A database implementation of LADM Valuation Information Model for Turkish case study

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Content of presentation

- **LADM Valuation Information Model**
- **Property Valuation Practices in Turkey**
- **Turkish Country Profile of LADM Valuation Information Model**
- **Prototype implementation of the Model**

Research domain – Valuation aspect of land administration

- **Land administration** is the processes of determining, recording and disseminating information about the ownership, **value** and use of land (FIG, 1996).

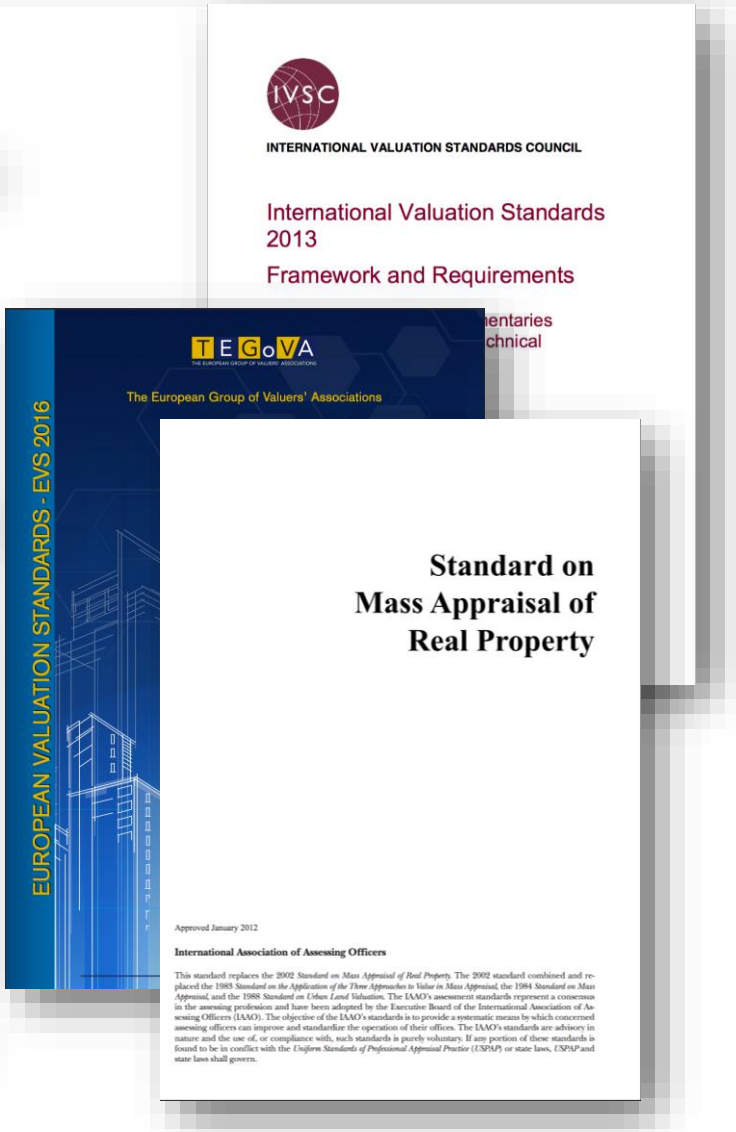
- No **internationally accepted information model** that defines the **semantics of property valuation** databases or registries.

- **A recently started joint activity** under **FIG Commission 9 and 7** has started development of an information model for the **specification of valuation information** maintained by **public authorities** especially for property taxation.

- Maximum reuse of existing standards should be considered for creating such a model.

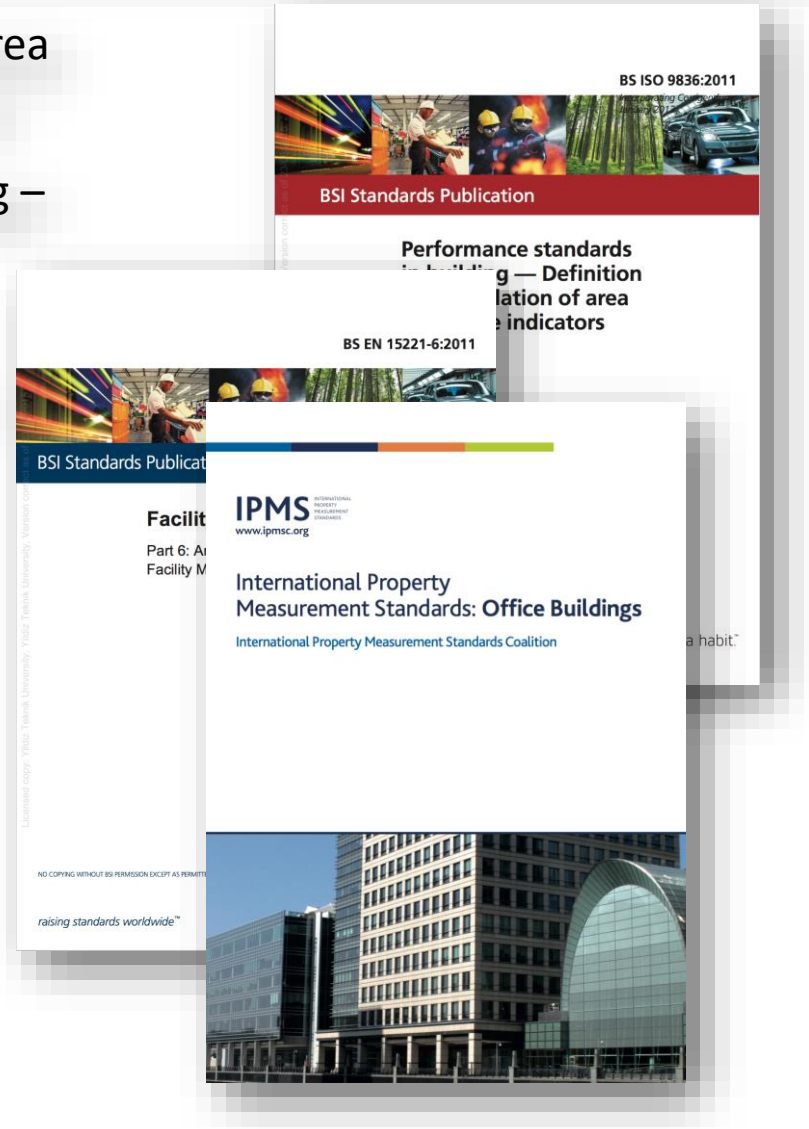
Valuation standards

- International Valuation Standards, International Valuation Standards Council (IVSC)
- European Valuation Standards, The European Group of Valuers' Associations (TEGoVA)
- Standard on Mass Appraisal of Real Property, International Association of Assessing Officers (IAAO)
- Standard on Ratio Studies, International Association of Assessing Officers (IAAO)
- Red Book, Royal Institution of Chartered Surveyors (RICS)
- The **valuation standards** focus more on **concepts** and **terminology** of **value**, **valuer**, and **valuation practices**, hovewer, **there is no internationally accepted data model** that defines semantics of property valuation registries and the links between valuation registries and the land administration registries (land, building, dwelling) by these standards.



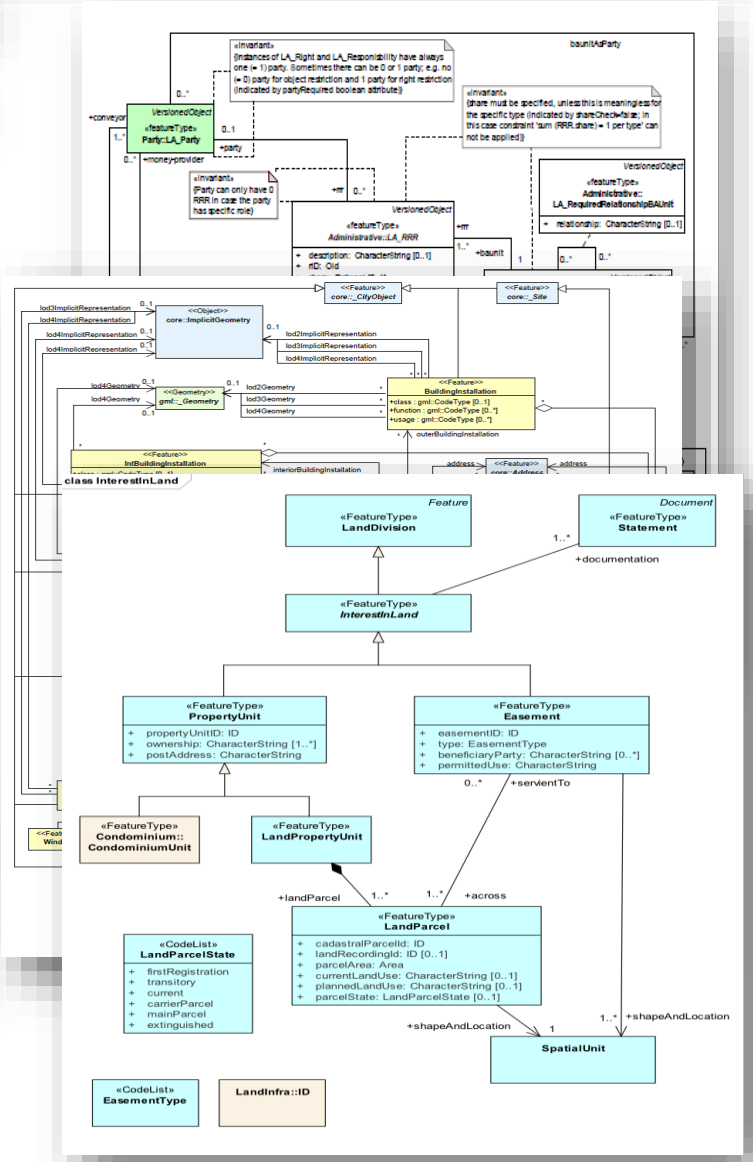
Area and volume measurement standards

- EN 15221-6:2011 Facility Management, Part 6: Area and Space Measurement in Facility Management
- ISO 9836:2011 Performance Standards in Building – Definition and calculation of area and space indicators
- International Property Measurement Standards: Office Buildings
- RICS Code of Measuring Practice



Geographic information standards

- **ISO 19152:2012 Land Administration Domain Model**
- INSPIRE Data specifications on Cadastral Parcels and Buildings
- OGC CityGML
- OGC IndoorGML
- OGC LandInfra / InfraGML



LADM provides the most relevant basis for the development of a valuation information model.

- It is an ISO standard for the domain of land administration, which is related to *management of information concerning the ownership, **value** and use of land*.
- It is conceptually the most close and emphasizes the relationship to other property related databases.
- Its abstract designing approach provides a flexible frame for the further development of country specific data models.

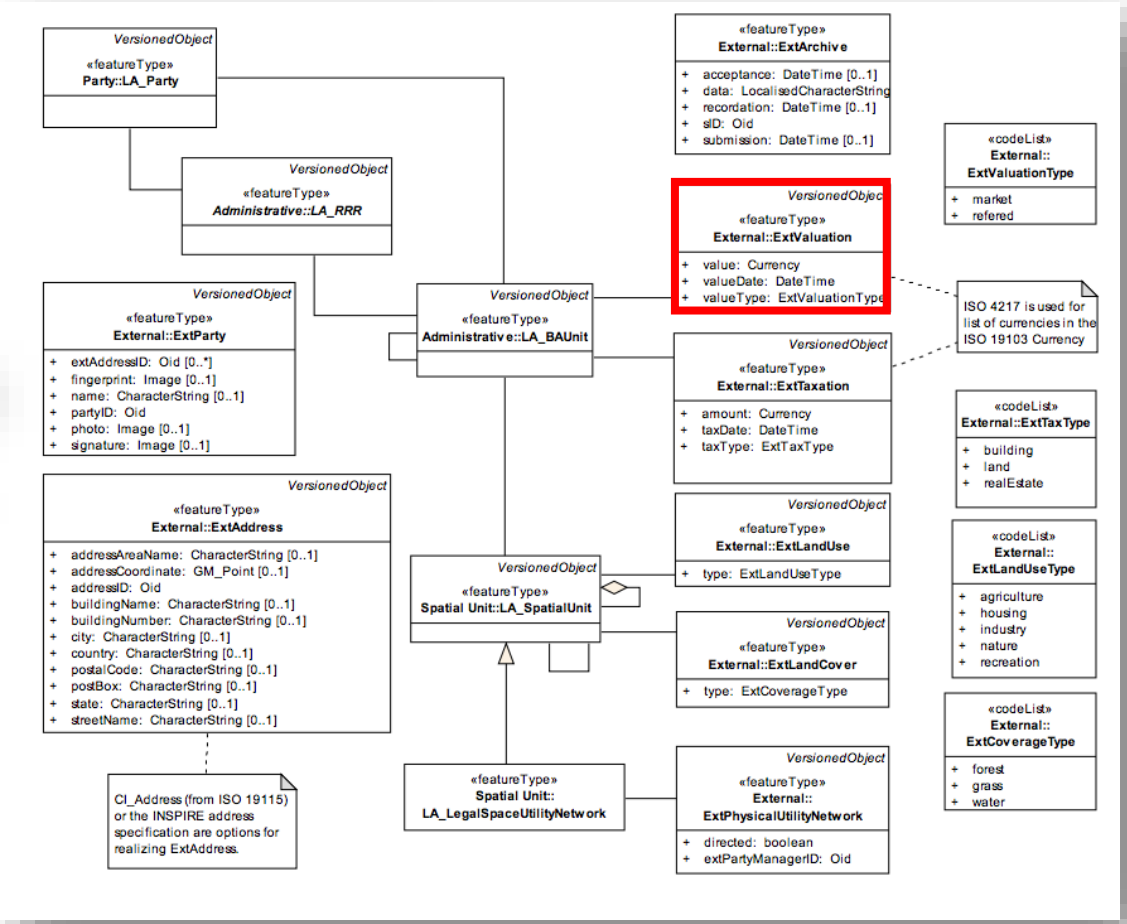
LADM Valuation Information Model

LADM ExtValuation class was extended from the property valuation point of view to provide an information model for valuation databases.

Scope: Administrative valuations applied for recurrently levied property taxes.

Methodology: Supply LADM with new classes, attributes and relationships adopted from developed thesaurus, country applications and existing geoinformation standards.

Contribution: A common basis for SDI based integration of valuation databases with other land administration databases.



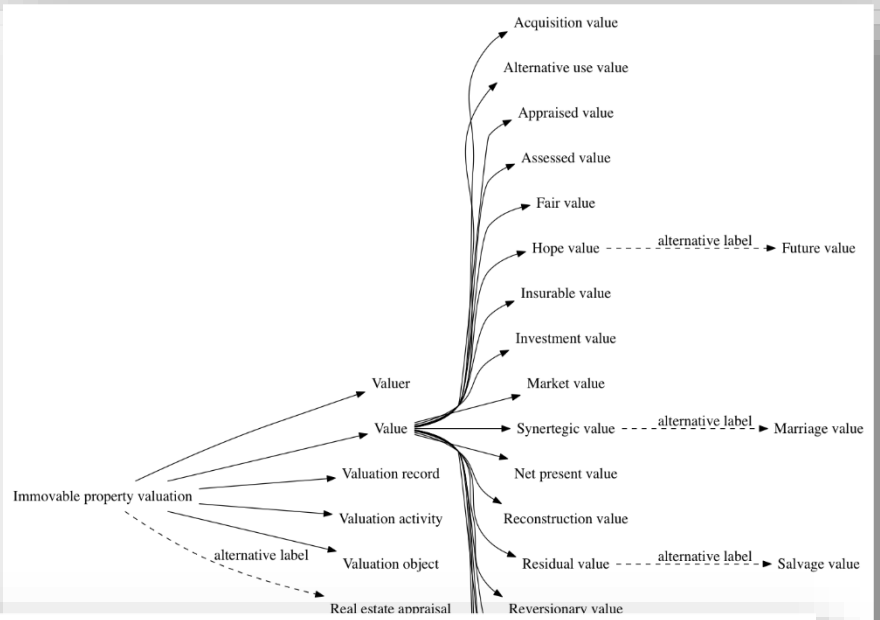
Identification of valuation domain semantics

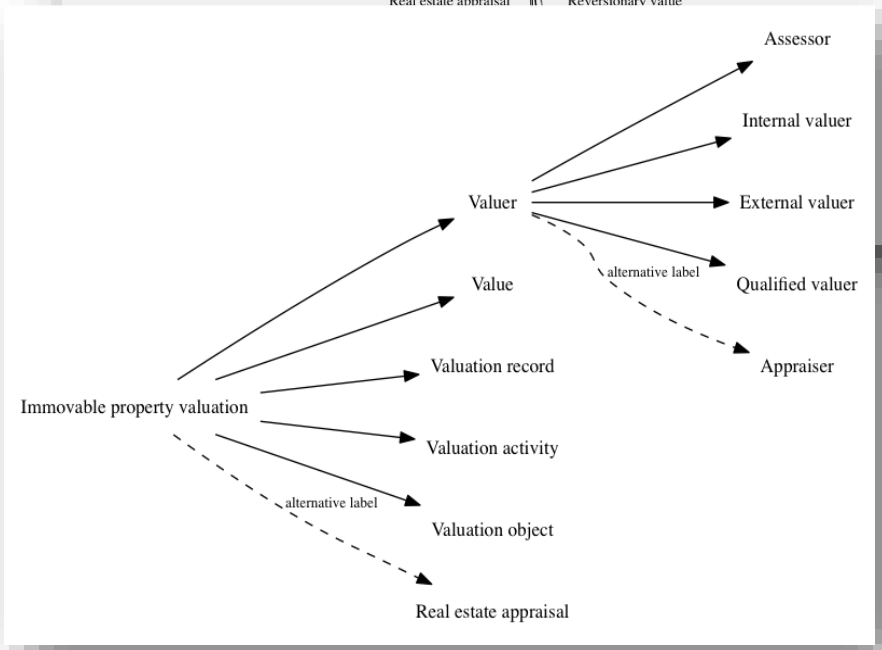
An **Immovable Property Valuation Thesaurus** was developed in order to reveal core semantic (terms and term relationships) of the valuation domain.

The purpose is to support the identification of candidate classes and attributes for the development of valuation information model.

The thesaurus derived from glossaries and main text of the international valuation standards issued by IVSC, TEGoVA and IAAO.

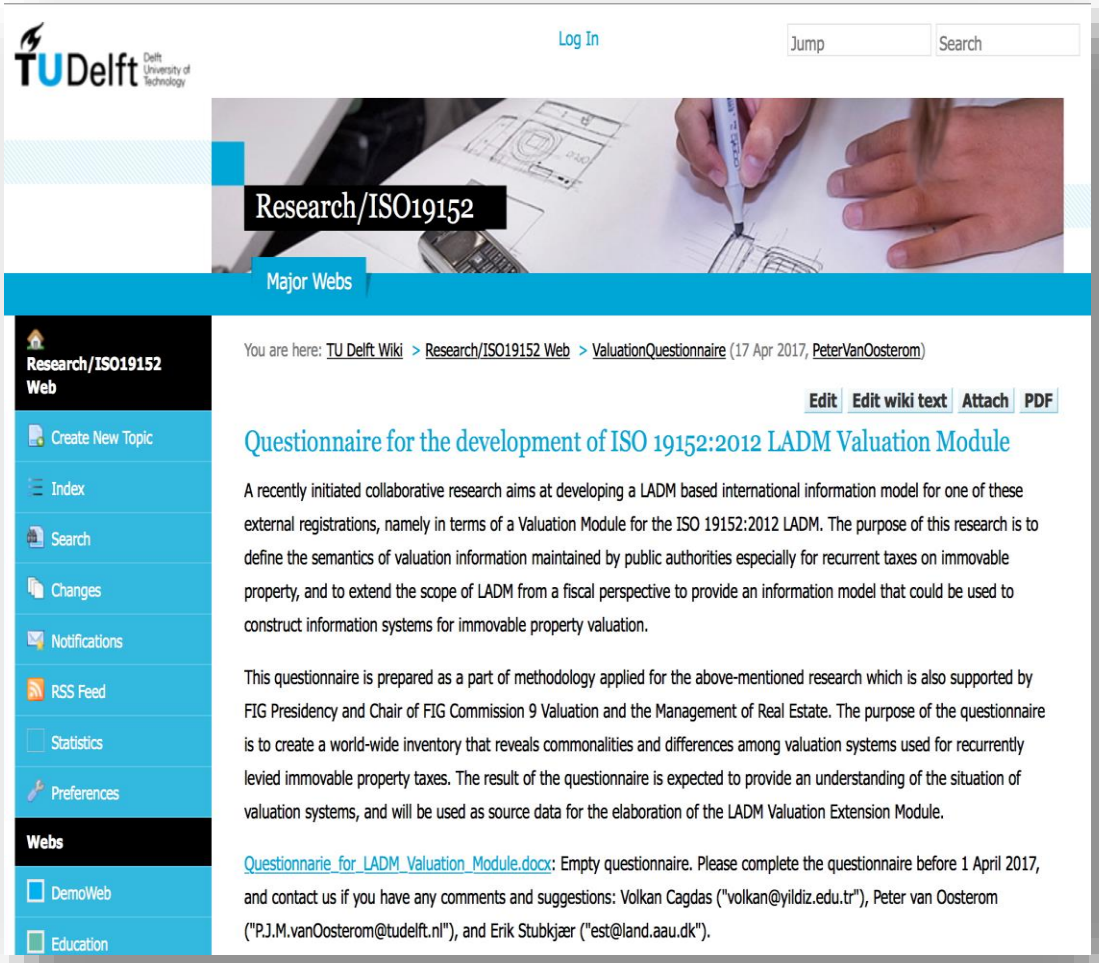
The thesaurus was encoded through the Simple Knowledge Organization Systems (SKOS) specifications developed by W3C. See, http://cadastralvocabulary.org/IPVT.rdf.





Identification of country applications

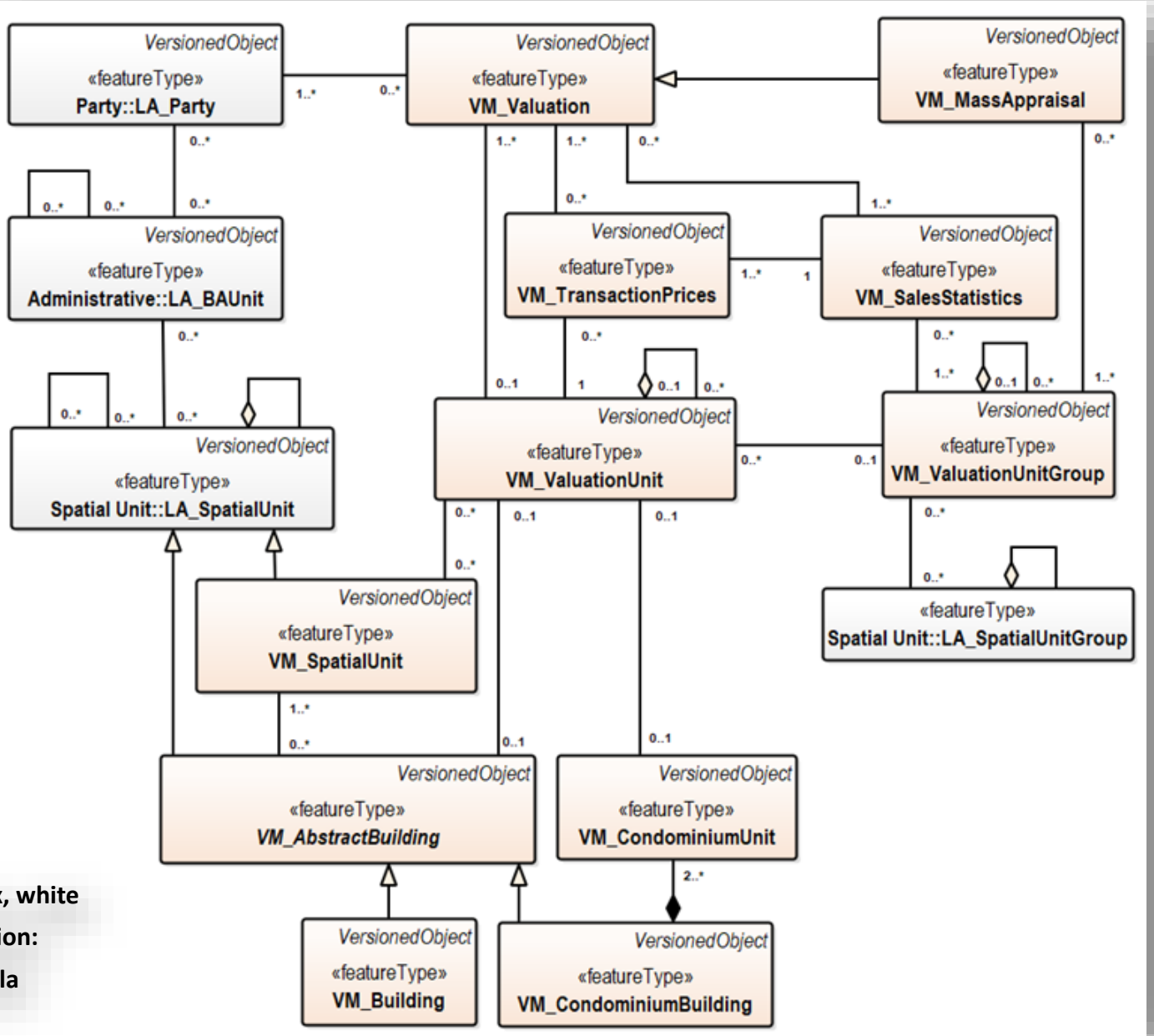
A questionnaire based dataset has been obtained from delegates of FIG Comm. 7 and Comm. 9, available at at http://isoladm.org/ValuationQuestionnaire.



Respondents

1. Argentina (D. A. Erba, C. A. Basilio)
2. Bolivia (J. G. A. Flores)
3. Brazil (E. Silva)
4. Colombia (D. R. Gutiérrez)
5. Costa Rica (J. M. Díaz)
6. Croatia (H. Tomić)
7. Cyprus (A. Aristidou)
8. Denmark Erik (E. Stubkjaer)
9. Denmark Manohar (M. Velpuri)
10. Ecuador (F. R. Bueno)
11. India (M. Velpuri)
12. Latvia (R. Pētersone)
13. Macedonia (V. Miskovski)
14. The Netherlands (R. Kathmann)
15. Poland (P. Parzych, J. Bydłosz)
16. Singapore (M. Velpuri)
17. Slovenia (D. Mitrović)
18. South Africa (M. Velpuri)
19. South Korea (L. Young-ho, K. Bong-Jun)
20. Spain (A. Velasco)
21. Turkey (V. Çağdaş, A. Kara)
22. UK Ben (B. Elder)
23. UK Pete (P.Wyatt)

LADM Valuation Information Model



LADM: LA_ prefix, white

Valuation extension:

VM_ prefix, vanilla

Property Valuation Practices in Turkey

There are two types of annually levied recurrent taxes on immovable property in Turkey: **Building tax** and **Land tax**.

The **land tax** is levied from **unimproved properties** (i.e. cadastral parcels).

The **building tax** is levied from **improved properties** which cover both 'legal buildings' and their legal parts (e.g. condominium units) and 'illegal buildings'.

The land and building taxes are levied according to the '**tax value**' of properties.

The tax values of urban and rural land parcels are assessed with a **sales comparison approach** by on the basis of unit parcel values determined by **local valuation commissions** in **every four years**, for **each street** in urban areas and each district in rural areas (parcel unit price per square meter).

The building tax values are generally assessed with a **cost approach** based on the '**cost of building per square meter**' determined by the **Ministry of Finance** and the **Ministry of Public Works and Settlement**.

Property Valuation Practices in Turkey

The Tax Assessment Statute has determined data requirements for the three different taxation objects:

i) improved property,

ii) unimproved property (cadastral parcel) **located in urban areas**, and

iii) unimproved property (cadastral parcel) **located in rural areas**.

Property Valuation Practices in Turkey

Data required for valuation of improved property (land and improvements together as condominium property)

Improvement (building) characteristics	Definitions and characteristic value type
The cost of building per square meter	It is determined by the Ministry of Finance and the Ministry of Public Works and Settlement every year on the basis of building construction type, use and construction quality type.
Building use type	Type of building usage defined by Turkish Property Tax Law (residential, office, other specific building).
Building construction type	Type of construction (steel framework, concrete framework, stone, stone frame, timber, shanty, sun-dried or mud brick).
Building quality type	Construction class of buildings defined in Turkish Property Tax Law (luxury, first class, second class, third class, simple construction).
Gross floor area	Total gross area of building (condominium)
Physical obsolescence	It is calculated by a scheme given in Tax Assessment Statute
Elevator	Existence of the elevator.
Heating/air conditioning	Existence of the heating and/or air conditioning.

Property Valuation Practices in Turkey

Data required for valuation of unimproved properties (rural and urban land)

Urban land parcel characteristics	**Definitions and characteristic value type**
Land parcel area	Area of land parcel
Parcel unit price per square meter	It is determined by local valuation commissions every four years and these values are updated between the assessment periods by the half of the revaluation rate.
Rural land characteristics	**Definitions and characteristic value type**
Land parcel area	Area of land parcel
Parcel unit price per square meter	It is determined by local valuation commissions every four years and these values are updated between the assessment periods by the half of the revaluation rate
Rural parcel type	Type of rural parcel (barren land, bottom land, wetland)

Property Valuation Practices in Turkey

- The **tax values** of **improved** and **unimproved properties** are currently calculated by the equation 2.1 and 2.2 according Property Tax Law and the official statements issued by the Ministry of Finance.
- $V_{imp.pro.} = \left[\left(A_{impr} \times C_{impr}\right) \times (1 - o) \times (1 + (e + h)\right] + (A_{parcel} \times V_{Parcel})$ (2.1)
- $V_{unimp.pro} = A_{parcel} \times V_{Parcel}$ (2.2)

$V_{imp.pro.}$= tax value of improved property

$V_{unimp.pro.}$= tax value of unimproved property

A_{impr} = area of building

A_{parcel}= area of parcel

V_{Parcel}= the unit price per square meter of parcels

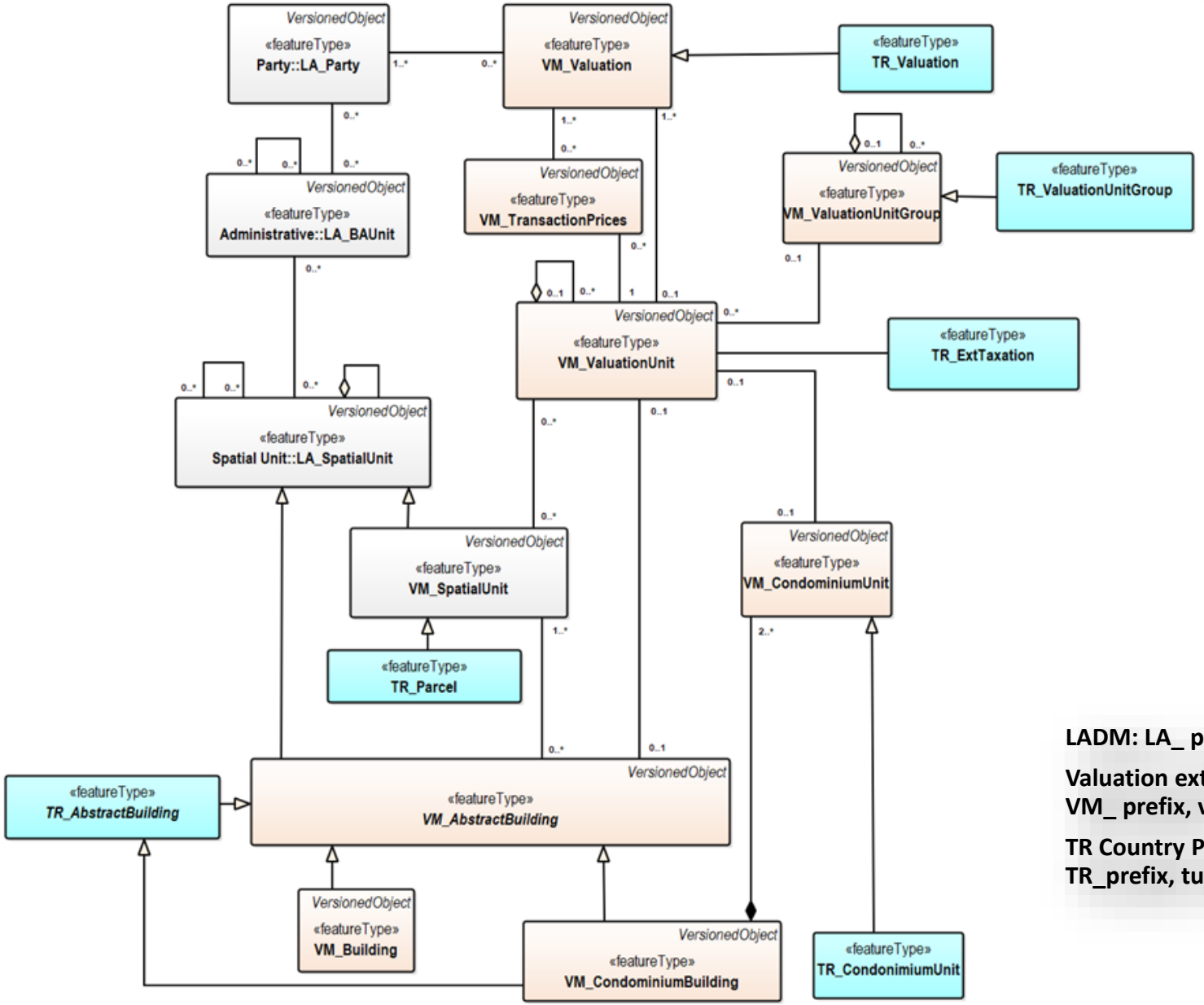
C_{impr}= cost of construction per square meter

o= physical obsolescence of improvements

e= availability of elevator

h= heating/air conditioning in improvements

Turkey LADM Valuation Information Model Country Profile

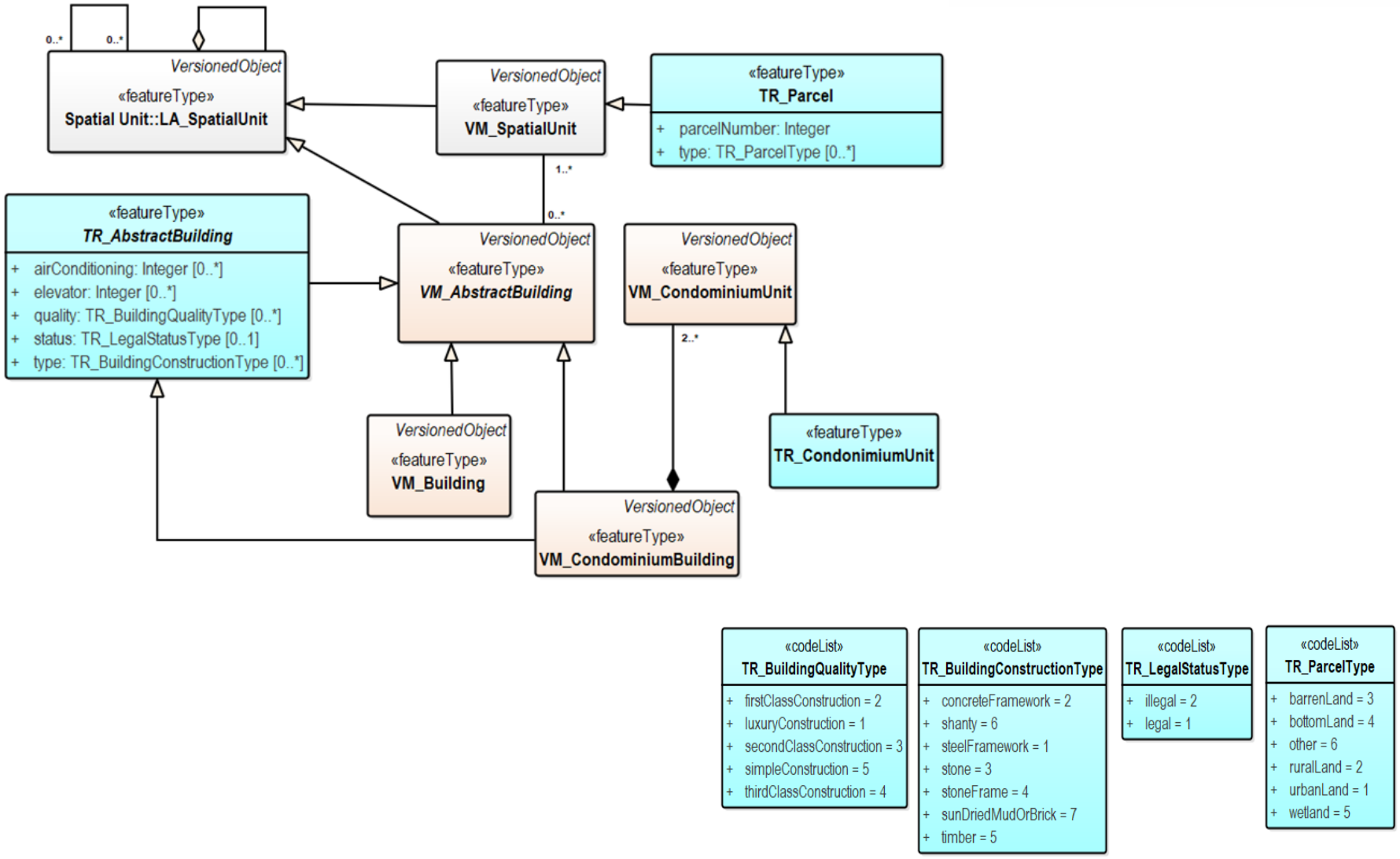


LADM: LA_ prefix, white

Valuation extension: VM_ prefix, vanilla

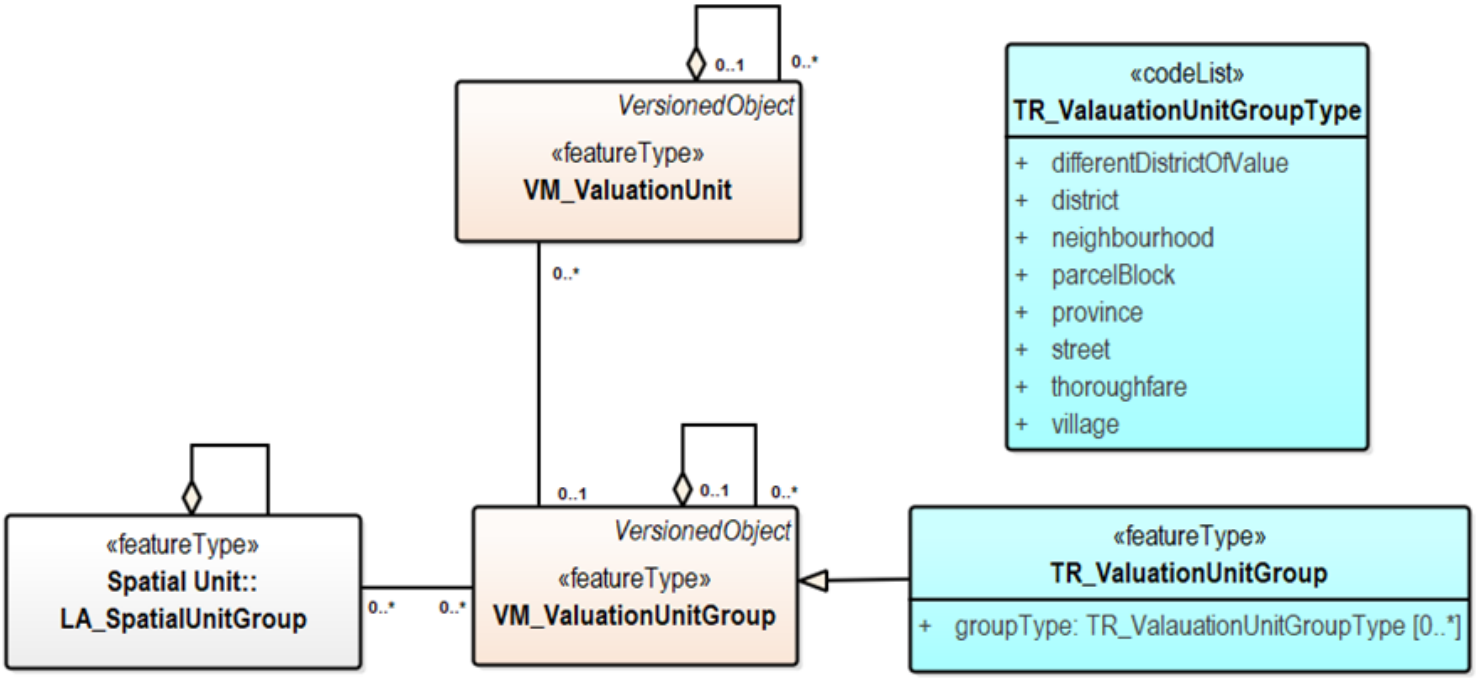
TR Country Profile: TR_prefix, turquoise

Turkey LADM Valuation Information Model Country Profile



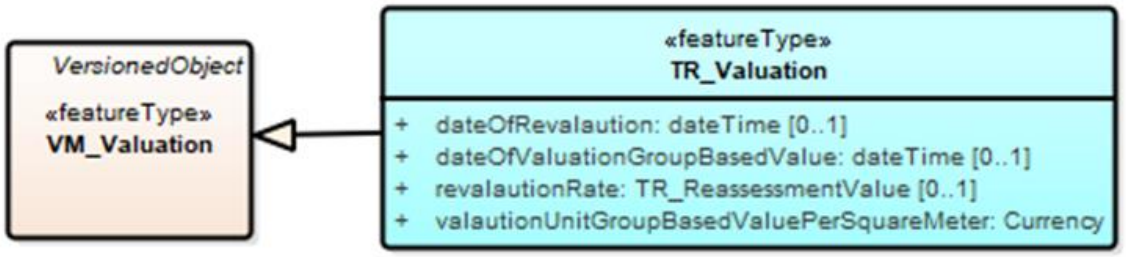
Spatial classes and code lists of LADM Valuation Information Model Turkish Country Profile

Turkey LADM Valuation Information Model Country Profile

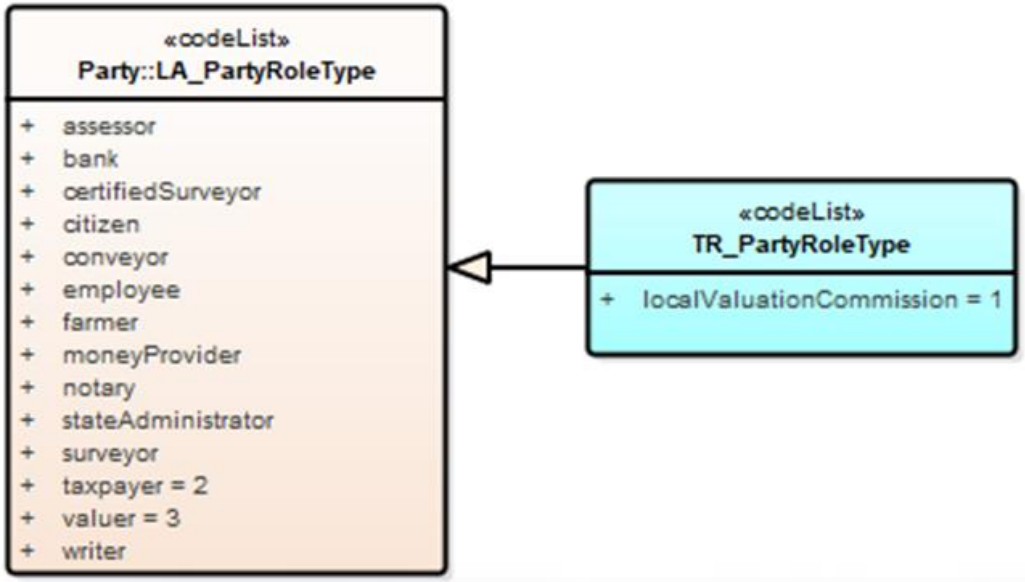


Valuation Unit Group part of the Turkish Country Profile

Turkey LADM Valuation Information Model Country Profile



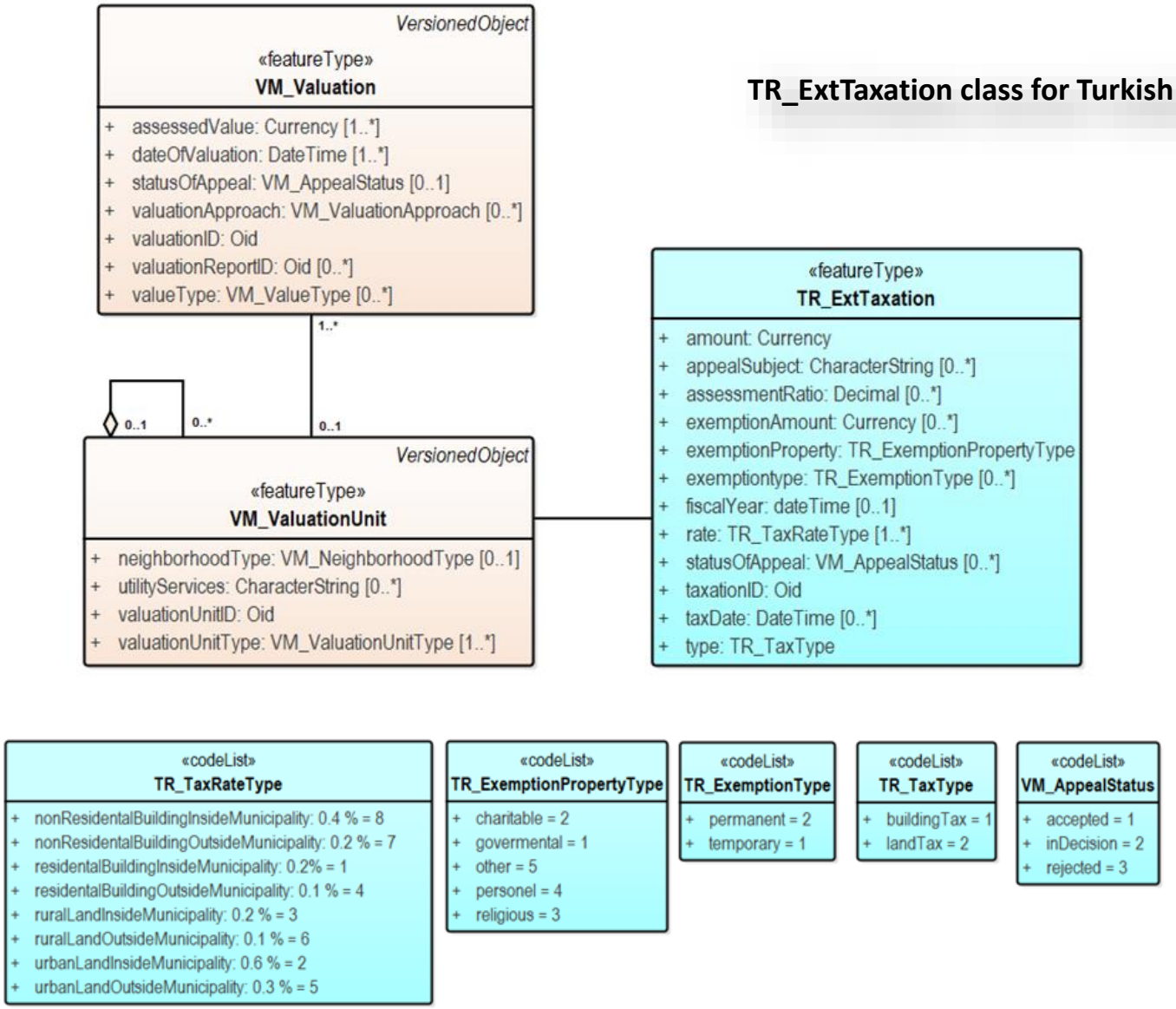
Valuation part of the Turkish Country Profile



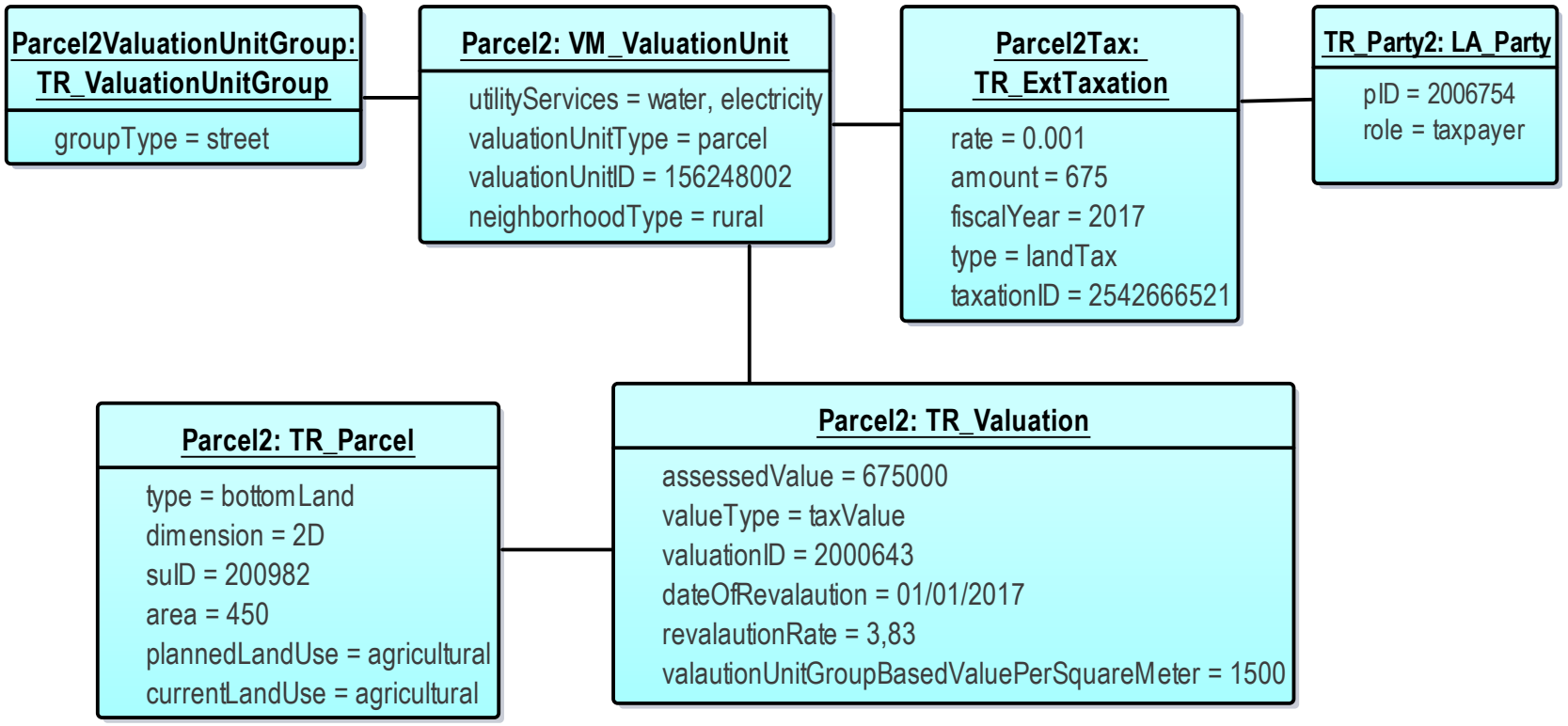
Extended LA_PartyRoleType for the Turkish Country Profile

Turkey LADM Valuation Information Model Country Profile

TR_ExtTaxation class for Turkish Country Profile

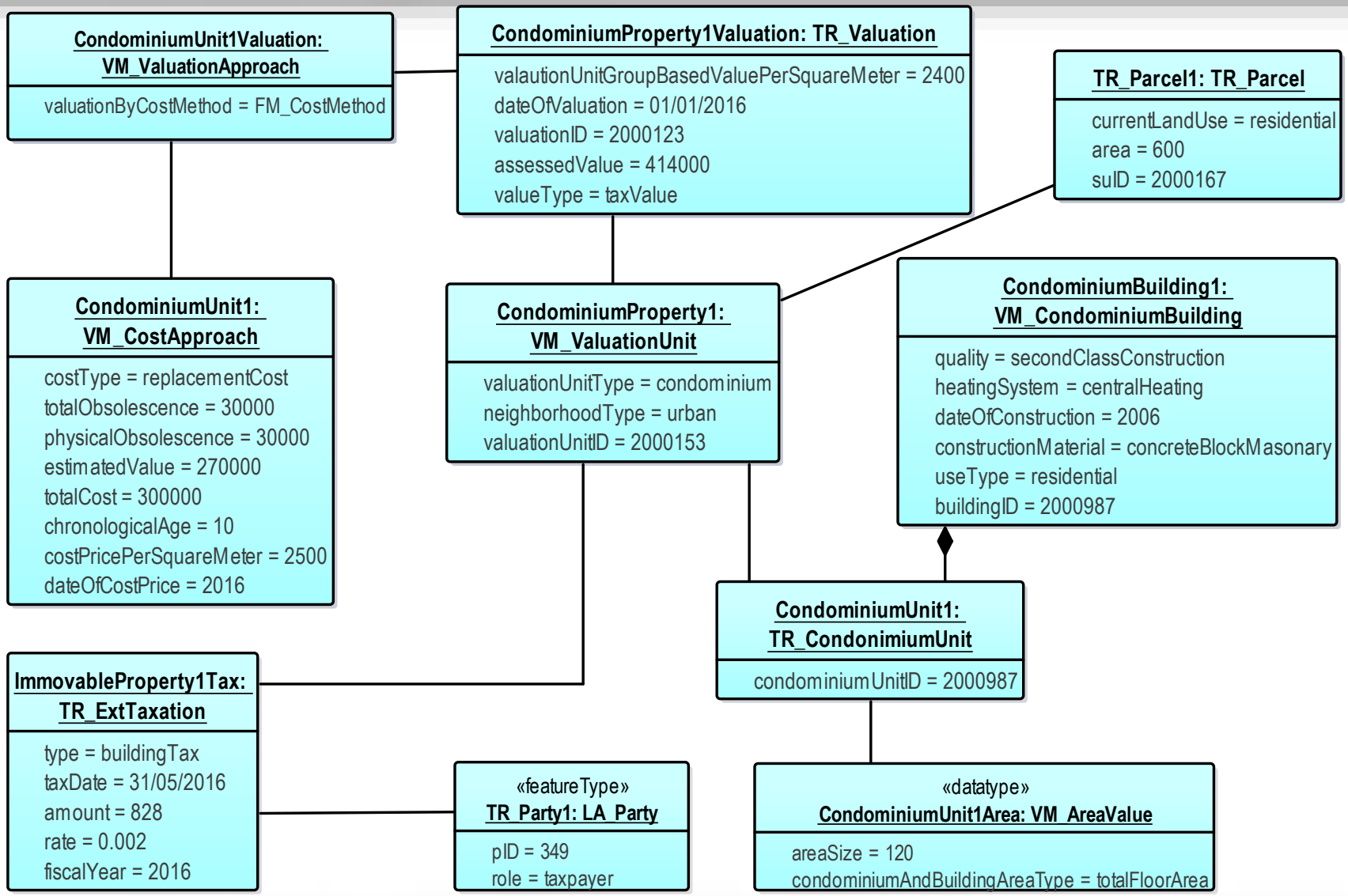


UML Use Case Diagrams - 1



Land valuation conducted for recurrently levied immovable land taxation in Turkey

UML Use Case Diagrams - 2

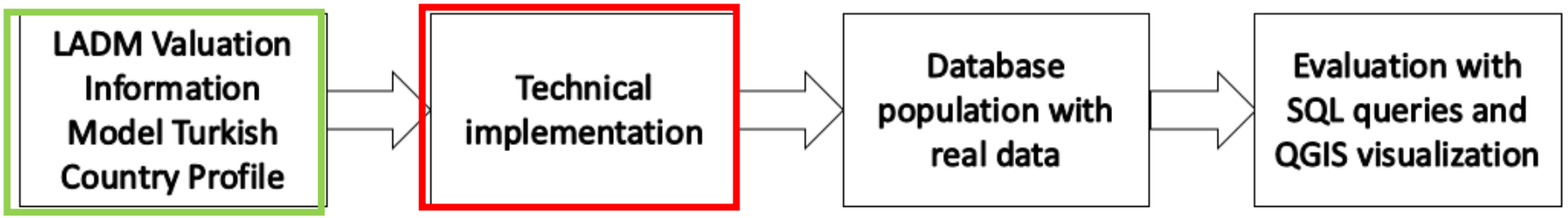


Condominium valuation conducted for recurrently levied immovable property taxation in Turkey

Prototype implementation of Turkey Country Profile

Approach

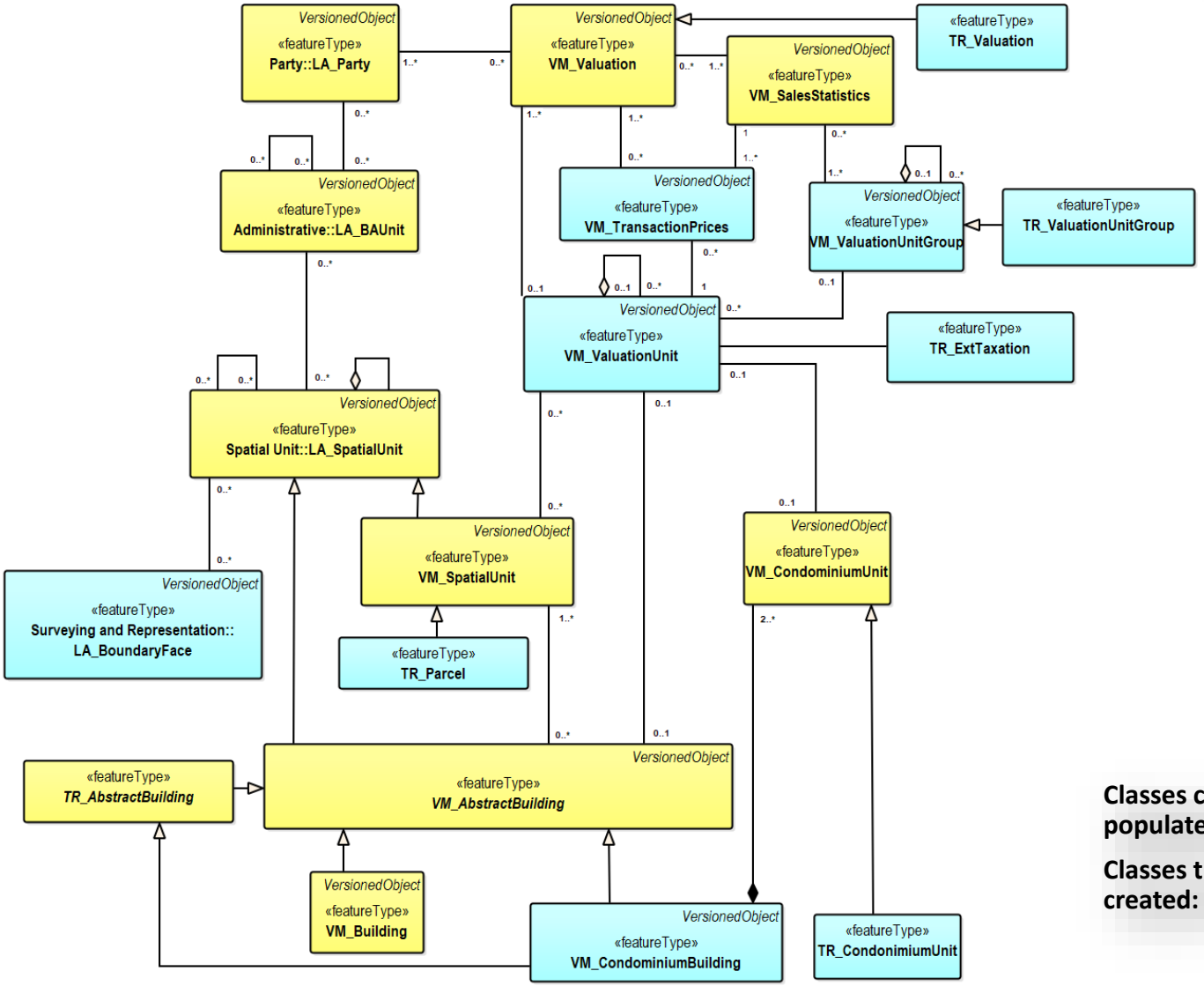
Figure below shows the methodology followed for the prototype implementation.



Solution

A prototype was developed for assesing the models via loading/converting real data and conducting test using prototype system (database (Oracle 11g) + GUI (QGIS)).

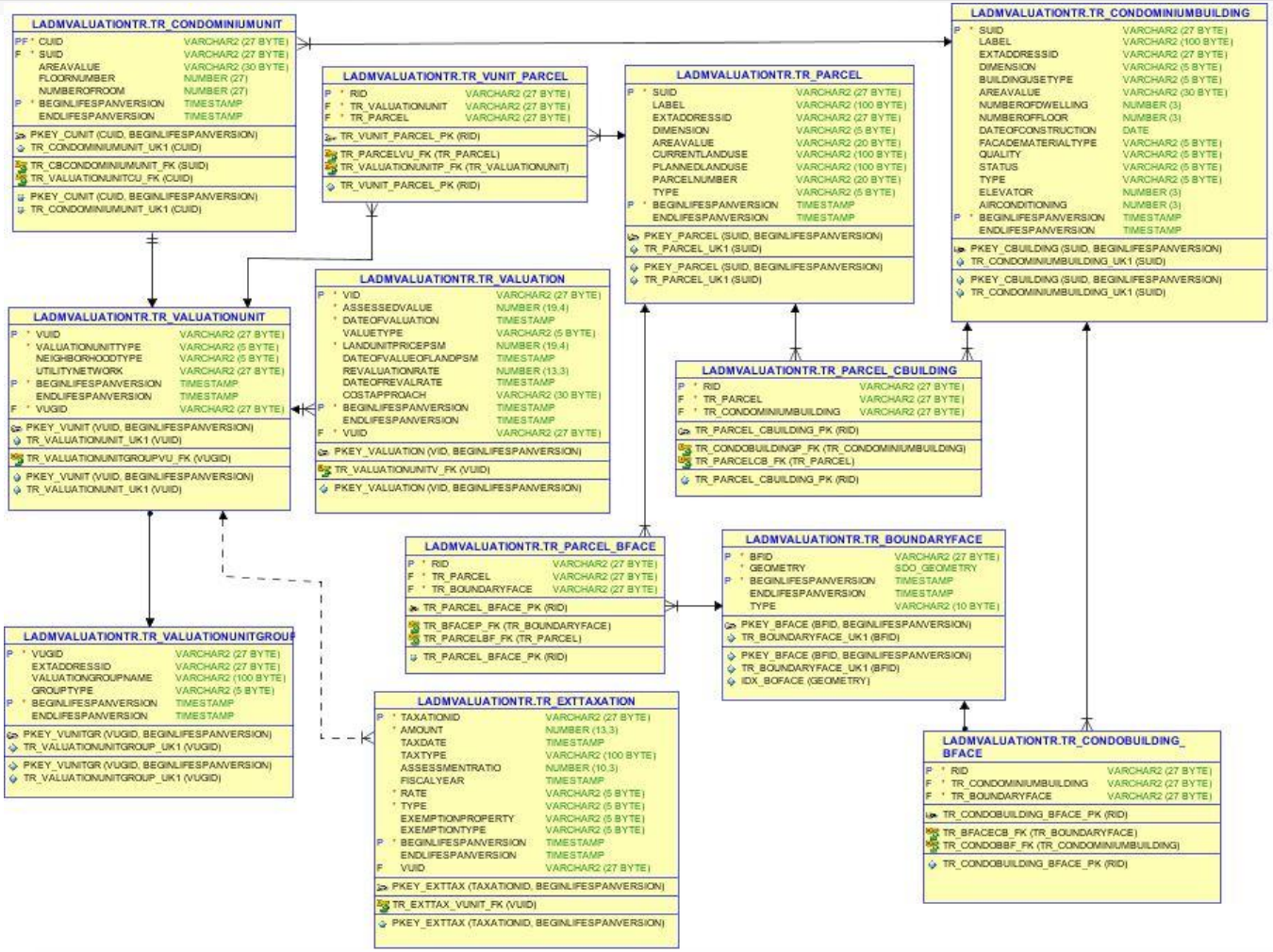
Prototype implementation of Turkey Country Profile



Classes created and populated : Turquoise

Classes that are not created: Yellow

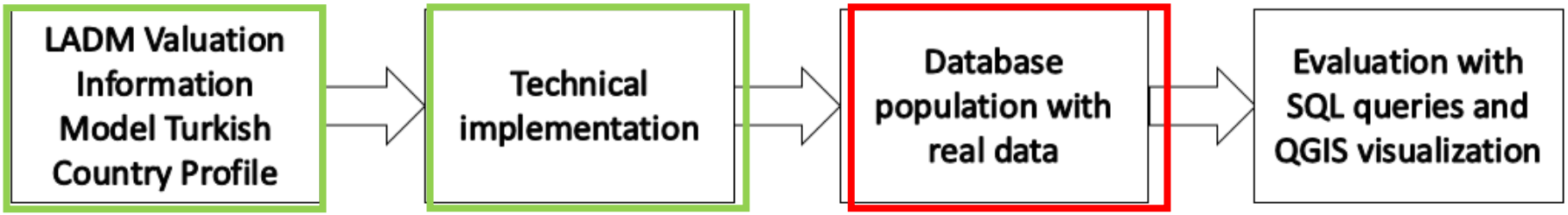
Prototype implementation of Turkey Country Profile



Oracle 11g schemas of the Turkish LADM Valuation Information Model Country Profile

- **Each table (including code lists) has beginLifeSpanVersion and endLifeSpanVersion attributes for versioning.**
- **Unique ID togerher with the beginLifeSpanVersion were specified as PK.**
- **All attributes of parent classes were inherited to child classes.**
- **Both spatial (R-tree index) and non-spatial (B-tree index) indexes were cretaed for enabling efficient queries.**

Prototype implementation of Turkey Country Profile



Fatih, İstanbul

Mamak, Ankara

	Fatih	Mamak	Total
TR_ValuationUnit	1351	49	1400
TR_Parcel	124	49	173
TR_CondominiumBuilding	125	0	125
TR_CondominiumUnit	1351	0	1351
TR_ValuationUnitGroup	43	1	44
TR_BoundaryFace	4122	49	4171

Prototype implementation of Turkey Country Profile

Loading/converting real data

```
CREATE TABLE "LADMVALUATIONTR"."TR_VALUATION" (
"VID" VARCHAR2(27) PRIMARY KEY NOT NULL ,
"ASSESSEDVALUE" NUMBER(19,4) NOT NULL ,
"DATEOFVALUATION" TIMESTAMP NOT NULL,
"VALUETYPE" VARCHAR2(5) ,
"VUNITVALUEOFLANDPSM" NUMBER(19,4) ,
"DATEOFVALUEOFLANDPSM" TIMESTAMP ,
"REVALUATIONRATE" NUMBER(13,3) ,
"DATEOFREVALRATE" TIMESTAMP ,
"COSTAPPROACH" VARCHAR2(5) ,
"BEGINLIFESPANVERSION" TIMESTAMP NOT NULL ,
"ENDLIFESPANVERSION" TIMESTAMP
);
```

```
Insert into LADMVALUATIONTR."TR_VALUATION"
(VID,VUID,ASSESSEDVALUE,
DATEOFVALUATION,VALUETYPE,LANDUNITPRICEPSM,DATEOFVALUEOF
LANDPSM,
REVALUATIONRATE,DATEOFREVALRATE,COSTAPPROACH,BEGINLIFESP
ANVERSION)
values
('val5299','22603618',32815.5969942678,'01-JAN-
2017','1',2354.55989204835,
'01-JAN-2014','0.0383','01-JAN-
2017','cp_2017_903',CURRENT_TIMESTAMP);
```

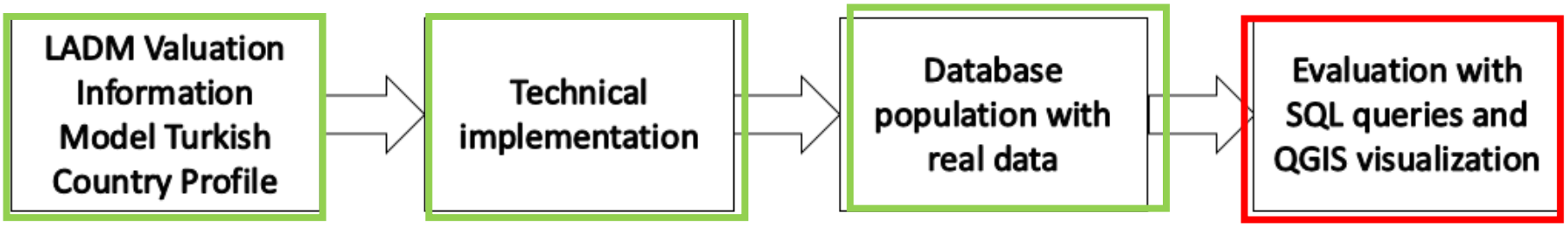
Populating database with real valuation data

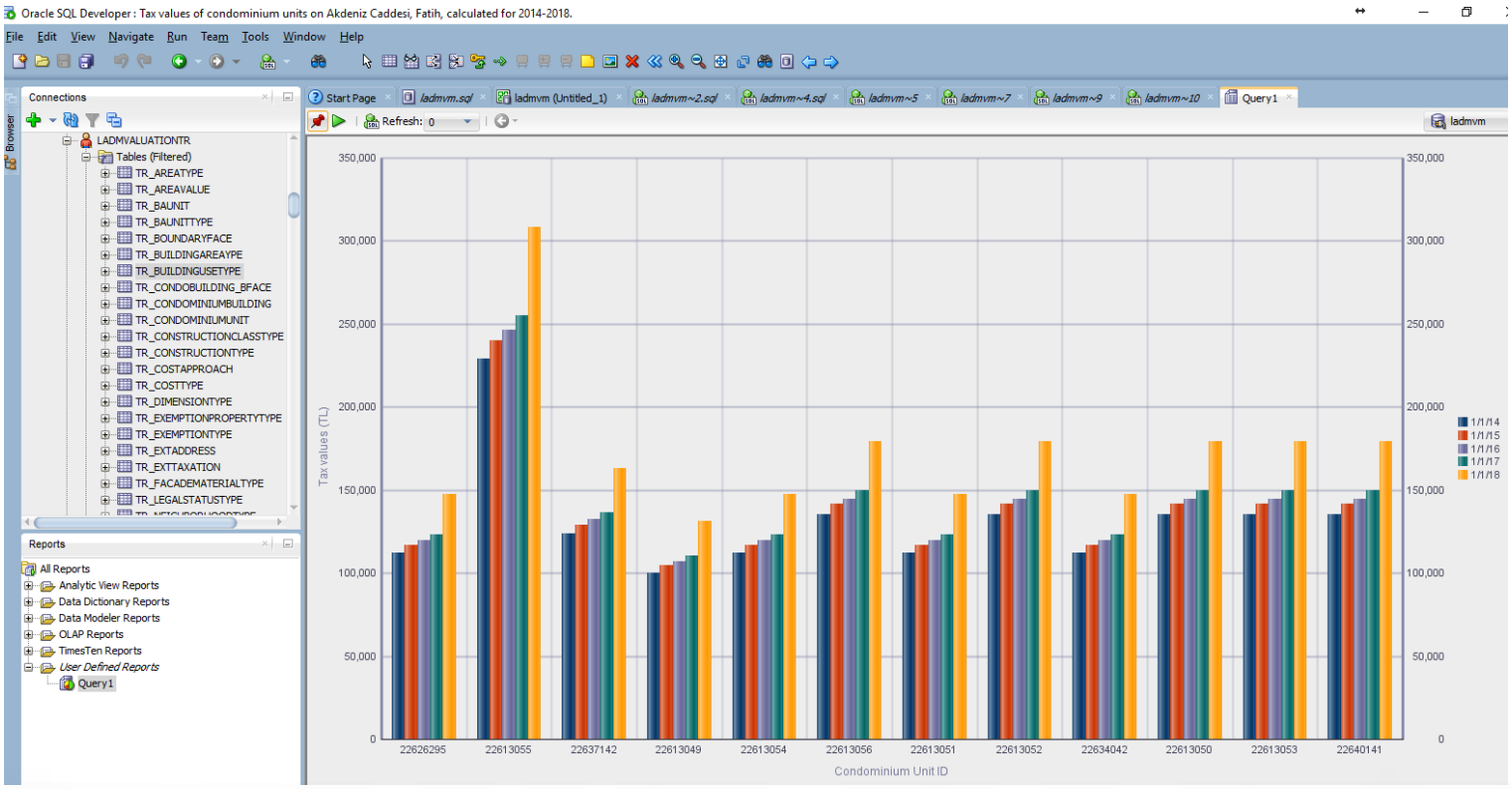
```
CREATE TABLE "LADMVALUATIONTR"."TR_BOUNDARYFACE" (
"BFID" VARCHAR2(27) PRIMARY KEY NOT NULL ,
"GEOMETRY" MDSYS.SDO_GEOMETRY ,
"BEGINLIFESPANVERSION" TIMESTAMP NOT NULL ,
"ENDLIFESPANVERSION" TIMESTAMP
);
```

```
Insert into LADMVALUATIONTR.TR_BOUNDARYFACE
(BFID,GEOMETRY,BEGINLIFESPANVERSION)
values
('24479176',
MDSYS.SDO_GEOMETRY
(
2003, 5254, NULL, MDSYS.SDO_ELEM_INFO_ARRAY(1, 1003,
1),
MDSYS.SDO_ORDINATE_ARRAY
(
413407.90756448416505009, 4542451.57615116517990828,
413413.47755162254907191, 4542451.73611651640385389,
413413.54753908480051905, 4542449.7261210847645998,
413407.95755187491886318, 4542449.5461559109389782,
413407.90756448416505009, 4542451.57615116517990828
)
),
CURRENT_TIMESTAMP);
```

Populating database with real geometry data

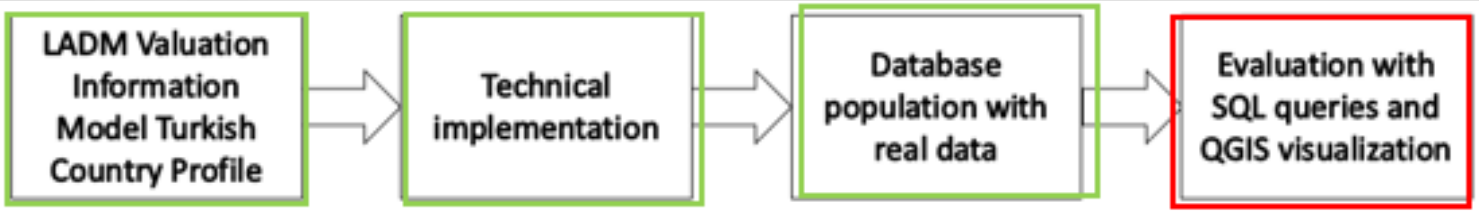
Prototype implementation of Turkey Country Profile





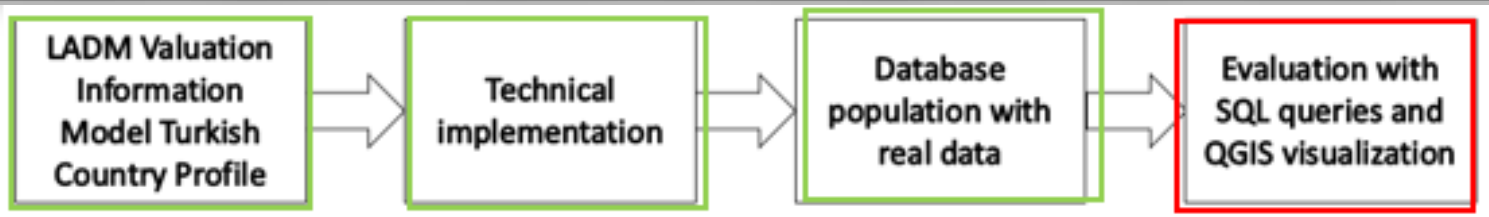
The time series of tax values of condominium units (improved properties) in Akdeniz Street, in Fatih District, İstanbul from 2014 to 2018 (via using Oracle SQL Developer).

Prototype implementation of Turkey Country Profile



The condominium building which contains the condominium unit with the highest tax amount in the selected area of Fatih District, İstanbul.

Prototype implementation of Turkey Country Profile



Unimproved urban parcels with annual tax amount in 2017 are higher than 400 Turkish Liras in the selected area of Mamak District, Ankara

Conclusions – Future works

Concluding remarks

- The flexible framework of LADM Valuation Information Model provide basis for the development of country specific data models.
- The prototype developed shows that the LADM Valuation Information Model and its Turkish Country Profile is feasible in terms of information management aspects of valuation activities.

Future works

- LADM Valuation Information Model will be tested with further valuation activities, for example, mass valuation conducted for property taxation purposes with other country profiles
- 3D aspects in proprty valuation activities should be investigated in the context of LADM Valuation Information Model.
- Officially propose (submit) to ISO TC211 as part of revised version of ISO LADM.

Questions / Comments ?