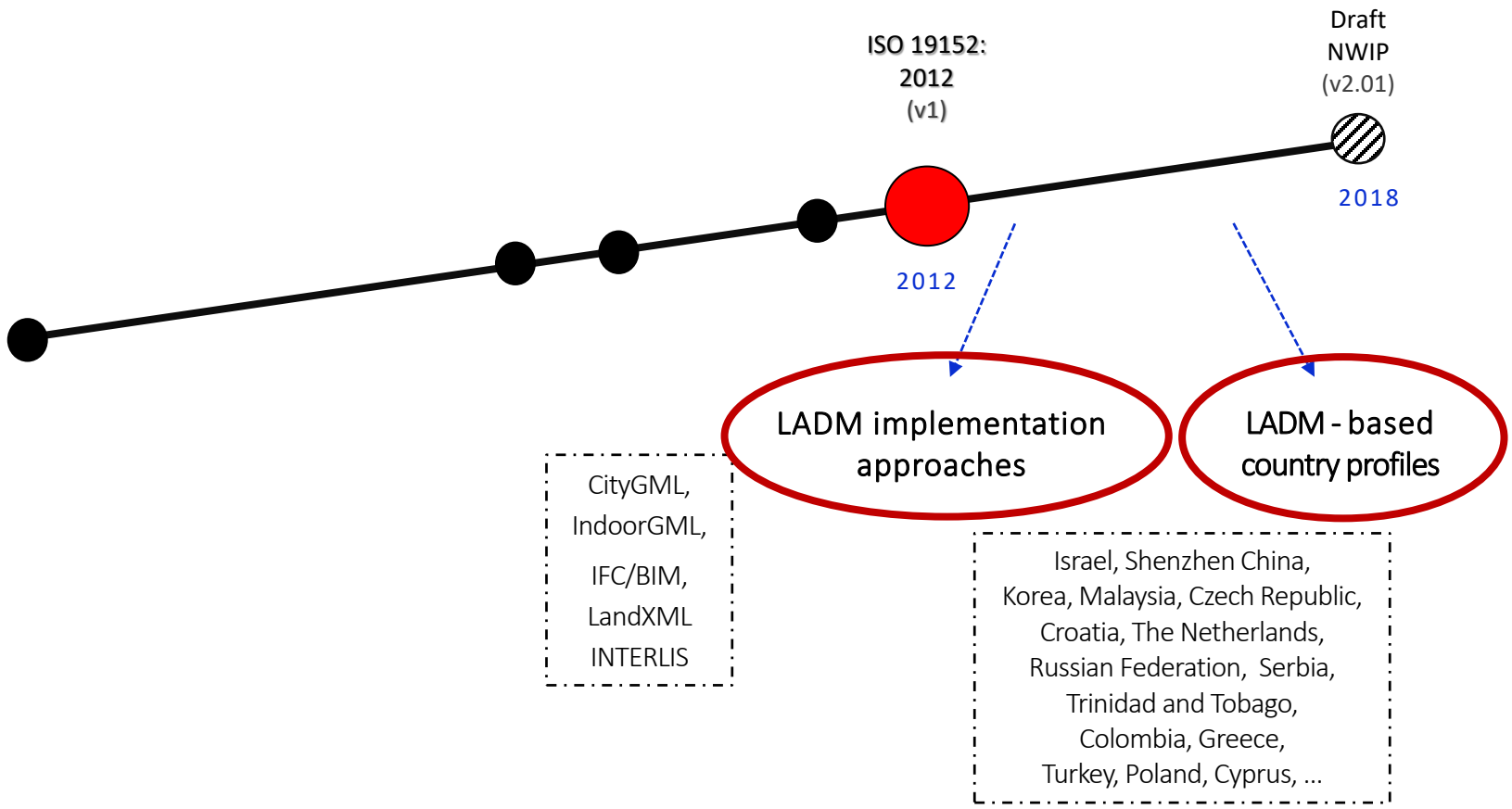
Maintaining,

Constructing

2 3D CADASTRE DEVELOPMENTS

3D CADASTRE EFFORTS

CURRENT POSSIBILITIES OF LADM



"Fully operational" implementations

applying a holistic approach achieved in different levels of maturity

"Partly operational" implementations

- submission of 3D survey plans,
- prototype stage,
- link with physical models,
- focus on visualization,
- focus on constraints & validation

SPATIAL UNIT PACKAGE

LADM provides an abstract framework to model the components in land administration domain, offering several representations ranging from text to 3D topology

"true" 3D representation of spatial units

LA_BoundaryFace

mixed (2D and 3D) representations of spatial units

LA_BoundaryFaceString
&
LA_BoundaryFace

! *topological information alone is not sufficient to describe a spatial unit*

geometrical information must be associated with each topological primitive

6 spatial profiles based on the "structure" attribute in class LA_Level:

- 2D point based,
- 2D Text based,
- 2D Unstructured line based,
- 2D Polygon based,
- 2D Topological based,
- 3D Topological based.

3 LADM REVISION: REQUIREMENTS

REQUIREMENTS
TO BE UPDATED

CONCLUSIONS

from LADM collective experience regarding 3D support

- LA_Parcel class specializations are usually created ~usually related to 3D

  (eg. PL_3DParcel; PL_CadastralParcel; MY_Shared3DInfo; GR_SRPO)

- corresponding classes at the Surveying Representation sub-package are created

  (eg. 3D_Surveying and Representation Sub-package)

- LA_Level: used for spatial units classification or categorization in modules

  (eg. Czech Republic, Malaysia, Greece)

- Encoding of LADM spatial representations (map LADM classes with encoding schemas)

  (eg. within LandXML, LA_BoundaryFace volumetric approach can be encoded in 2 different schemes)

- Need to close the gap between LADM country profiles and their technical implementation

- External classes links → in which LoD do they refer to?

  (eg. ExtPhysicalBuildingUnit represented according to CityGML or IndoorGML or BIM/IFC in terms of which LoD levels being referred to?)

- Need for explicitly model the use cases of 3D Cadastre, including different types of spatial units

  (eg. ... archaeology, planning, mining, etc.)

New/Current users needs

NEED to update

LADM User Requirements

- ***Requirement C08***, *"System boundary of LADM, external classes and information infrastructures"*: considering external classes more explicit and specific relations with the physical models that those classes are linked should be established.
- ***Requirement C10***, *"Miscellaneous"*: new requirement may derive regarding code lists → more explicit modelling & semantics of code list are needed (ISO 3166 principles could be discussed).
- ***New requirements***

4 OPPORTUNITIES FOR REFINEMENTS

- explore more explicit modelling of links with external physical objects to enhance a fit for purpose approach.
- explicitly model all use cases of 3D Cadastre, including different types of spatial units (marine, archaeology, planning, mining, air, etc.) → could be added as a new user requirement.
- update of LADM User Requirements paying attention in placing 3D Cadastres in context the whole chain of spatial development.
- explore multiple approaches to further model current (e.g. topological profile) or sharpen new spatial representations & spatial profiles (e.g. point clouds profile, for non-topological 3D parcels).
- validation of the new spatial profiles is crucial (rules & tests, functions, spatial database types, cross-model constraints between legal and spatial attributes, etc.).
- Consider also the semantic aspect of data sources, not only the geometrical, as data in BIM/IFC, CityGML LandXML, InfraGML, IndoorGML are produced based on different domain knowledge → conceptual & terminological differences between data sources.

there is no single spatial profile/model best suitable for all types of applications
→ it depends on the type of each application and thus its requirements should be defined accordingly

THANK YOU!