

# Revision of Croatian LADM profile according to the new regulations in surveying profession

**Nikola Vučić, PhD**

Saša Vranić, PhD

Prof. Miodrag Roić, PhD

Hrvoje Matijević, PhD

CROATIA, Dubrovnik, 2022

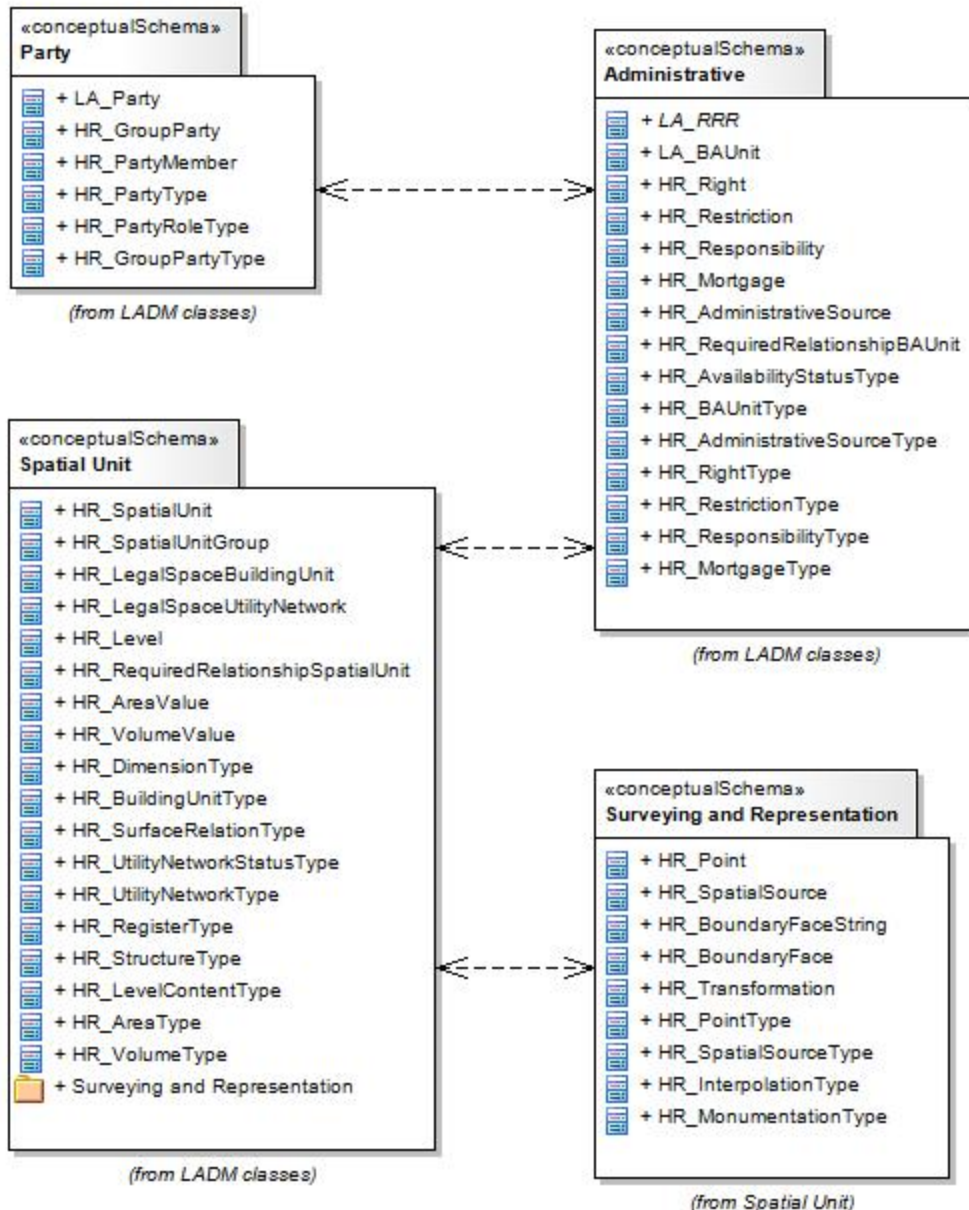
March 31<sup>th</sup> – April 2<sup>nd</sup>

# CONTENTS

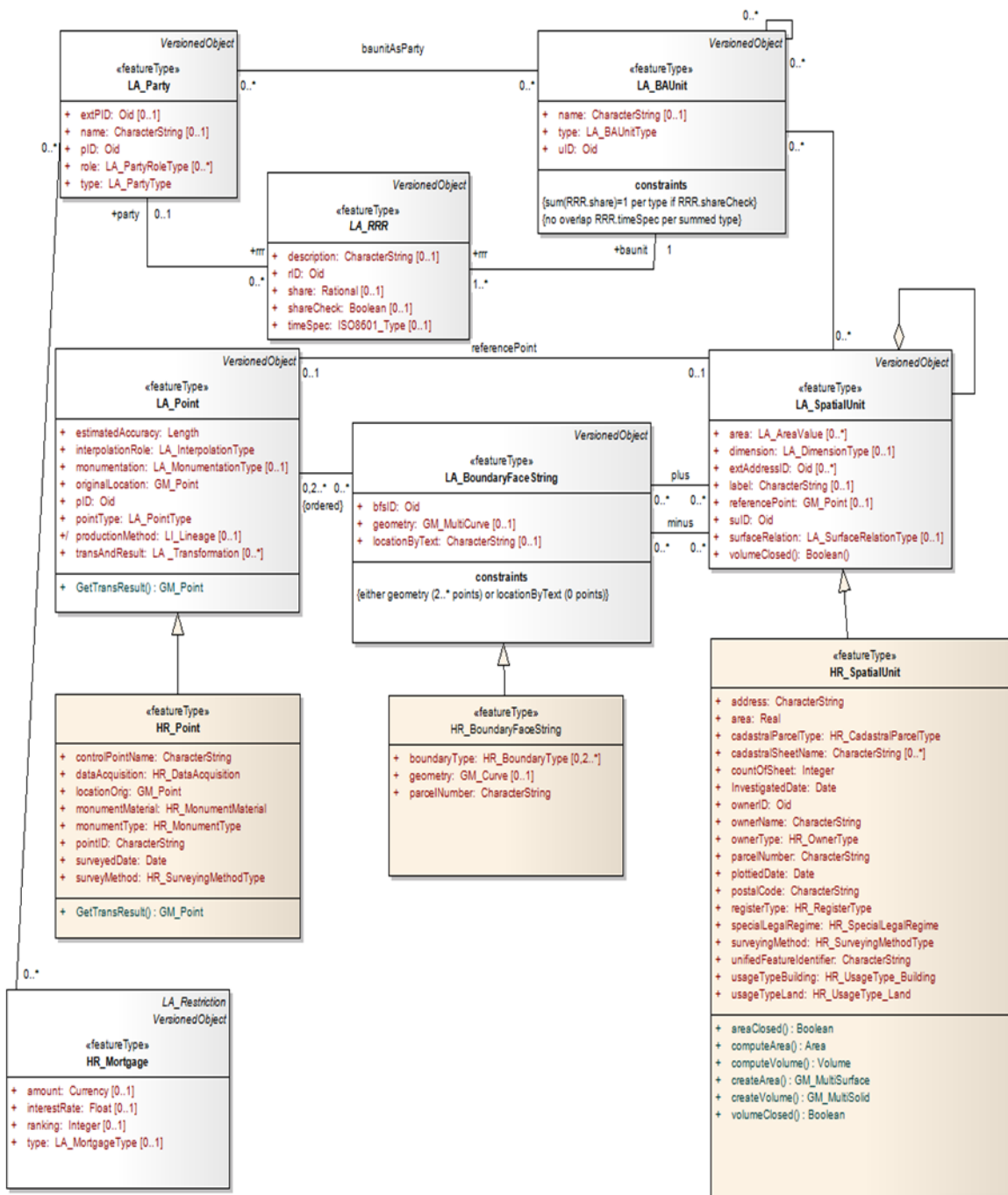
- ❖ INTRODUCTION
- ❖ THE FIRST VERSION OF CROATIAN LADM PROFILE
- ❖ THE SECOND EDITION OF LADM
- ❖ THE CURRENT STATUS OF LAND ADMINISTRATION IN CROATIA
- ❖ PROPOSAL OF REVISED CROATIAN LADM PROFILE (HR\_LADM\_V2)
- ❖ CONCLUSION

# INTRODUCTION

- ❖ **The Croatian LADM profile was created and presented by Vučić et al (2013) at the 5<sup>th</sup> LADM workshop in Kuala Lumpur.**
- ❖ **Since then, many changes have been introduced in Croatian LAS. Updated laws on land cadastre, utility cadastre, cadastre of buildings and national spatial data infrastructure have made the path for more efficient maintenance of cadastral data but also for changes in the direction of increased and diversified usage of LAS data.**
- ❖ **This paper analyzes changes in Croatian LAS since 2013 and integrates them in LADM to create a revised version of Croatian LADM profile.**



## Croatian LADM profile overview



# Croatian LADM profile – 3D cadastre model

# Croatian LADM profile – code lists

«codeList» HR_MonumentMaterial
+ carvingCrossInASolidRock = 5
+ ceramicPipe = 3
+ concretePillar = 1
+ ironWedge = 2
+ plasticMarkerWithAnIronCore = 4

«codeList» HR_SurveyingMethodType
+ canNotInvestigation = 0
+ coordinateMethodByAeroPhotogrammetry = 3
+ coordinateMethodByCROPOS = 5
+ coordinateMethodByLandSurvey = 2
+ graphicMethod = 1
+ orthogonalMethod = 6
+ orthophoto = 4

«codeList» HR_DataAcquisition
+ mapDigitizing = 1
+ surveyed = 2

«codeList» HR_BoundaryType
+ boundaryOfCadastralMunicipality = 3
+ boundaryOfCommunityOrTown = 4
+ boundaryOfCounty = 5
+ boundaryOfParcel = 2
+ boundaryOfState = 6
+ boundaryOfUsageType = 1

«codeList» HR_RegisterType
+ arableLandAreas = 1
+ forestAreas = 8
+ inlandWaterAreas = 9
+ landAreasPreparedForUse = 12
+ meadowAreas = 2
+ naturalUnproductiveAreas = 11
+ oliveTreesAreas = 4
+ orchardAreas = 3
+ pastureAreasAndUnclassifiedAgriculturalLand = 6
+ PondsAndReedsAreas = 7
+ seaAreas = 10
+ vineyardsAreas = 4

«codeList» HR_ResponsibilityType
+ icicleRemoval = 4
+ monumentMaintenance = 1
+ snowRemoval = 3
+ waterwayMaintenance = 2

«codeList» HR_SpecialLegalRegime
+ borderCrossingArea = 15
+ culturalProperty = 3
+ forestPark = 11
+ importantLandscape = 10
+ maritimeDomain = 1
+ monumentOfParkArchitecture = 12
+ nationalPark = 5
+ naturalMonument = 9
+ parkOfNature = 7
+ port = 17
+ protectedArea = 13
+ railroadInfrastructure = 16
+ regionalPark = 8
+ specialPurposeLandOfDefence = 14
+ specialReserve = 6
+ strictReserve = 4

«codeList» HR_OwnerType
+ owner = 1
+ possessor = 2
+ unregisteredOwner = 3

«codeList» HR_UsageType_Building
+ administrativeBuilding = 117
+ auxiliaryBuilding = 158
+ buildingForReceptionOfPassengers = 119
+ chapel = 134
+ church = 133
+ commercialBuilding = 111
+ container = 149
+ convent = 135
+ faculty = 128
+ farmDwelling = 108
+ fisherman'sHouse = 109
+ garage = 153
+ gasStation = 146
+ greenhouse = 151
+ hall = 146
+ hangar = 148
+ heatingPlant = 144
+ holidayHome = 105
+ hospital = 131
+ hostel = 114
+ hotel = 112
+ house = 101
+ hydro-PowerPlant = 142
+ in-doorSwimmingPool = 122
+ industrialBuilding = 141
+ infirmary = 132
+ kindergarten = 130
+ lighthouse = 124
+ memorial = 140
+ mixed-useBuilding = 103
+ monastery = 136
+ monument = 139
+ mosque = 138
+ motel = 113
+ mountainLodge = 110
+ openHall = 147
+ orchardHouse = 106
+ publicBuilding = 125
+ rentalBuilding = 116
+ residentBuilding = 102
+ restaurant = 115
+ sacralBuilding = 126
+ school = 129
+ serviceBuilding = 118
+ shed = 154
+ silo = 150
+ sportsHall = 121
+ stadium = 123
+ storageFacility = 156
+ subterraneanBuilding = 159
+ subterraneanBusinessBuildng = 160
+ subterraneanGarage = 161
+ subterraneanShelter = 162
+ synagogue = 137
+ temporaryResidenceBuilding = 104
+ thermo-electricPowerPlant = 143
+ tower = 152
+ transformerStation = 145
+ vineyardHouse = 107
+ woodShed = 155
+ yardBuilding = 157

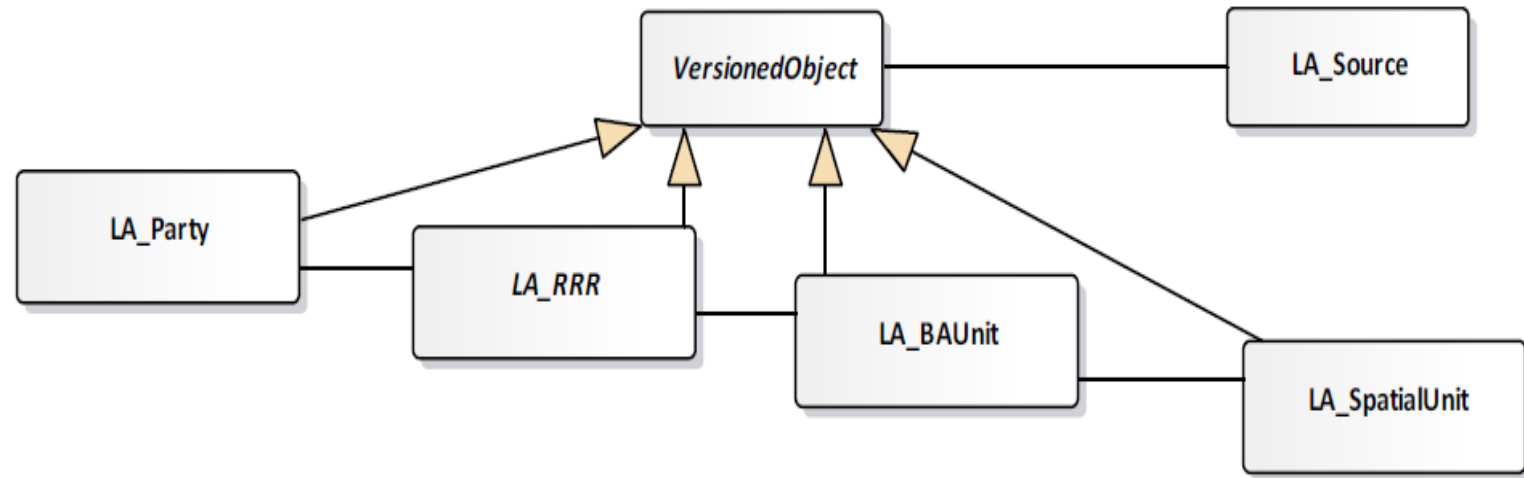
«codeList» HR_UsageType_Land
+ airport = 54
+ backwater = 24
+ bareRockyGround = 33
+ canal = 20
+ cemetery = 50
+ children'sPlayground = 47
+ cliffs = 31
+ constructedLand = 42
+ developedBeach = 51
+ dike = 61
+ disposalSite = 63
+ dryStoneWall = 34
+ embankment = 59
+ fairgrounds = 49
+ fish-farm = 28
+ fish-pond = 15
+ forests = 16
+ garden = 4
+ garden-greenhouse = 5
+ garden_polytheneGreenhouse = 6
+ gravelCoastline = 40
+ gravelPit = 56
+ grazingLand = 13
+ gully = 37
+ highway = 68
+ lake = 21
+ land-sideSite = 36
+ landForSportAndRecreation = 46
+ landUnderBuilding = 43
+ mariculture = 29
+ marina = 53
+ market = 48
+ oliveGrove = 9
+ oliveGrove-nursery = 10
+ opencast = 58
+ orchard = 7
+ orchard-nursery = 8
+ otherWoodlands = 17
+ park = 45
+ path = 67
+ plowfield = 2
+ plowfield-greenhouse = 3
+ pond = 25
+ pool = 23
+ port = 52
+ railwayLine = 69
+ reed-patch = 14
+ reservoir = 22
+ river = 18
+ road = 66
+ rockyCoastline = 39
+ rockyGround = 32
+ sand = 35
+ sandbank = 38
+ sandPit = 57
+ sea = 27
+ slash = 60
+ square = 65
+ stoneQuarry = 55
+ stream = 19
+ street = 64
+ swamp = 26
+ unclassifiedAgriculturalLand = 1
+ unfertileLand = 30
+ vineyard = 11
+ vineyard-nursery = 12
+ waste = 62
+ yard = 44

# THE SECOND EDITION OF LADM

- ❖ The LADM is in the process of revision. It has a much wider scope and it has a modular structure where each part is covering a specific subdomain. The working titles of LADM Edition II parts are:
  - ❖ ● Part 1 – Fundamentals
  - ❖ ● Part 2 – Land Registration
  - ❖ ● Part 3 – Marine Space Georegulation
  - ❖ ● Part 4 – Valuation Information
  - ❖ ● Part 5 – Spatial Plan Information
  - ❖ ● Part 6 – Implementations

In comparison to the first version of LADM, two new classes are introduced as the base classes: VersionedObject and LA\_Source.

Class LA\_Source represents the LAS process and it is associated with the class VersionedObject.



The basic classes of LADM (Lemmen et al, 2021)



# THE SECOND EDITION OF LADM



Newly added relationships between classes VersionedObject and LA\_Source  
(Lemmen et al, 2021)

# THE CURRENT STATUS OF LAND ADMINISTRATION IN CROATIA

- ❖ The law introduced the Register of Buildings as a transitional register towards 3D cadastre, combining datasets from several existing sources and newly collected datasets.
- ❖ The scope of Register of Geographical Names and Register of Spatial units have been redefined.
- ❖ The Cadastre of Infrastructure was returned under the jurisdiction of the State Geodetic
- ❖ The process of cadastral surveys has been redefined and technical reambulation was abandoned as a methodology for partial improvement of cadastral map quality since its results were not satisfying in the past

# Real property cadastre

- ❖ **Quality of field measurement data for boundaries of cadastral parcels and buildings must be determined by the level of confidence for horizontal coordinates with 95% probability standard positional accuracy up to 0.1 meter**

# **System of Digital Geodetic Reports (SDGR)**

- ❖ **The System of Digital Geodetic Reports (SDGR) is a comprehensive web application developed following the most recent web technologies and principles of interoperability and openness, that provides full support to licensed surveyors in preparing the Digital Geodetic Report (DGR).**
- ❖ **It supports the entire process with downloading of initial state of data in digital GML format and preparation and development of geodetic data in digital form in order to submit the geodetic report to the cadastral office for the electronic review and confirmation**



## Sustav digitalnih geodetskih elaborata

Aplikativno rješenje koje ovlaštenim geodetskim izvoditeljima omogućava potpunu podršku za pripremu digitalnog geodetskog elaborata (DGE) prateći cjelokupan proces od preuzimanja digitalnih podataka početnog stanja u GML formatu, pripreme i izrade geodetskog elaborata do predaje DGE na pregled i potvrđivanje

PRIJAVA



2.876

BROJ KORISNIKA

107.476

BROJ REALIZIRANIH  
DIGITALNIH GEODETSKIH  
ELABORATA

139.320

UKUPAN BROJ ELABORATA

262.541

BROJ ČESTICA S MJERILOM  
1

922.727

BROJ USPJEŠNIH  
KONTROLA KVALITETE

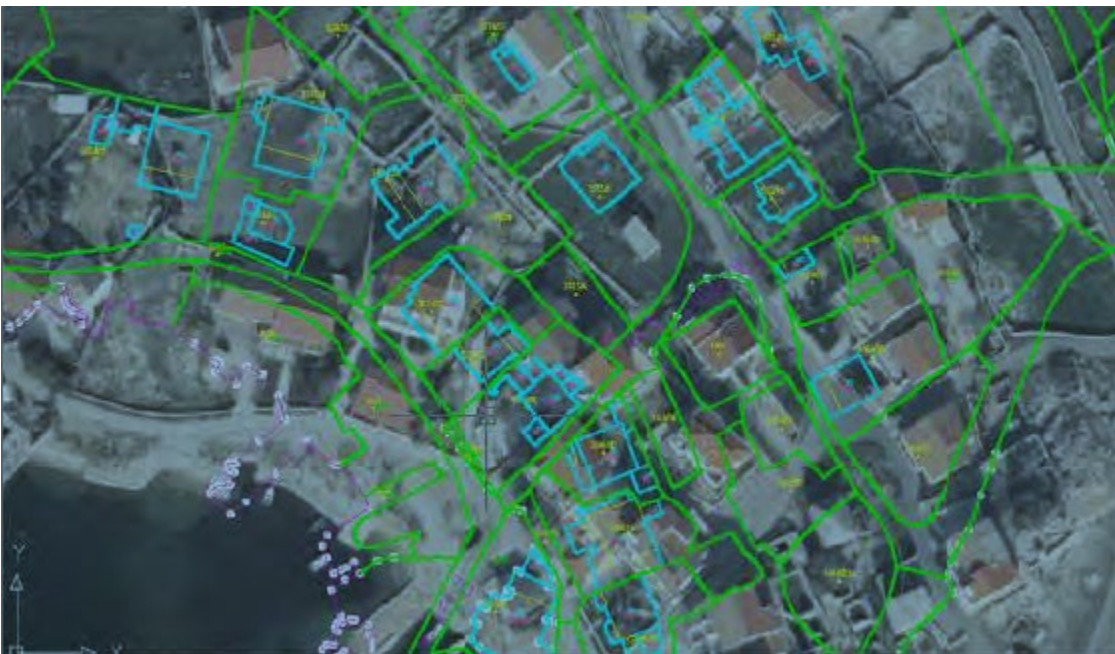
17.907

BROJ RIJEŠENIH  
KORISNIČKIH PRIJAVA

# Cadastral maps homogenisation

- ❖ **An improvement of old cadastral maps was necessary and SGA selected an optimal solution, cadastral map homogenisation – a technical procedure for geometric improvement of cadastral parcels in graphical survey, which takes care not to break the best parts of the digital cadastral map.**
- ❖ **This technical action does not change the legal status of graphical cadastral data and cannot substitute the cadastral survey, but enables the changes based on the measured individual geodetic surveys in the official records by the overlapping method and properly represent the actual position on the field.**



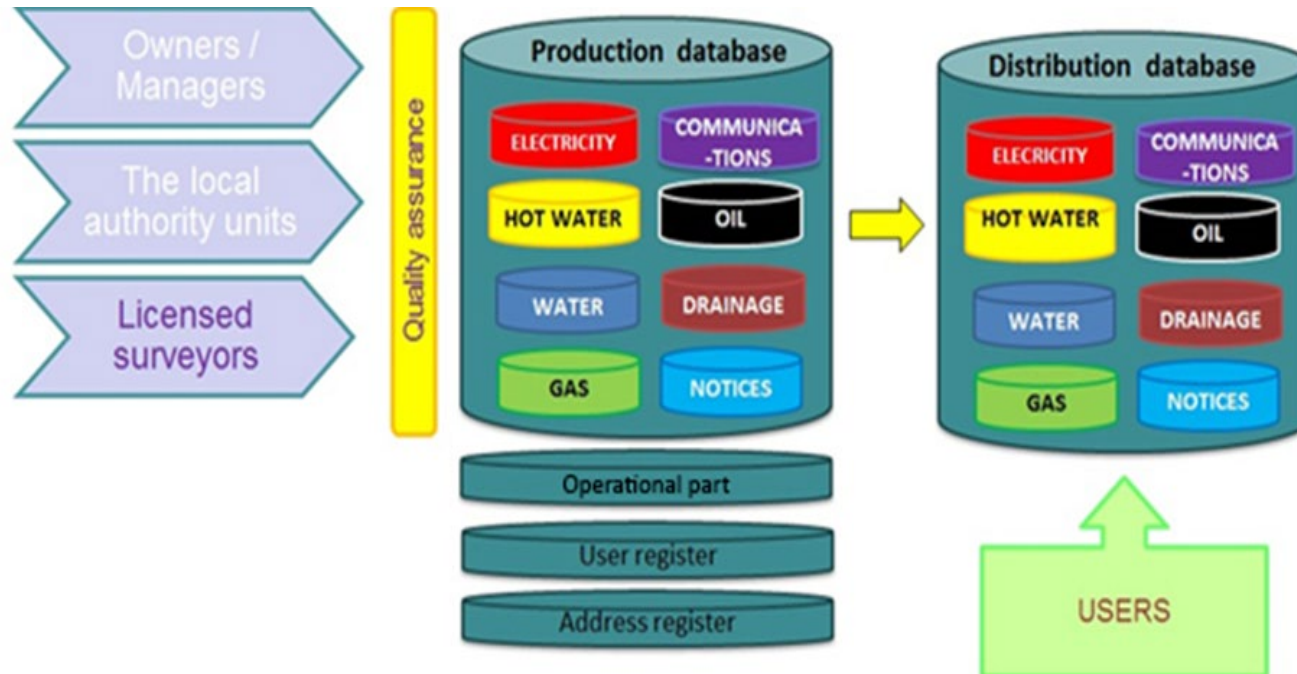


## Cadastral maps homogenisation



**SOURCE:**  
Homogenizacija  
katastarskih planova,  
Završno izvješće o  
provedenom projektu 2017.-  
2020.  
[dgu.gov.hr](http://dgu.gov.hr)

# Utility cadastre





# Utility cadastre

# ski.dgu.hr

The screenshot displays the 'ski.dgu.hr' web application, titled 'JEDINSTVENA INFORMACIJSKA TOČKA - SUSTAV KATASTRA INFRASTRUKTURE'. The interface includes a search bar at the top right for 'Pretraži infrastrukturu ili obavijesti'. On the left, a sidebar lists 'SLOJEVI PODATAKA' (Data Layers) with categories like 'Prostorni podaci' and 'Slojevi infrastrukture'. The 'Slojevi infrastrukture' section is expanded, showing various utility types: Elektroenergetska infra..., Elektronička komunika..., Naftovodna infrastrukt..., Plinovodna infrastrukt..., Vodovodna infrastrukt..., Toplovodna infrastrukt..., Odvodna infrastruktura, Zajednički objekti, and Obavijesti. The main map area shows an aerial view of a city with numerous colored lines and symbols representing these utility networks. A bottom status bar displays map coordinates (48°59'2.840, 50°39'68.210), scale (1:1000), and projection (HTRS96/TM). The footer contains logos for the European Union, DGU, and FIG, along with text about funding and project goals.

REPUBLICA HRVATSKA  
Državna geodetska uprava

SKI

JEDINSTVENA INFORMACIJSKA TOČKA - SUSTAV KATASTRA INFRASTRUKTURE

Marko Pipalović

Pretraži po lokaciji/adresi...

Pretraži infrastrukturu ili obavijesti

SLOJEVI PODATAKA

SVI SLOJEVI ODABRANI SLOJEVI

> Prostorni podaci

■ Vidljivost svih slojeva grupe

Prozornost

> Slojevi infrastrukture

> Elektroenergetska infra...

> Elektronička komunika...

> Naftovodna infrastrukt...

> Plinovodna infrastrukt...

> Vodovodna infrastrukt...

> Toplovodna infrastrukt...

> Odvodna infrastruktura

> Zajednički objekti

> Obavijesti

© Državna geodetska uprava

1:1000 HTRS96/TM 48°59'2.840, 50°39'68.210 20m

Optimizirano za Chrome, Firefox, Safari  
©2020 Državna geodetska uprava. Sva prava pridržana.

Europska unija  
Zajedno do fondova EU

Operativni program  
KONKURENTNOST  
I KOHIZIJA

Projekt je sufinancirala Europska unija iz Europskog  
fonda za regionalni razvoj. Sadržaj internetske stranice  
isključivo je odgovornost Državne geodetske uprave.

O NAMA UVJETI KORIŠTENJA IZJAVA O PRISTUPAČNOSTI KONTAKT ZAKONI

# Building register

- ❖ This register will serve as a platform for:
- ❖ developing a good, complete and fair basis on which property tax can be established
- ❖ improving management of real property and resolving legal issues in multi-residential buildings
- ❖ better management of spatial and construction planning and housing policy
- ❖ promoting the development of community and infrastructure planning
- ❖ providing a better overview of apartments and office spaces, as well as for providing a systematic statistical census

# Regulation of surveying profession

- ❖ The new Law on Geodetic Activity came into force in 2018. This law regulates surveying profession on territory of the Republic of Croatia. The basic novelty of this law is new division of professional geodetic works into two basic types:
- ❖ • works which affect the quality of official state records on the territory of the State Geodetic Administration and which serve for the management and maintenance of the land cadastre and real estate cadastre and thus affect the safety of legal transactions
- ❖ • works for technical and other purposes.

# The Law on Communal Economy

- ❖ **The Law on Communal Economy came into force, which regulates:**
  - **the principles of communal economy**
  - **performing and financing communal activities**
  - **building and maintaining communal infrastructure,**
  - **paying communal contributions and communal fees,**
  - **maintaining communal order and other issues important for communal economy**

# **Multi-year program of cadastral surveys of construction areas for the period 2021-2030**

- ❖ Adopted by Croatian Parliament in October 2021.**
- ❖ The implementation of activities from this Program. will provide up-to-date data on real property in construction areas in the Republic of Croatia and areas around construction areas that are important for the development of cities and municipalities, counties and countries and in which more than 80% of economic activities.**
- ❖ The program aims to measure 600,000 hectares of land, mostly in the construction area**

# PROPOSAL OF REVISED CROATIAN

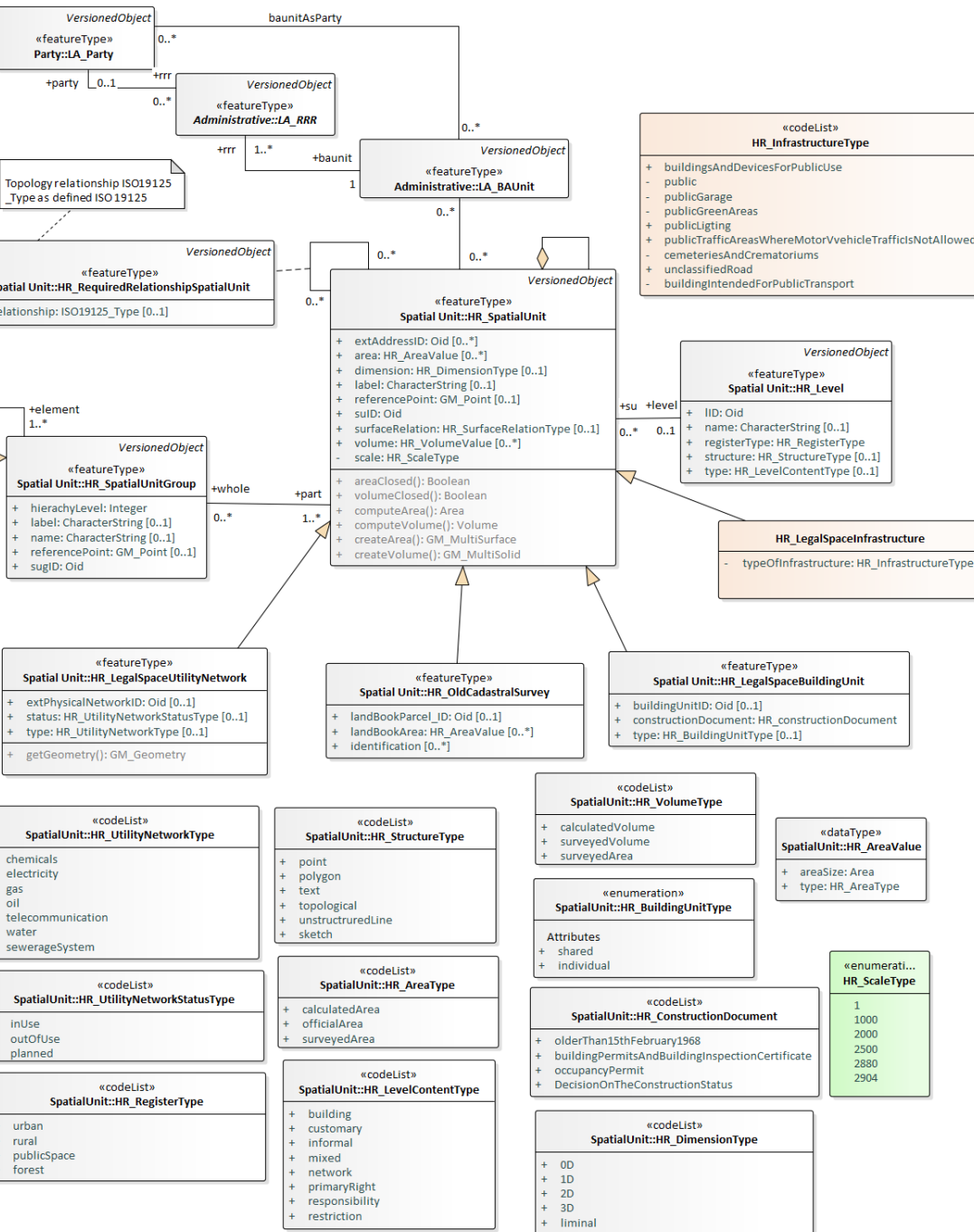
## LADM PROFILE (HR\_LADM\_V2)

- ❖ The main focus of this revision is on the SpatialUnit.
- ❖ We added a new class *HR\_LegalSpaceInfrastructure* in order to support changes occurred by adopting the Law on Communal Economy which recognizes different communal objects that should be registered in cadastre



# PROPOSAL OF REVISED CROATIAN LADM PROFILE (HR\_LADM\_V2)

- ❖ Introduction of the attribute scale to class *HR\_SpatialUnit*. This diagram is mandatory and has a list of possible values defined by *HR\_ScaleType*.
- ❖ This attribute is introduced in Croatian LAS to manage the accuracy issue of parcel boundaries. For instance, if the parcel boundaries are measured after 2018 with the standard positional accuracy up to 0.1 meter, a parcel will have the value of scale=1.



# Revised Spatial Unit package of Croatian LADM profile



# CONCLUSION

- ❖ Initial efforts to address changes in Croatian LAS since 2013. We described the changes mainly in the LADM package SpatialUnit since other changes are quite recent and are in early stages of implementation.
- ❖ Although ISO 19152 (LADM) is an excellent basis for modelling the land administration system in the Republic of Croatia, it is not commonly used. One of the reasons might be that LADM usage is not mandatory. Recently developed databases based on new technologies are operating with old data (typically older than 50 years). Data from different time periods might have different legal weight. Hence, changing attributes and entries in order to improve data models or enhance the queries can be challenging.

# FURTHER RESEARCH

- ❖ The following research will include a more systematic analysis of other LADM packages in relation with Croatian LAS changes.
- ❖ Once LADM Edition II will be made available another revision of the Croatian profile would be needed.

# Thank you for your attention!

**nikola.vucic@dgu.hr**



SOURCE: <https://www.britannica.com/place/Dubrovnik>