

Investigating the Conformity between the Land Administration Domain Model and the Vietnamese Land Administration System

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Key words: Land Administration Domain Model, LADM, Vietnamese Land Administration System, Vietnamese LAS

SUMMARY

LADM is the conceptual schema on land administration which is derived from Core Cadastral Domain Model. It was submitted to the International Organization for Standardization (ISO) with a desire to design and develop land administration systems (LAS) more efficiently and effectively. It is important that, if Vietnam wants to apply LADM to its LAS, the conformity between this system and LADM will be investigated.

In this paper, the similarities and differences about goals, concepts and some classes between LADM and the Vietnamese LAS are described. In Vietnam, land by law is belonging to all people with the State acting as the representative owner. It means that the citizens only have user rights on land, and therefore are qualified as "land user", but not as "land owner". However, land users can have ownership on immovable properties associated with land. Therefore, there is a clear separation between rights on the land parcel and properties associated with it. Another important issue is to determine the source of land use. Depending on the type of land use source rights, responsibilities, restrictions or financial obligations shall be different. Thus, an issue is raised as how to present these characteristics in the model.

Based on a literature review about LADM, understanding of the Vietnamese LAS, and an analysis of users' requirements, it can be seen that the adoption of LADM in Vietnam is possible. By the comparison in terms of which LADM classes can be applied directly, and which LADM classes have to be modified to be suitable in Vietnamese LAS, this paper shows the country profile for the Vietnamese LAS. Some new classes are added in the model as DC_ParcelSource, DC_Forest, and DC_PerennialsGarden. DC_ParcelSource is a subclass of DC_Source which is the description of land use source for each land parcel. DC_Forest and DC_PerennialsGarden are subclasses of DC_SpatialUnit. These results contribute to more complete land administration model in Vietnam based on LADM and to lay a foundation of modernization of the Vietnamese LAS.

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1. INTRODUCTION

Nowadays, the development of science, technology, and economy leads to changes in land management. There are many sophisticated relationships related to land to affect land use. In addition, requirements of people are getting higher and higher. Traditional cadastral systems, however, can not meet the high standards set by this development. The Commission 7 on Cadastre and Land Management of the International Federation of Surveyors (FIG) studies trends and develops visions. The term “Cadastre 2014” was coined and used widely in the world. It has been considered as a reference for management, design or improvement of cadastral systems (Kaufmann, Steudler, 1998). Continuing the development of Cadastre 2014, FIG has organized a lot of workshops and introduced the Land Administration Domain Model (LADM) to provide the conceptual schema on the land administration domain.

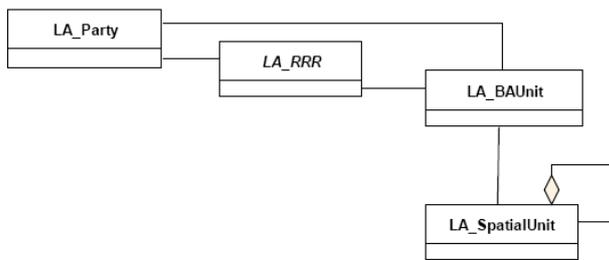
With a desire to enable land administration systems more efficiently and effectively; countries applied this model to design a country profile, such as the Netherlands, Hungary, and Japan. In Vietnam, there has been some progress in modernizing the land administration system by establishing land information system or cadastral data standards. However, to develop the land administration system, it is very important to build the land administration domain model because the conceptual model can serve as foundation to develop other systems. The main purpose of this paper is to initially research the conformity between the LADM and the Vietnamese Land Administration System, and designing a country profile for Vietnam. This paper is organized as follows:

- The LADM (Section 2),
- Vietnamese Land Administration system (Section 3),
- The similarities and differences between existing systems relevant to the Vietnamese LAS and the LADM (Section 4),
- The Vietnam country profile, based on the LADM (Section 5), and:
- Concluding remarks (Section 6).

2. THE LAND ADMINISTRATION DOMAIN MODEL (LADM)

LADM – earlier named the “Core Cadastral Domain Model” – was submitted to the International Organization for Standardization (ISO) in 2008 (Lemmen and van Oosterom,

2009). LADM provides a reference model that will serve two goals: (1) to provide an extensible basis for the development and refinement of efficient and effective land administration systems, based on a Model Driven Architecture (MDA), and (2) to enable involved parties, both within one country and between different countries, to communicate, based on the shared vocabulary (that is, an ontology) implied by the model (ISO/DIS 19152, 2011)¹. It is expressed in UML class diagrams to establish the relationship between people (LA_Party) and land (LA_BAUnit, LA_SpatialUnit) via rights, restrictions, and responsibilities (LA_RRR) (Figure 1).



There are three packages and one subpackage of the LADM, which are the Party package (land users and land managers), the Administrative package (land use rights), the Spatial package (parcels, buildings and utility networks), and the Surveying and Spatial Representing subpackage.

Figure 1. Basic classes of LADM (ISO/DIS 19152, 2011)

Each package or subpackage is a group of some classes. Many LADM classes are subclasses of VersionedObject class (Figure 2). The VersionedObject class is introduced in the LADM to manage and maintain historical data in the database. Hence, this class requests that inserted and deleted data are given a time-stamp, including begin time and end time.

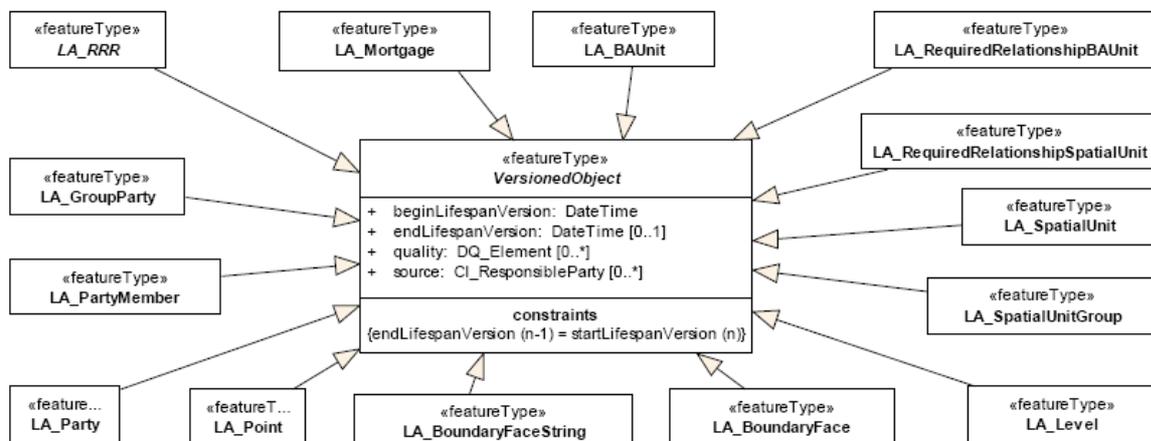


Figure 2. VersionedObject's subclasses (ISO/DIS 19152, 2011)

Apart from the VersionedObject class, LADM also provides the (authentic) source-document related to administrative activities and attributes of surveying that is called LA_Source class. LA_Source has two subclasses: LA_AdministrativeSource and LA_SpatialSource (Figure 3).

Three packages and one subpackage are described in Table 1.

¹ This concerns the Draft International Standard. An International Standard for LADM is expected to be available in July 2012

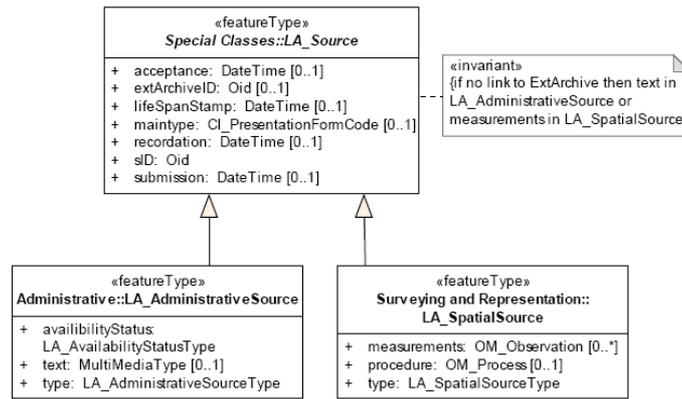


Figure 3. Class LA_Source (ISO/DIS 19152, 2011)

Table 1. The LADM packages

No.	Name	Type	Description
1	Party	Package	Refers to people such as persons, companies, groups, etc. It maintains LA_Party, LA_GroupParty and LA_PartyMember classes. A “group party” is any number of parties, e.g. a community or a household. A “party member” is a constituent of a party or group party.
2	Administrative	Package	Refers to the legal and administrative characteristics. The main classes of this package are LA_RRR (right, restriction, responsibility) and LA_BAUnit (basic administrative unit). A “right” is the permission to do something, e.g. lease or ownership. A “restriction” is the limitation to do something, e.g. it is not allowed to build in safety corridor of railway. A “responsibility” is the obligation to do something, e.g. fire prevention. A “baunit” is the set of zero or more spatial units against which (one or more) unique and homogeneous rights, restrictions, and responsibilities, e.g. an apartment unit with three spatial units (the apartment, a garage, and a laundry room)
3	Spatial Unit	Package	Refers to the legal land object. The main class is LA_SpatialUnit (an alias of this class is LA_Parcel). Spatial Units are refined into two specializations: building units (in class LA_LegalSpaceBuildingUnit) and networks (in class LA_LegalSpaceNetwork). Spatial units may be represented in text, or a single point, or a set of unstructured lines, or as a surface or as a 3D volume.
4	Surveying and Spatial Representation	Subpackage	Refers to the data acquisition (such as classical surveys, ortho-images, satellite navigation systems) and the topology representation of spatial units use boundary face strings (2D representation of boundaries of spatial units) and boundary faces (3D representation of boundaries of spatial units). The four classes of this subpackage are LA_Point, LA_SpatialSource, LA_BoundaryFaceString and LA_BoundaryFace. The individual points are instances of class LA_Point, which is associated to LA_SpatialSource.

3. VIETNAMESE LAND ADMINISTRATION SYSTEM

3.1. Characteristics of land ownership in Vietnam

In Vietnam, land belongs to all people with the State as the representative owner (Land Law, 2003). It means the owner is the State and the others are right holders or land users. However, the State shall grant land use rights to land users via the form of allocation of land, lease of land, and recognition of land use rights for persons currently using the land stably and for long term. It also regulates the rights and obligations of land users. Based on this characteristic, there is a difference between a land parcel and properties associated with land. Land users can not own their land parcels; however, they can own their buildings or gardens attached to this land. As the owner, the State shall exercise the right of disposal with respect to land as follows: decide on the land use purposes by passing decisions and by considering and approving land use zoning and land use plans; decide the quotas on allocation of land and on duration of land use; decide on allocation of land, lease of land, land recovery, and permission for conversion of land use purpose; and determine the land prices (Land Law, 2003).

3.2. Land users, land managers, land use rights, land use obligations and land use restrictions

The type of land users are stipulated in the Land Law and include: domestic organizations, households, individuals, communities, religious establishments (e.g. pagodas), foreign organizations with diplomatic functions, Vietnamese residing overseas who invest in Vietnam, foreign organizations and individuals investing in Vietnam. According to the circular about land inventories and stock-takings, land managers including organizations (the commune People's Committee, the land fund development organizations, and other organizations) and communities (Land Law, 2003).

Land users shall be granted the land use rights by the State. In general, the rights to the land could be divided into two groups, which are general rights (e.g. to be issued land use rights certificate (LURC) and to enjoy the results labor and investment in the land) and other rights, including the right to exchange, assign, lease, sub-lease, bequeath and donate a land use right; right to mortgage, guarantee and contribute capital using land use rights; and the right to be paid compensation when the State recovers land. Depending on the type of land users and the type of land use source² as well as financial contribution to the government, land users might have nine rights or less. For example, if the land users are individuals who have a LURC, they will have nine rights; whereas, if the land users are organizations having allocated land with money from the State, the numbers of rights is less than individuals because the bequeath right is not applicable for organizations.

Rights always come with obligations. Land users always have the following general obligations: using land according to the objectives, registering the land use right, and fulfilling financial obligations in accordance with law. Further there are some factors that impact to land use rights and obligations. They are land restrictions, which are land use planning, the protection of the safety corridor, restrictions on construction area, dispute, and blockade by the decision of the court.

² Land Use Source shows the role of ownership of the State. The State shall grant land use rights to land users via the form of allocation of land, lease of land, and recognition of land use rights for persons currently using the land stably.

3.3. Current condition of Land Administration system in Vietnam

With the assistance of World Bank and some developed countries especially Sweden (Swedish International Development Cooperation Agency - SIDA), Vietnam has been implementing several projects to reform, improve and modernize the land administration system, in which one of the largest projects is the Vietnam Land Administration Project - VLAP. The general target of this project is to strengthen the accessibility of every subject to land information services via the development of the completed land administration in some selected provinces of Vietnam (such as Hanoi, Hung Yen, Thai Binh, Binh Dinh and Tien Giang). Up to now, this project has been implemented in nine provinces.

Many efforts are being made to computerize the land management system. One of the progresses is the establishment of Vietnam's Cadastral data standards. Those are based on the national geographic information standards issued by Ministry of Natural Resources and Environment (MoNRE) and on the international geographic information standards series ISO 19100. The standards provisions to standardize: cadastral data content, metadata, reference system coordinates, presentation and exchange/distribution of cadastral data. The structure of cadastral data content is shown in Figure 4.

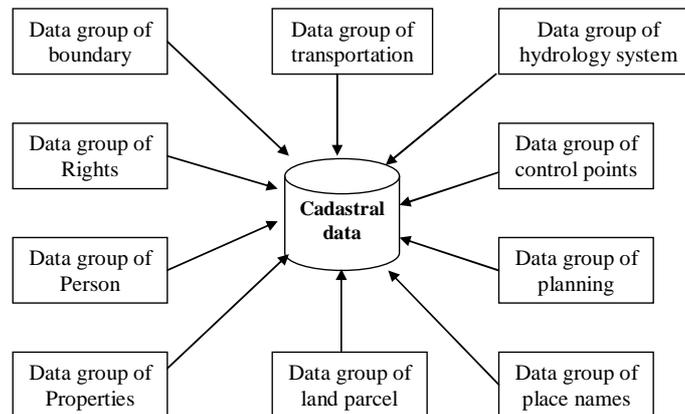


Figure 4. The structure of cadastral data content (Circular 17, MoNRE, 2010)

Based on this standard and other regulations related to cadastral data, some land information systems could be designed. Currently, there are many LISs in Vietnam: ViLIS - Vietnam Land Information System, CILIS - Land Information System of CIREN (the Information Centre of Natural Resources and Environment), and ELIS – Environment Land Information System. The software for the LIS which is called ViLIS is well known. In 2007, MoNRE issued a Decision to apply this software at the Land Registration Offices at provincial and district level for land management. Basically, the database-model in ViLIS describes the complex relationships (in terms of technique) between the land parcels and land users in many situations. But, to be widely implemented, ViLIS as well as its database needs to be improved to meet the diverse requirements of land information management.

3.4. Users' requirements for LA system in Vietnam

Analysis of users' requirements is considered the first step in system design. This section

describes the main requirements from land managers and land users in Vietnam. The two main places where data have been gathered are Thanh Xuan District, Hanoi and Tan Linh commune – Ba Vi District, Hanoi. Thanh Xuan is one of the new districts in urban area and Tan Linh is one of the mountainous communes in rural area. The ways to define the requirements are by collecting rules and regulations in the legal documents; by collecting data, reports, and complaint papers from citizens; and by interviewing cadastral officials. Asked issues are the characteristics of land management at local level, the difficulties in the management and some cases of disputes, complaints or concerns of citizens. As a result, some groups related to complaints can be defined as disputes about boundary of the land parcels; disputes about rights to bequeath; and concerns about LURCs.

The purpose of this paper is on analysis at a conceptual level; therefore, the users' requirements are integrated in the information needed to be managed.

3.4.1. Land parcel information

The basic information of land parcels is shown in Table 2. It can be seen that the attributes as land parcel identifier, area, land use, financial obligations, land prices and land restrictions can be expressed directly by using the spatial unit class, restriction class and one of the external classes in LADM. However, there is no information related to source of land use; whereas, this is the important attribute in the Vietnamese LAS. Source of land use is important for land registration, by this LURC issues, financial obligations, and duration of land use. Due to history, the change of land policies and the change of territory of administrative units, land and buildings in some areas have various sources; Thanh Xuan District is an example. Thanh Xuan District is one of the new districts that has been established since 1996, based on the merging of some communes in Dong Da District, Thanh Tri District and Tu Liem District. The documents relevant to land and houses in many communes are insufficient or empty (due to not being delivered or incomplete transfer). Hence, one of the difficulties in land registration in this district is to identify the source of land use.

In LADM, there is LA_Source class to show the administrative sources (in the Administrative package) and spatial sources (in the Surveying and Representation package). However, there is not the source for land parcel or spatial unit. Therefore, the new class related to source for land parcel would be added.

Table 2. Some basic information of land parcels

No.	Name	Description
1	Land parcel identifier	It is uniquely identified for each parcel of land. It consists of three numbers separated by a dot (MX.SB.ST). In which "MX" is the ID of commune, "SB" is the number of map that contains the land parcel and "ST" is the number of the parcel
2	Legal area	There are differences between parcel area in the map, in field and in the document. However, the legal area is the value written in the legal document which is used to calculate land use charge, land taxes or other issues.
3	Source of land use	To show the type of land use source. There are 6 types as land allocation without money; land allocation with money; land lease with payment once; land lease with annual payment; recognized land use rights from State; and lease, sub-lease land use rights of enterprises to invest in infrastructure in industrial zone.

4	Duration of land use	To define the period of land use. For example, land used on a stable and on long term basis, e.g. 20 years or 50 years depends on the type of land use, land users and source of land use.
5	Land use type	The data about land use include a code part and a description part. For example, "ONT" is the code part; and the description part is "Residential area". Land use data are recorded in cadastral files into four forms which are land use in certificates, land use according to land inventory, land use planning and detailed land use (if applicable). It can be seen that such information would enable land managers to easily recognize if the use of the land parcel is appropriate or, if not, has to be changed. For example, one parcel has type "paddy land" in the LURC, but according to land inventory, it has type "residential land". This inconsistency demonstrates that there confusion from managers or this parcel is used in improper land use.
6	Financial obligations	To show the land use money, land rent, land use tax, income tax payable on assignment of land use rights, fees and charges payable for land administration on land use. The source of land use and land transactions can have impact on financial obligations
7	Land prices	To show the value of land parcels in State price or market price. The price of parcel shall be formed by People's Committees of provinces and cities under central authority, consultancy organizations or auctions.
8	Land restrictions	Data regarding to land restrictions are provided for land parcels in some cases such as entire land parcel or part of parcel belonging to land use planning, safety corridors or restrictions about construction area

3.4.2. Person information

Data related to persons includes land users and land managers. For land users' role, there are six types of land users as community; household; husband-wife; individual, organization and group. For land managers' role, there are two types as community and organization. The basic information about person needed in record is shown in Table 3.

Table 3. The basic information about person

No.	Type	Information
1	Individual, Husband-wife	Name, date of birth, gender, people's ID from identification card, date of issue of ID card, place issued, passport, date and place of issue of passport, nationality, permanent address
2	Household	The head of household, husband/wife, members, permanent address
3	Organization	Name, type of organization, the representative, number, date and type of decision to establish the organization, address
4	Community	Name, the representative, address
5	Group	The representative, members

In LADM, the Party package can show the data related to a person. Moreover, LA_AdministrativeSource class in Administrative package can show the legal information about party because there is a relationship between LA_AdministrativeSource and LA_Party. Therefore, this basic information above could be satisfied.

3.4.3. Properties associated with land

Data on properties associated with land consist of houses, technical infrastructure buildings, other buildings, forest and perennials. In order to get this information in the system, land users

have to register any change.

In LADM, `LegalSpaceBuildingUnit` and `LegalSpaceUtilityNetwork` which are the subclasses of `SpatialUnit` class can describe the houses and construction buildings. However, there is no information related to forest and perennials. Therefore, it should be added the new classes to represent this characteristic.

3.4.4. Land Use Right Certificate (LURC) information

A LURC shall be issued for the land parcel that has full conditions for certification. It is one of the most important legal documents to protect the benefit of land users and to ensure the land transactions. In the Vietnamese land administration there exist a lot of certificates, e.g. certificate on land parcel and houses, certificate on buildings (such as LURC based on Land Law 1993, LURC based on Land Law 2003); certificate of houses ownership and certificate of construction building ownership. To unify one certification form for convenient land management, a new certificate of land use rights, ownership of houses and other properties associated with land is given under the Decree 88/2009/NĐ-CP. The contents of the certificate including: land users and owners of houses and other assets associated with land; land parcels; plots of land parcels, houses and other assets associated; the changes after issued certificate (The government of socialist republic of Vietnam, 2009).

Data on LURC for each parcel consist of “Identification of certificate” and “Input number in certificate record”. LURC is a kind of title. Hence, this requirement could be satisfied in `AdministrativeSource` class in LADM because `AdministrativeSource` is the class of `LA_Source` which supplies the legal information of document.

3.4.5. Surveying and map information

Surveying and map information includes information on the basis of surveying and on the control points. Before 2000, the national coordinate system in Vietnam was HN-72 established on Ellipsoid Krasovski 1940 and Gauss projection. Since 2000, the VN-2000 coordinate system is in use, with Ellipsoid WGS-84 and UTM (Universal Transverse Mercator) projection. Up to now, these two systems existed although there is a decision to use VN-2000 uniformly in the country. Moreover, some maps are established in simulated coordinate systems. The inconsistency in coordinate systems leads to difficulties in analyzing and sharing data. In cadastral data, the information about coordinate system is very necessary in order to transform into the unified system. Apart from the coordinate system, data on the method of surveying, scale of map, name of mapping agency and inspection agency are also important.

Tan Linh is a commune in Ba Vi district, in Hanoi city with an area of 2773.23 ha. The commune is in mountainous area. Maps for land management in Tan Linh particularly and Ba Vi generally are incomplete. These maps have been measured in 1987 in the local coordinate system, including 48 sheets at scale 1:1000. During 24 years, although there are a lot of land use changes, these maps have not been updated. However, these maps still are important documents to serve LURC issuance. Consequently, there are disputes and confusion about land use boundaries, triggering difficulties in land management, especially in LURC issuance.

The control points are one of the objects that are represented on cadastral map. There are some relevant attributes such as the identifier, level and type of point, and coordinate values in the national coordinate system. According to accuracy, there are five level (order) types in national points such as level 0 (GPS network), level 1, level 2, level 3 and level 4. There are two level types of cadastral points: level 1 and level 2.

In LADM, LA_Point class presents attributes really sufficiently. This class can show information not only on control points but also general points. Hence, these requirements can be met.

4. THE SIMILARITIES AND DIFFERENCES BETWEEN EXISTING SYSTEMS RELEVANT TO VIETNAMESE LAS AND LADM

Based on the analysis of the characteristics of the Vietnamese LAS and LADM, some comments on the similarities and differences will be presented here.

In terms of the goals, the Vietnamese LAS has been improved gradually to serve requirements supporting a modern economic-social development. Moreover, the unity, the connection between the local government and the levels of the land management system, is a desire in Vietnamese LAS. Therefore, the goals of LADM are completely consistent with LA in Vietnam.

In terms of the concepts, there is the similarity in the nature of the relationship between people and spatial units via rights, responsibilities, and restrictions. The regulations in land law, the content of the cadastral data standard as well as land information systems also would like to express this relationship by their language. Apart from the similarity about this relationship, LADM and Vietnamese LAS have the same concepts of objects or classes related to land. For example, the explanations of the “party” means people, land users and land managers; “spatial unit” means land parcels and other properties associated with land; “right” means land use rights; and “surveying” means control points. Basically, the core elements of cadastre which are people, land parcels, and legal relationships can be represented by using packages, classes, attributes, and types of relationships in LADM. The differences are often the attributes of classes and types in the code lists. Therefore, depending on the characteristics of Vietnamese LAS, the classes and attributes can be applied directly; there will be some changes in each package or class such as some new classes, new attributes, or types in the code lists.

5. THE VIETNAM COUNTRY PROFILE, BASED ON LADM

Based on the LADM and the requirements in Vietnamese LAS as described in Section 3, this section shows the country profile of Vietnam. However, this profile is based on LADM and only adds some new classes, new attributes and new types in code list (to differentiate LADM in Vietnam from other models, their names are given with DC_ as prefix).

5.1. Party package

The party package presents land users and land managers. The content of this package and the code lists are shown in Figure 5. In general, the classes and attributes as well as relationships between classes in the Party package are also inherited from LADM. However, the code lists

of party type, group party type and party role type add some new types that are specific for Vietnam LAS.

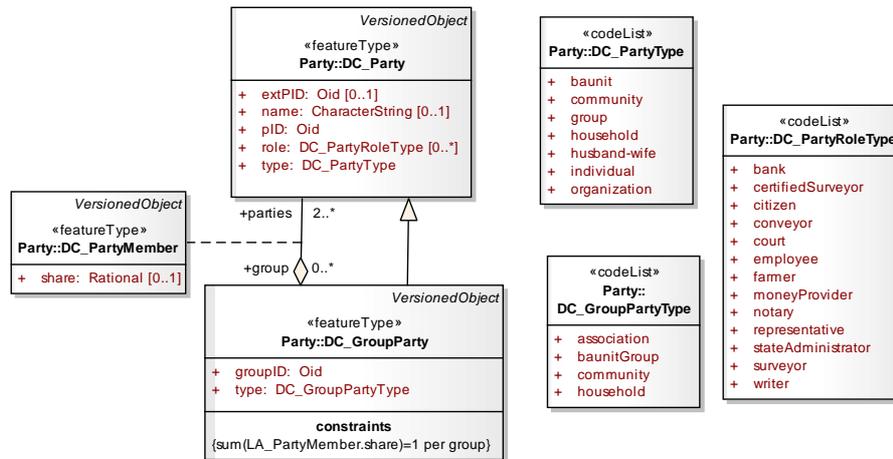


Figure 5. Content of the Party package and code lists

5.2. Administrative Package

The administrative package mentions about rights, responsibilities, restrictions and administrative characteristics in land use. Figure 6 depicts the classes and code lists in this package. Attributes and relationships are similar to LADM; however, the types in the code lists have been added and changed to suit to the Vietnamese conditions.

5.3. Spatial Unit package

The spatial unit package presents the attributes of the land parcels, buildings and other properties associated with land. According to the analysis of users' requirements in Section 3, some attributes related to the land parcel should be added: land use type, status land use, source of land use, duration of land use, land price, basis of land evaluation. Among these attributes, "source of land use" may be considered more important than others. It shows the impact of ownership of the State. It has consequences on the duration of land use, rights, restrictions and financial obligations. For example, there are two land residential parcels with two different sources. Parcel 1 is allocated with money, and parcel 2 is leased from the State. Obviously, parcel 1 shall have rights of land use for an individual such as transfer, mortgage, or bequeath; whereas parcel 2 can not be transferred or bequeathed. Moreover, parcel 1 shall be used in stable way long term; where, parcel 2 only is used in definite duration. In addition, "source of land use" is also the necessary information for the LURC. To sum up, "source of land use" is an important legal attribute of the land parcel which should be presented in the model. Besides this the attribute "basis of land evaluation" is the attribute related to legality of the land price. Hence, this research proposes a new class called DC_ParcelSource to show the legal properties related to the land parcel. DC_ParcelSource is also the subclass in DC_Source (similar LA_Source in LADM). DC_Source would also contain the DC_AdministrativeSource and DC_SpatialSource. Figure 7 shows the specialization class DC_ParcelSource of the class DC_Source.

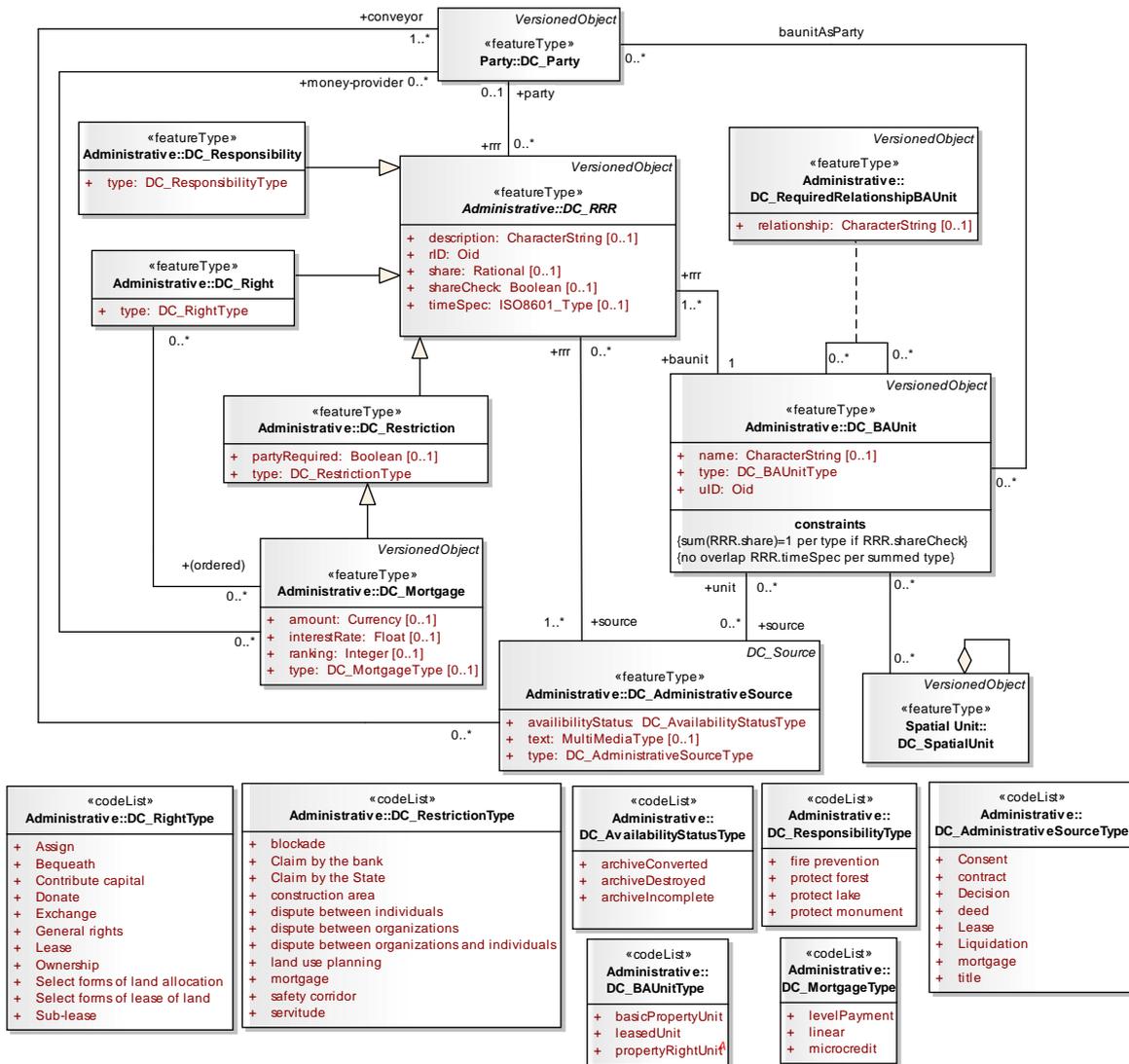


Figure 6. Content of Administrative package

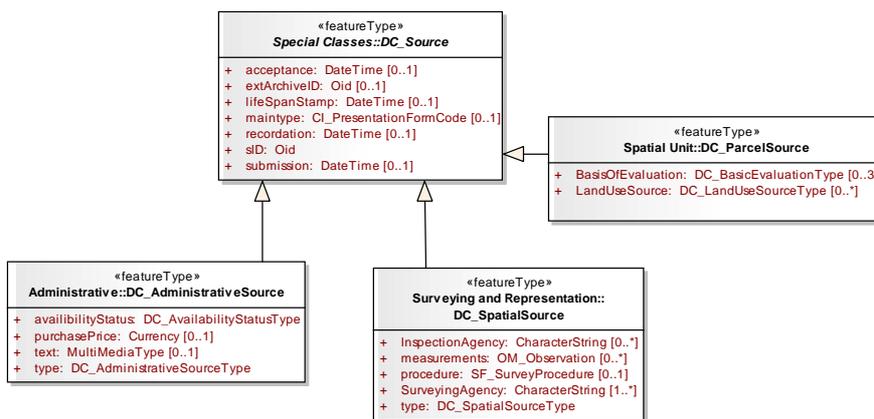


Figure 7. Structure of DC_Source

boundary string or boundary face. Its attributes are mostly inherited from LA_Point in LADM. However, there is a new attribute as Point level (to show the level of point according to the accuracy) and the specific value of coordinates in X, Y, Z axis.

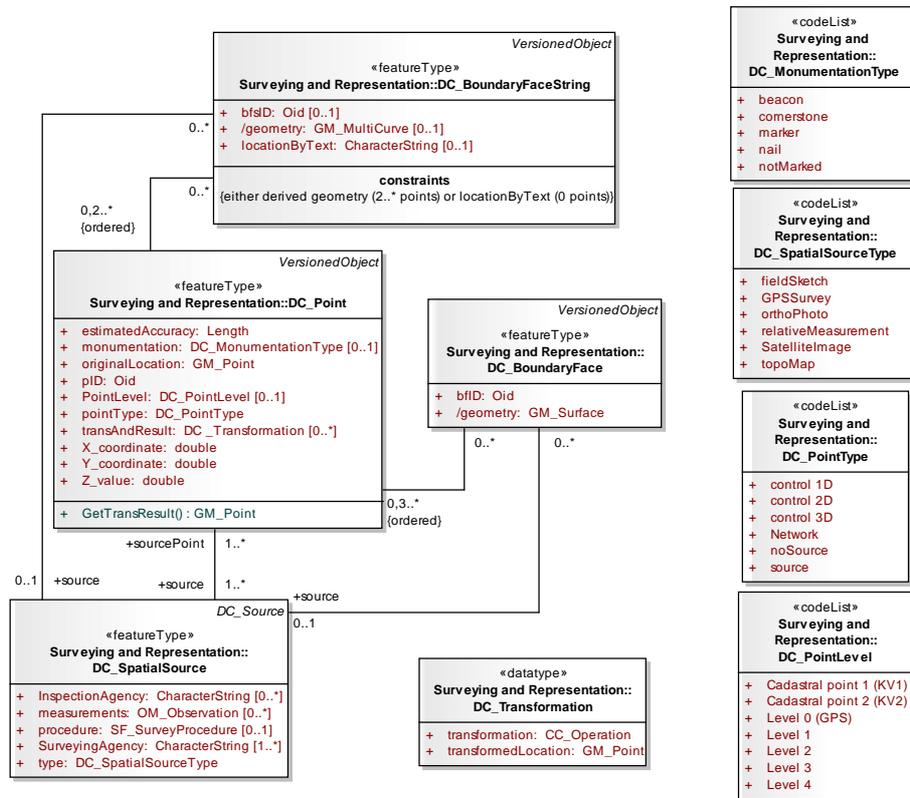


Figure 9. Content of Surveying and Representation Subpackage

6. CONCLUSION

LADM provides the general conceptual schemas for land administration in turn to lay a foundation for the establishment of a land data infrastructure. There are several countries that apply LADM to establish a country profile for their land administration system. Hence, this research is considered as the initial research to find out the conformity between LADM and Vietnamese LAS. A comparison of Vietnamese LAS with LADM classes indicated that LADM can be used as the reference model for the development of the Vietnamese LAS. The basic similarities are the conformity of the goals to forward the modern land administration system and to link other (authentic) systems as well as other countries; and the similarity of the main relationship between land users and land parcels via RRRs.

Because each country has specific characteristics of its land administration system, the country profile should show these. In Vietnam, land belongs to all people with the State as the representative owner. It means that land parcels can only be used; however, properties associated with land can be owned. Therefore, the Vietnam profile should express the role of the State as owner and the relative separation between land and assets associated with land

such as houses, buildings, forest and perennial garden. One of the tools to show the ownership of the State is that the State can grant land use rights to land users via different forms, like allocation of land, lease of land, and recognition of land use rights for persons currently using the land in a stable way for a long term. This is considered to be the source of the land parcel. This source is very important to define the rights, responsibilities, restrictions, financial obligations, duration of the land use, and LURC issuance. In LADM, there is the LA_Source class which is to show the legal document related to administration, party and spatial representation. However, there is no class to present the source of land parcels or spatial units in an explicit way. Hence, in the Vietnam profile, this research proposes the new class called DC_ParcelSource which is a subclass of DC_Source. This class contains not only the attributes related to source of land use of parcels, but also those related to legality of each parcel as basis of land evaluation. Moreover, to present the properties associated with land more complete; this research also adds two new classes, which are DC_Forest and DC_PerennialGarden. They are subclasses of DC_SpatialUnit.

In conclusion, the adoption of LADM in Vietnam is possible. In the further steps, land managers in Vietnam should conduct some projects to implement and validate LADM in Vietnam.

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