DESIGN AND DEVELOPMENT OF LADM-BASED CADASTRAL DATA MODEL: A CASE OF MONGOLIAN CADASTRE

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■ **Background**

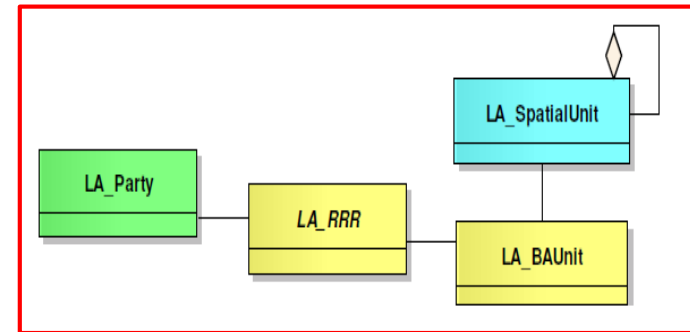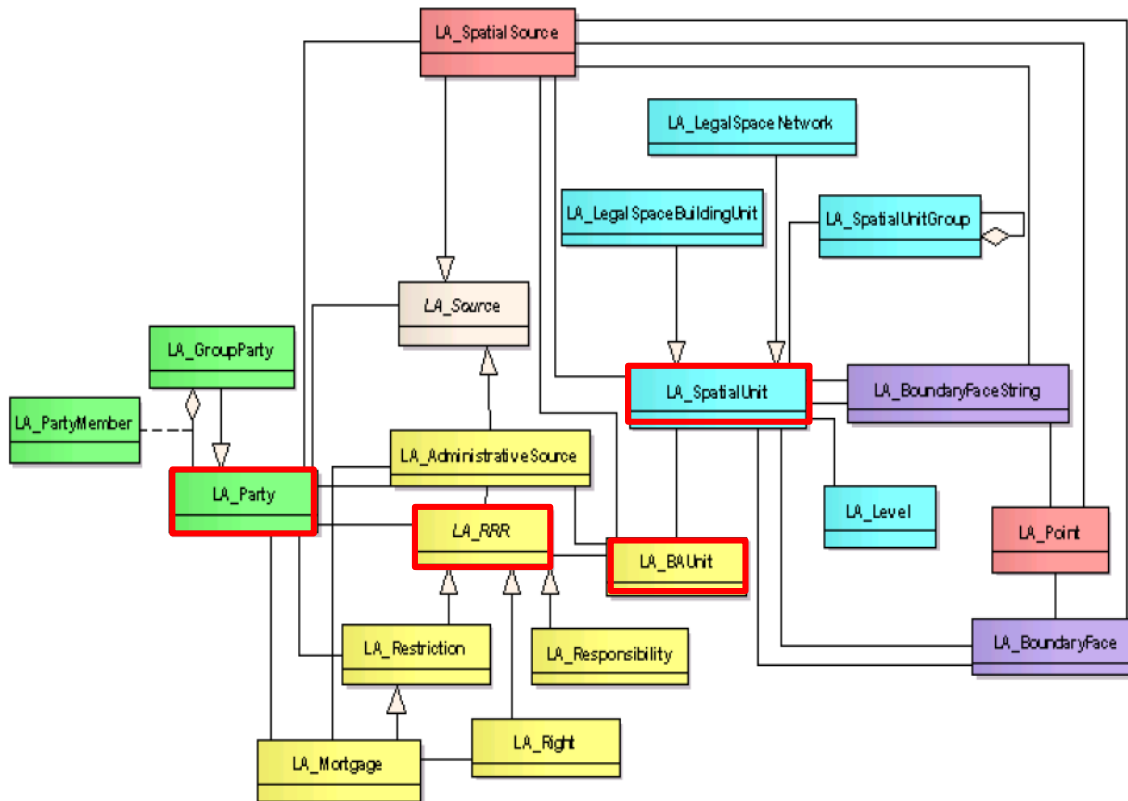- ISO established "ISO 19152 : Land Administration Domain Model(LADM)" international standard later in 2012
- LADM aims for modeling cadastral and land administration information for the purpose of providing a common vocabulary(ontology) and efficient system development
- Recently LADM second edition was submitted as a fiscal/valuation extension module

LADM Version 0.1
September, 2002, OGC, The Netherlands.

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LADM Version 0.3
September, 2003, Core Cadastral Domain Model, Digital Earth, Czech Republic

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LADM Version 1.0
October, 2006, CCDM 1.0, FIG, Munich

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LADM (ISO 19152)
May, 2012, ISO/TC 211, Norway

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LADM Edition II
2018년, ISO/OGC, New Work Item Proposal (NWIP)

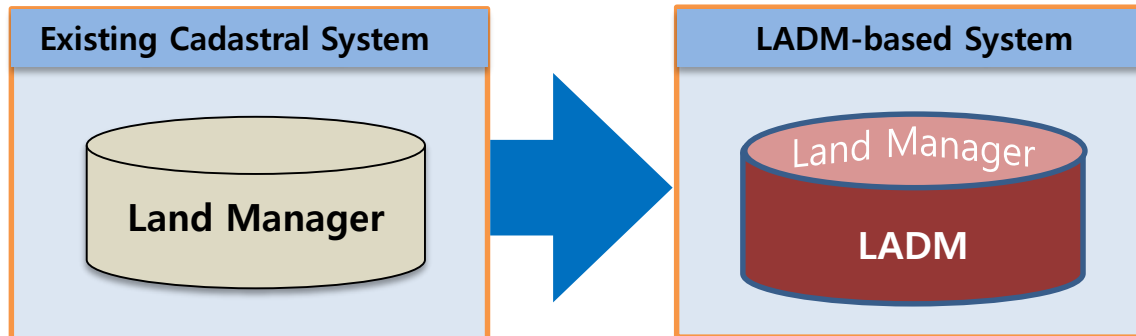**KICT** KOREA INSTITUTE of CIVIL ENGINEERING and BUILDING TECHNOLOGY

▪ Background

- LADM(ISO 19152) has 3 main packages namely Party, Administrative, Spatial Unit and one subpackage Surveying and Representation
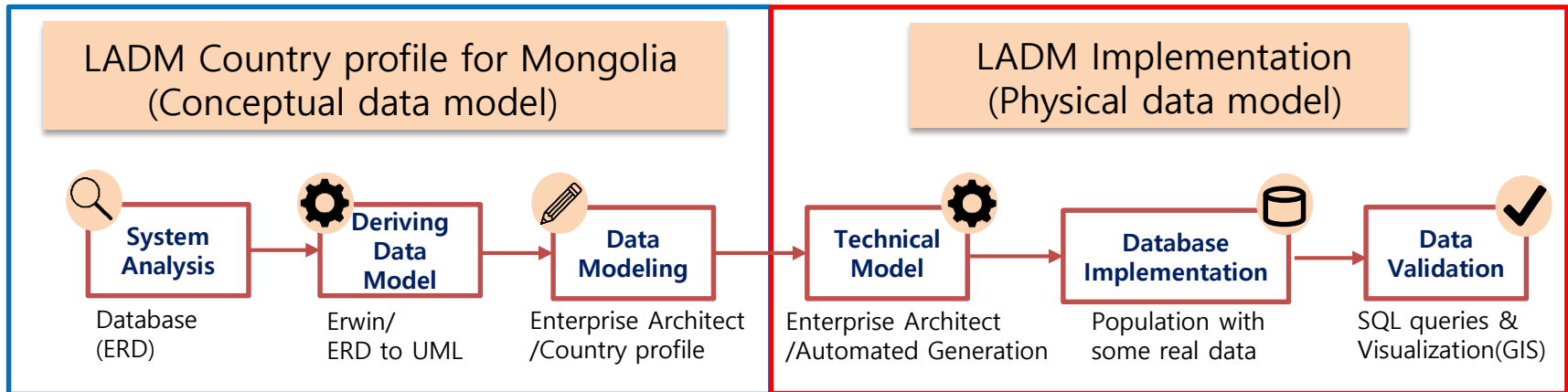- Core classes of LADM are LA_Party, LA_RRR, LA_BAUnit, LA_SpatialUnit

Study Purpose

- LADM was reviewed by many countries considering adoption

- Reviewing the possibility of adopting the LADM is essential for Mongolia

- **Study proposes to review possibility of adopting the LADM for Mongolian cadastral system "Land Manager"**

Existing Cadastral System	LADM-based System
Land Manager	Land Manager **LADM**

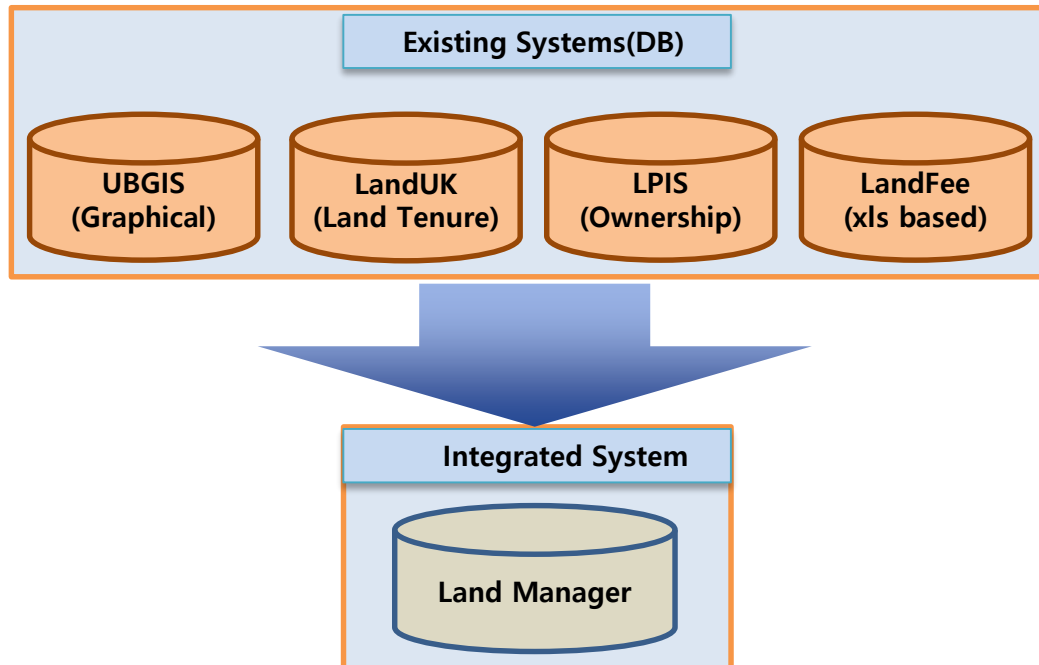- **Conceptual to technical model implementation**

    - First step is deriving current cadastral data model(UML class)

    - Second step is a mapping of the current cadastral classes to the corresponding LADM classes

    - Third step is completing LADM Country profile as a first step towards Implementation

LADM Country profile for Mongolia (Conceptual data model)			LADM Implementation (Physical data model)		
System Analysis	Deriving Data Model	Data Modeling	Technical Model	Database Implementation	Data Validation
Database (ERD)	Erwin/ ERD to UML	Enterprise Architect /Country profile	Enterprise Architect /Automated Generation	Population with some real data	SQL queries & Visualization(GIS)

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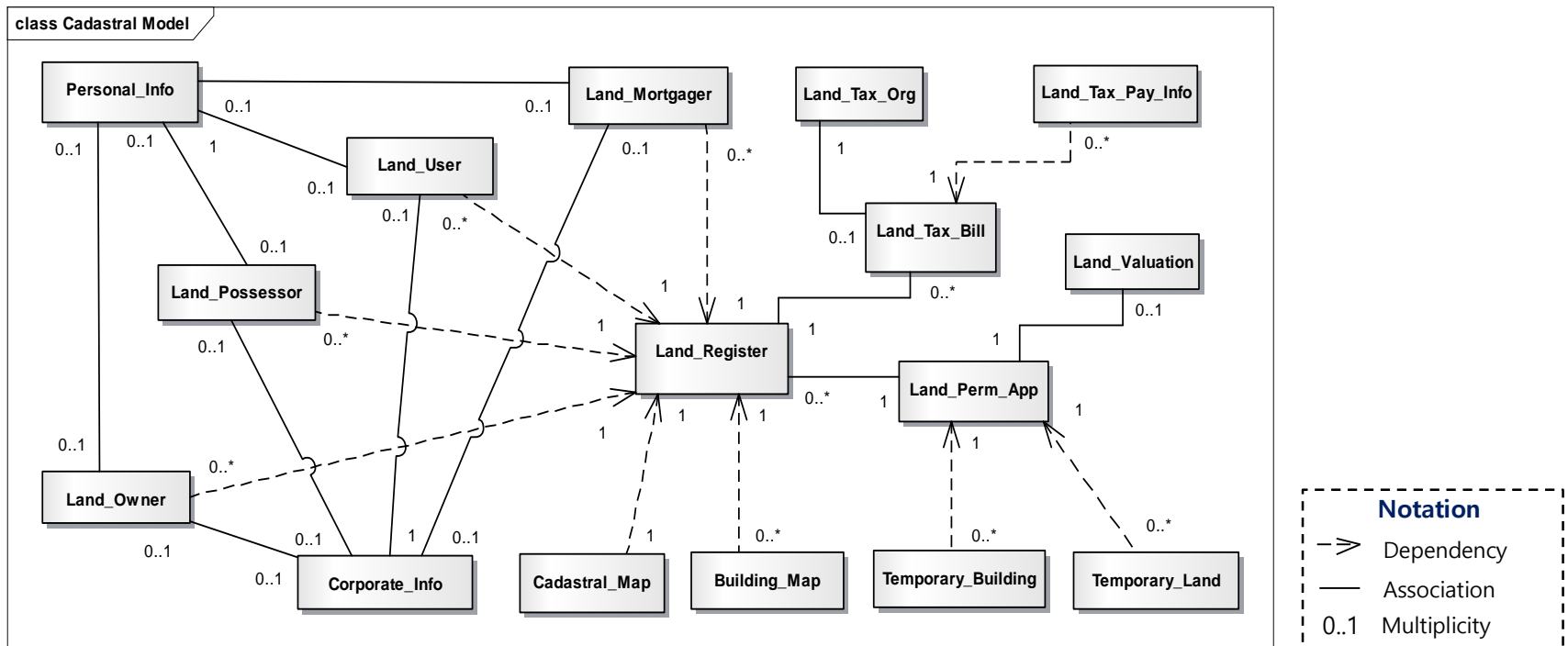
Current cadastral system

- Mongolia pursues a cadastral system supporting both legal(e.g. land tenure) and fiscal purposes(e.g. taxation) for multipurpose cadastre

- Four exsisting systems were integrated into a system "Land Manager" cadastral system in 2013

Existing Systems(DB)

| UBGIS (Graphical) | LandUK (Land Tenure) | LPIS (Ownership) | LandFee (xls based) |

Integrated System

Land Manager

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Current cadastral system core data model(UML)

- Core classes are Land Register, Land Permission Application and Land Tax Bill

- Land Register is for registered or permitted land based on an application
- Land Permission Application is for permission of land registration
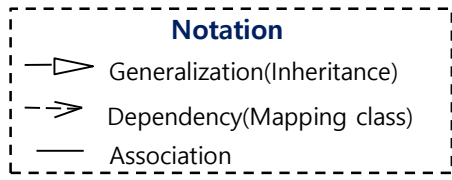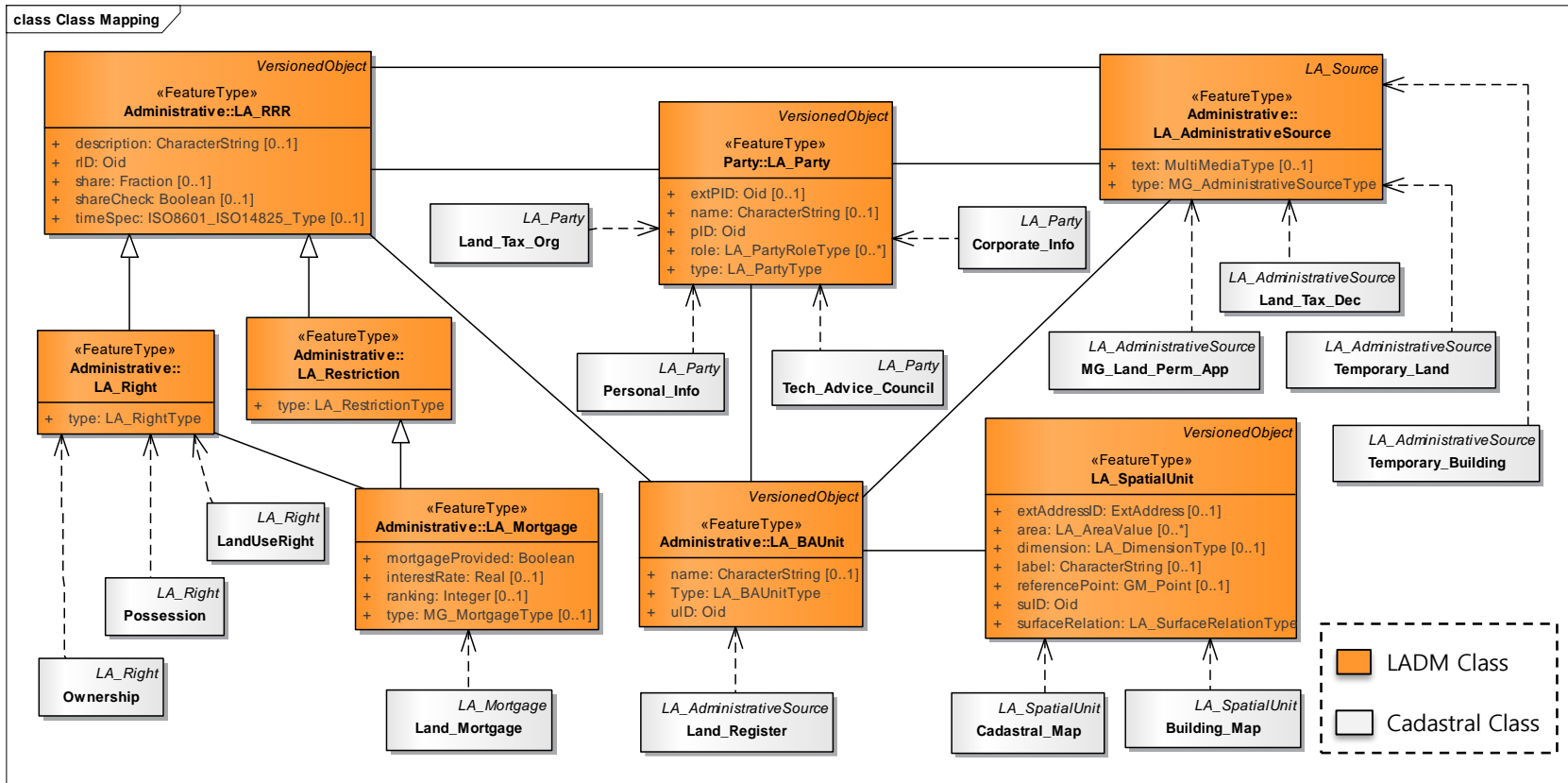- Land Tax Bill is for taxation on registered/permitted land

class Cadastral Model

Mapping of cadastral classes to the LADM classes

- LADM classes and corresponding cadastral classes

LADM	Cadastral class
Party Package	
LA_Party	Personal_Info, Corporate_Info, Tech_Advice_Council, Land_Tax_Org
Administrative Package	
LA_Right	Land_Owner, Land_Possessor, Land_User
LA_Restriction	Land_Mortgagor
LA_BAUnit	Land_Register
LA_AdministrativeSource	Land_Perm_App, Land_Tax_Dec, Temporary_Land, Temporary_Building
Spatial Unit Package	
LA_SpatialUnit	Cadastral_Map, Building_Map

LADM Country profile based on mapping

- Mapping of each data model produces LADM Country profile for Mongolia

LADM Country profile Implementation

- Transformation from conceptual to technical model

  - Party package implementation example(<u>Left side</u> : Physical model, <u>Right side</u> : SQL code)

▪ **Conclusion of the study is as follows**

- Based on the analysis of the current cadastral system data model was derived and converted to UML class

- Cadastral classes were compared to the LADM classes based on the corresponding classes

- LADM country profile was completed based on the mapping process

- LADM is applicable to the Mongolian cadastre so that LADM country profile is conformant with Level 1(low level)(ISO, 19152, Annex A)

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■ **Future work of this study is as follows**

- To increase awareness and necessity of adopting the LADM and study results some survey should be conducted to cadastral authority of Mongolia(ALAGaC) or other related agencies

- Further modeling of surveying and representation subpackage

- Implementation of the proposed data model with a real data prototype

- "LADM II" fiscal/valuation extension module application should be reviewed based on the country profile

- 3D cadastral data model and other standards such as InfraLand(InfraGML), LandXML–RRR should be considered with the country profile

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- **Detailed explanations can be referred to the following link**

  - "Development of LADM-based Cadastral Data Model : Focused on Mongolian Cadastral System" (Ph.D Thesis in Korean)
    http://www.riss.kr/search/detail/DetailView.do?p_mat_type=be54d9b8bc7cdb09&control_no=6abd77de5ae5a656ffe0bdc3ef48d419

  - "A Study on the Design of LADM-based Cadastral Data Model for Mongolia
    https://www.researchgate.net/publication/329935967_A_Study_on_the_Design_of_LADM-based_Cadastral_Data_Model_for_Mongolia_LADM

  - "A Study on Country Profile of Land Administration Domain Model for Mongolia(In Korean)"
    https://www.researchgate.net/publication/326504349_A_Study_on_Country_Profile_of_Land_Administration_Domain_Model_for_Mongolia

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Thank you

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