Towards Sustainable Land Governance: Extending the LADM to Support Global Initiatives Parameters - A Case Study in Indonesia

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3D Land Administration

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Presentation Overview

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02 Research Problem & Aim

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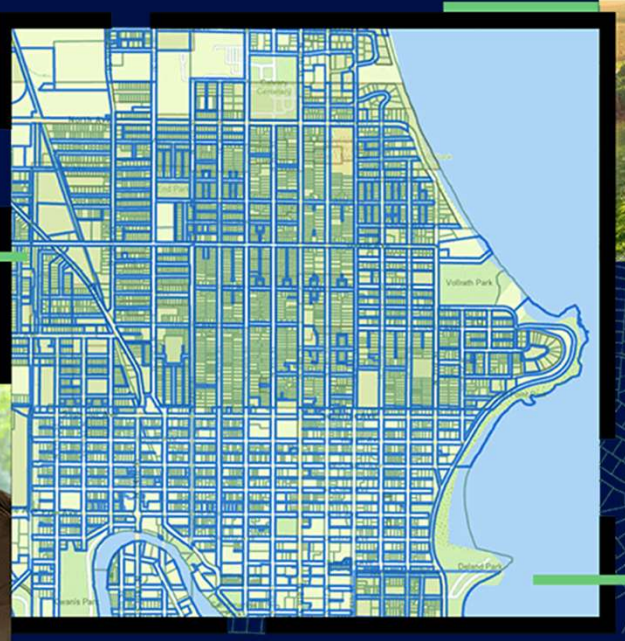
Land Is Important



- The ultimate resource
- The primary factor of production
- Foundation of Economic
- Integrity of each country related to Land-Human relation

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Land Administration Systems (LASs) are the basis for recording the complex range of rights, restrictions, and responsibilities (RRRs) related to people, policies, and places

Land Administration Systems

- Land Use
- Land Tenure
- Land Valuation
- Land Development

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Land Matters In SDGs

Transforming our world, Leave no one behind

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Investigating Global Initiatives

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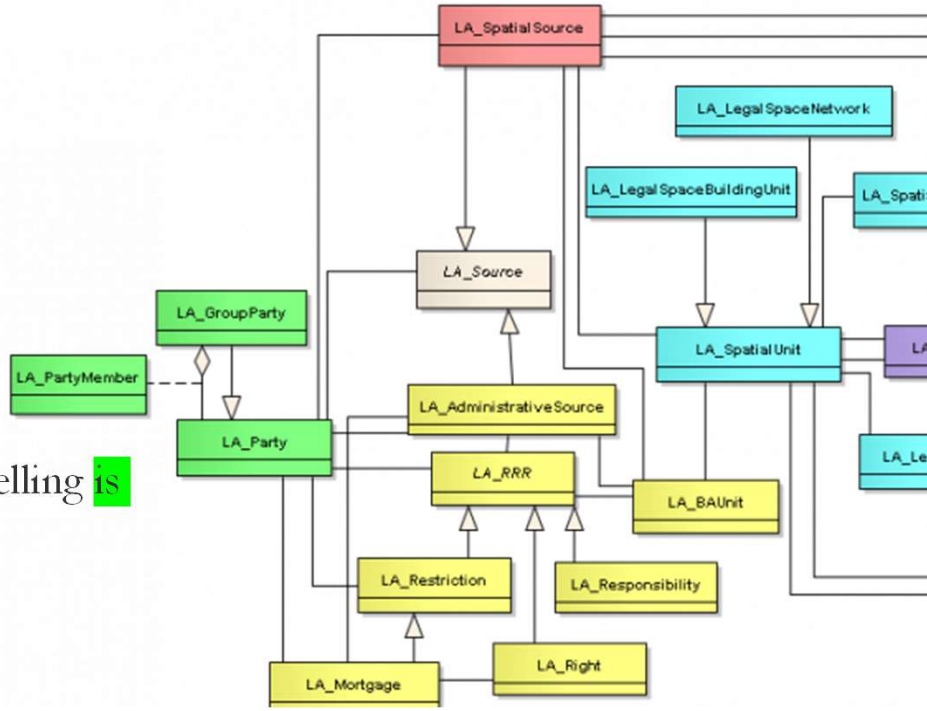
Empowering Modernization by Modifying Data Models



- To achieve a modern land administration, cadastral data modelling is a basic step toward efficient service delivery, because data are defined in the context of business processes
- Data models are essential for data validation and integration
- However, some modifications to existing data models could potentially improve their capacity to deliver sustainability

Kalantari, M., et al. A new vision on cadastral data models. in FIG Congress Proceedings, Munich, Germany. 2006.

Research Problem

The current design and development of Land Administration Systems require modification to align with land related global initiatives. Despite the recognized need for LAS advancements, existing research lacks comprehensive integration of global initiative parameters into LAS data models, especially within ISO standards like LADM.

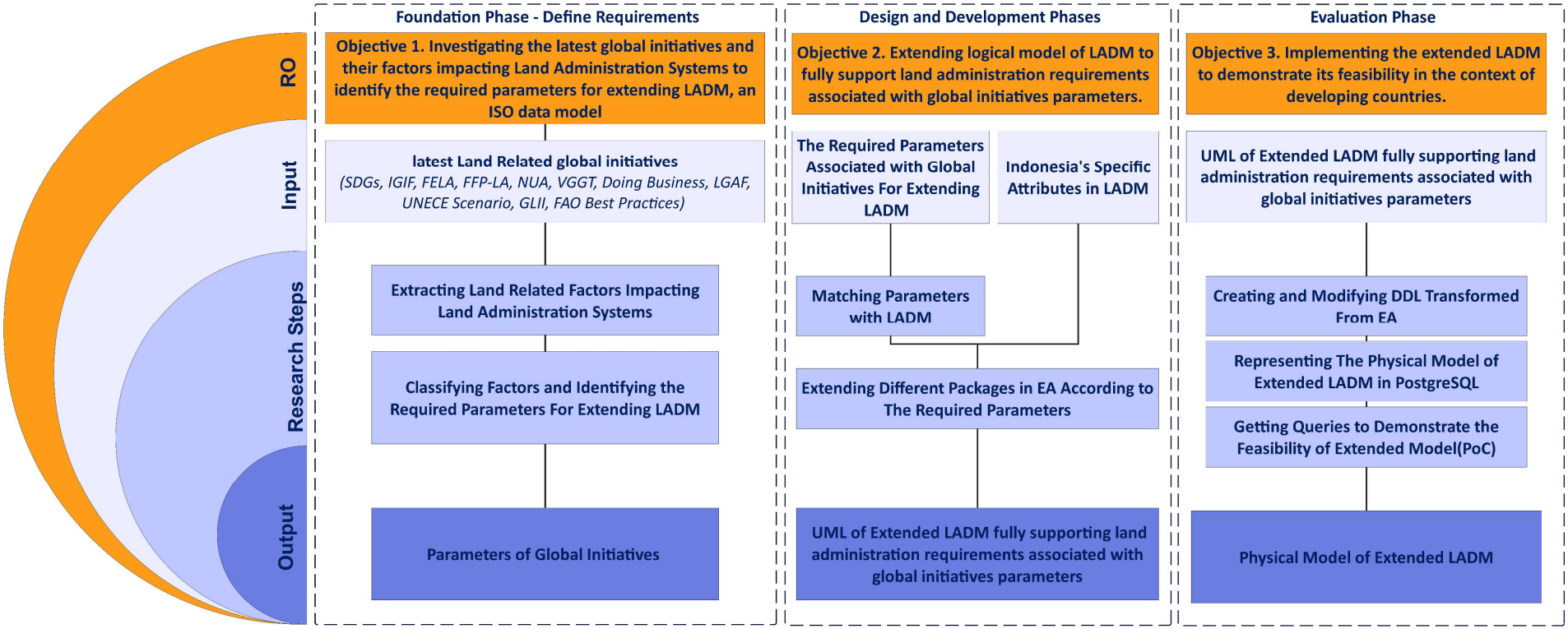
Research Aim

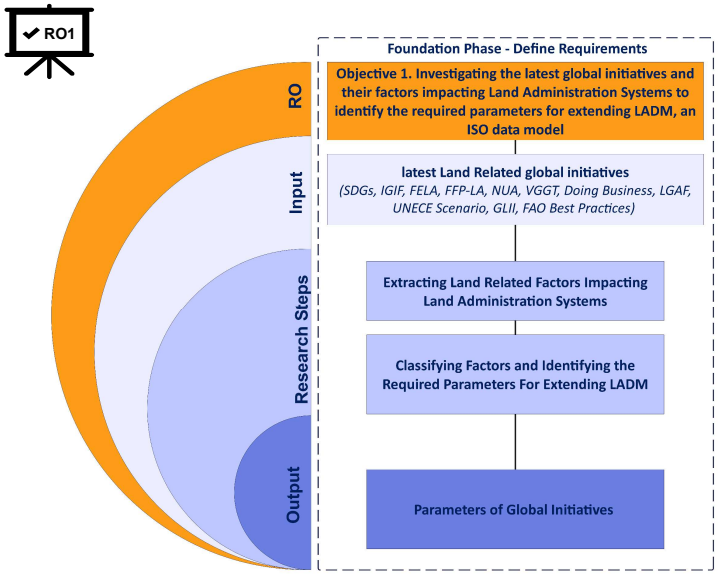
This research aims to bridge this gap by examining how global initiative parameters can be integrated into the LADM to align with contemporary trends. Unlike previous studies focusing on singular trends or parameters, this research takes a holistic approach, aiming to extend the LADM to collectively address multiple aspects and align with global initiatives.

Research Objectives

Research Objective 1	To investigate the global initiatives and factors impacting Land Administration Systems to identify the parameters for extending LADM, an ISO data model
Research Objective 2	To extend the logical model of LADM to support land administration requirements associated with global initiatives parameters
Research Objective 3	To implement and assess the feasibility of the extended LADM in addressing and incorporating global land administration parameters

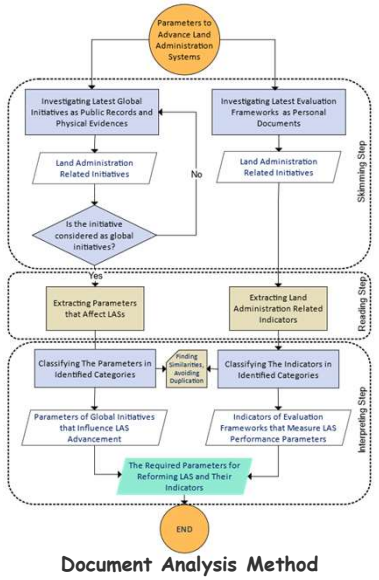
Design Science Research Methodology





RO1

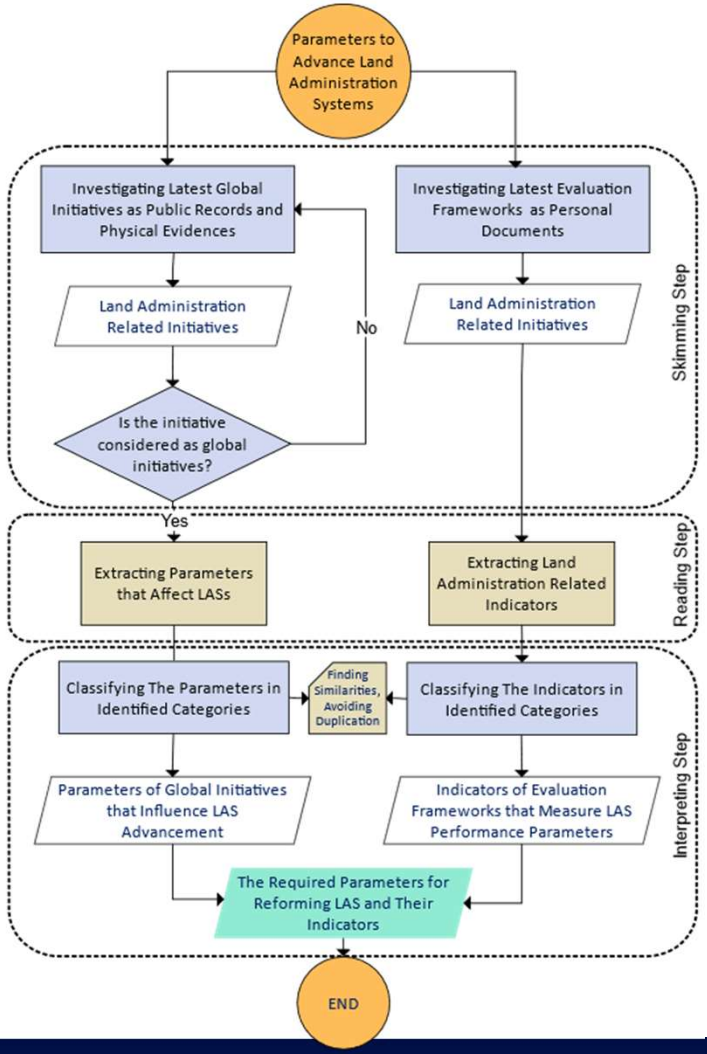
To investigate the global initiatives and factors impacting Land Administration Systems to identify the parameters for extending LADM, an ISO data model



Document Analysis Method

RO1

Document Analysis Method



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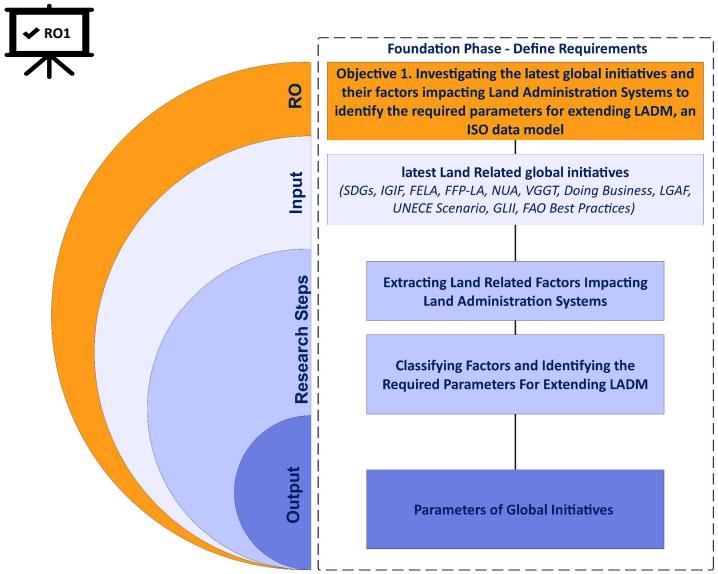

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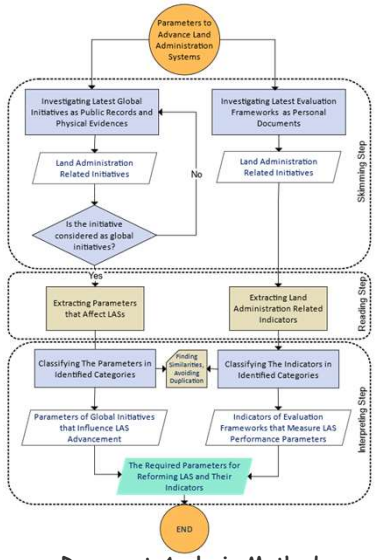

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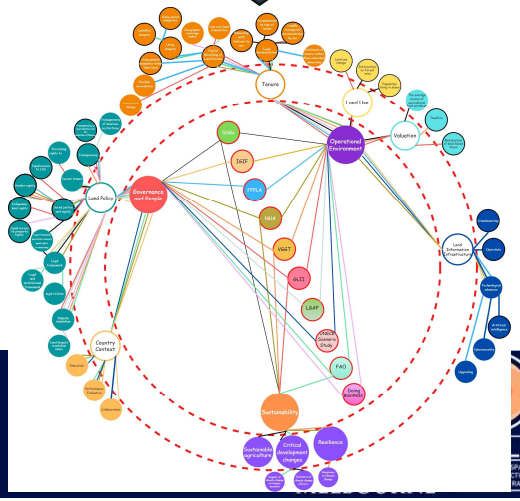
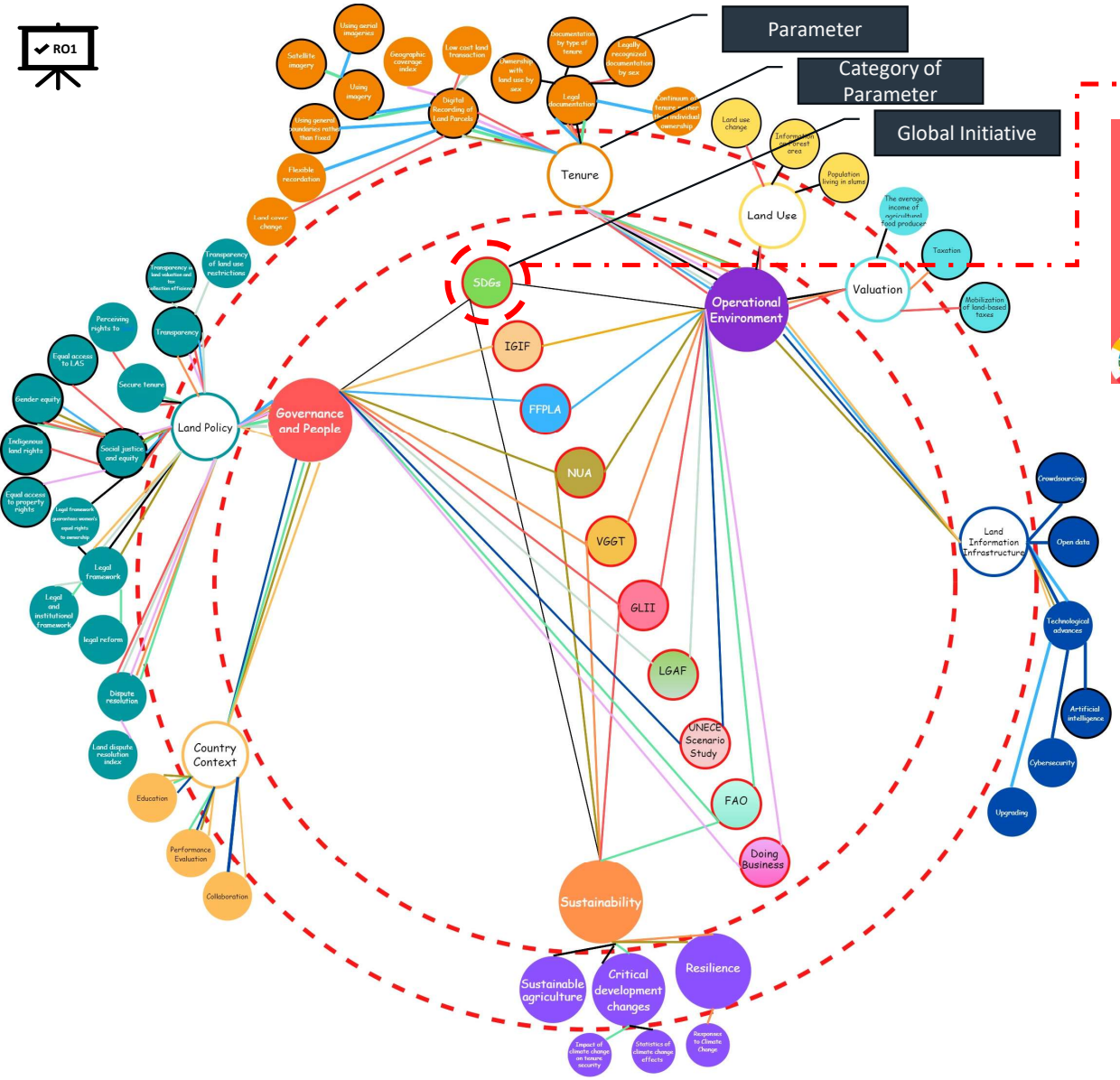
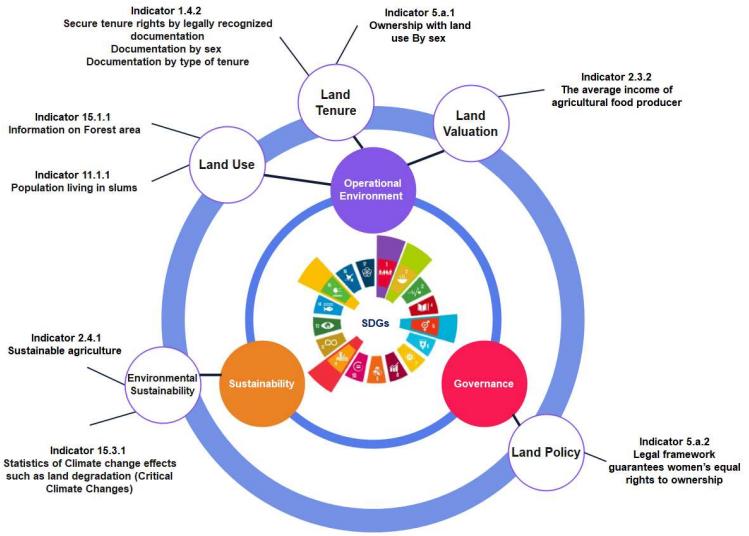
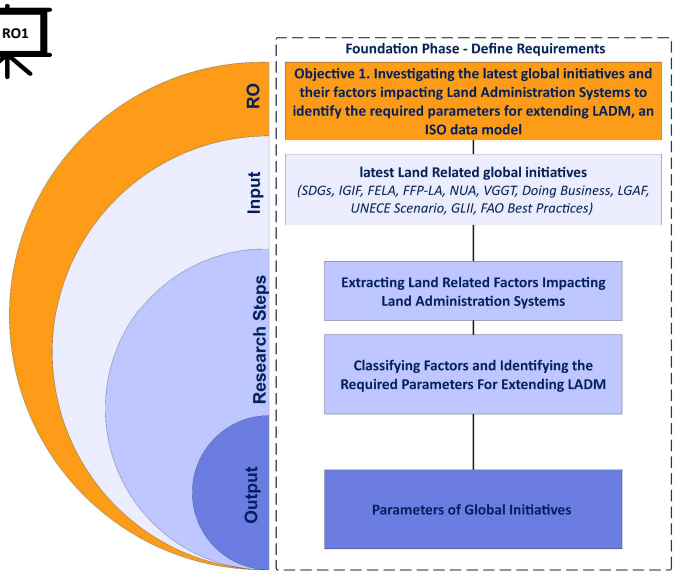



RO1
Parameter
Category of Parameter
Global Initiative
Tenure
Land Use
Valuation
Operational Environment
SDGs
IGIF
FFPLA
NUA
VGGT
GLII
LGAF
UNECE Scenario Study
FAO
Doing Business
Governance and People
Land Policy
Country Context
Land Information Infrastructure
Sustainability
Sustainable agriculture
Critical development changes
Resilience

Goal 1
1.4.2 Proportion of total adult population with secure tenure rights to land, (a) with legally recognized documentation, and (b) who perceive their rights to land as secure, by sex and type of tenure
Goal 2
2.3.2 Average income of small-scale food producers, by sex and indigenous status
2.4.1 Proportion of agricultural area under productive and sustainable agriculture
Goal 5
5.a.1 (a) Proportion of total agricultural population with ownership or secure rights over agricultural land, by sex; and (b) share of women among owners or rights-bearers of agricultural land, by type of tenure
5.a.2 Proportion of countries where the legal framework (including customary law) guarantees women's equal rights to land ownership and/or control
Goal 11
11.1.1 Proportion of urban population living in slums, informal settlements or inadequate housing
Goal 15
15.1.1 Forest area as a proportion of total land area
15.3.1 Proportion of land that is degraded over total land area


Indicator 1.4.2
Secure tenure rights by legally recognized documentation
Documentation by sex
Documentation by type of tenure
Indicator 5.a.1
Ownership with land use By sex
Indicator 2.3.2
The average income of agricultural food producer
Indicator 15.1.1
Information on Forest area
Indicator 11.1.1
Population living in slums
Land Tenure
Land Valuation
Land Use
Operational Environment
SDGs
Indicator 2.4.1
Sustainable agriculture
Environmental Sustainability
Sustainability
Governance
Land Policy
Indicator 15.3.1
Statistics of Climate change effects such as land degradation (Critical Climate Changes)
Indicator 5.a.2
Legal framework guarantees women's equal rights to ownership



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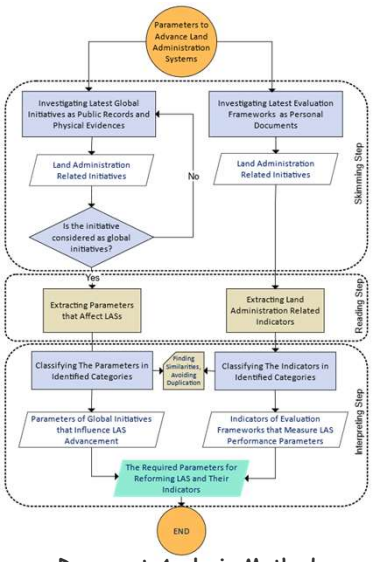

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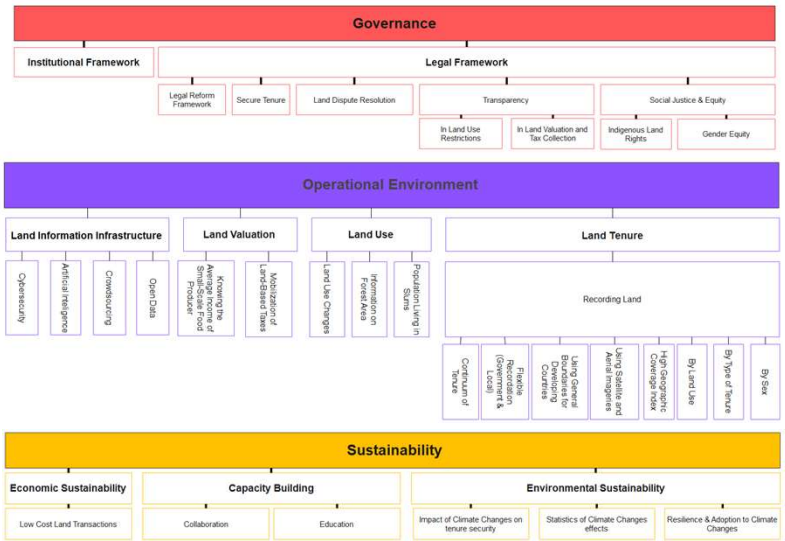
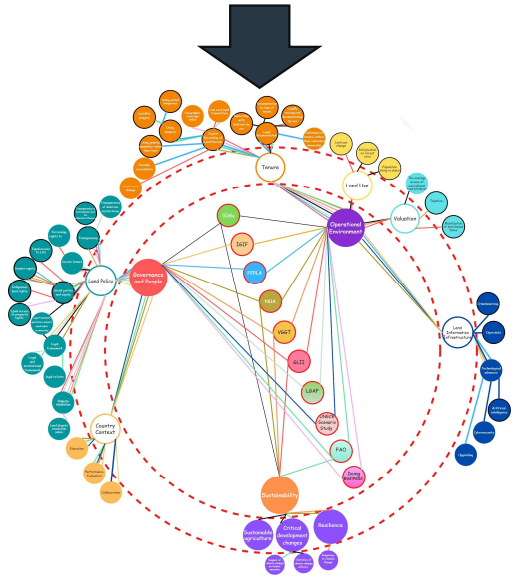
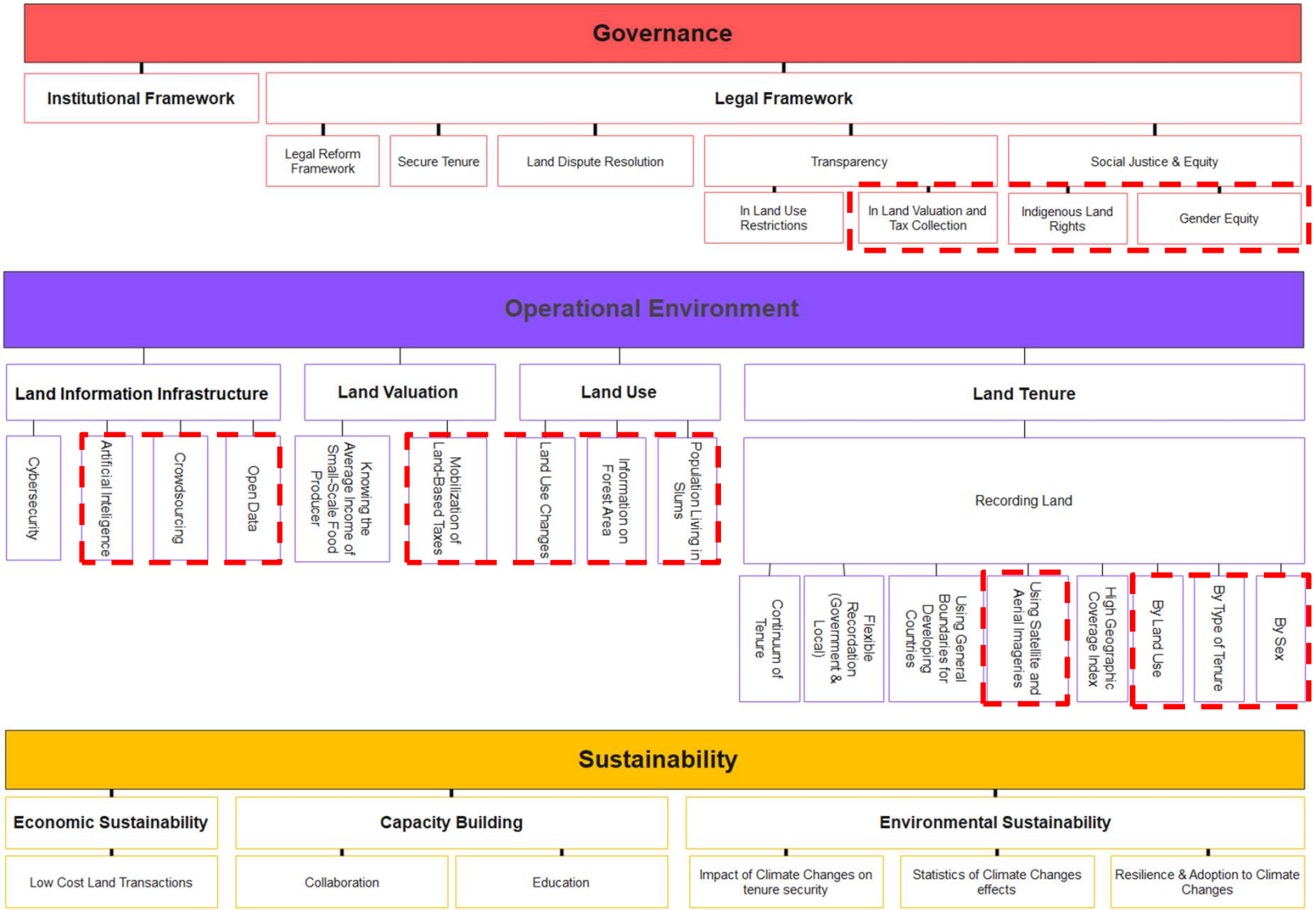




[15]

RO1

Parameters of Global Initiatives With Potential Impact on LAS



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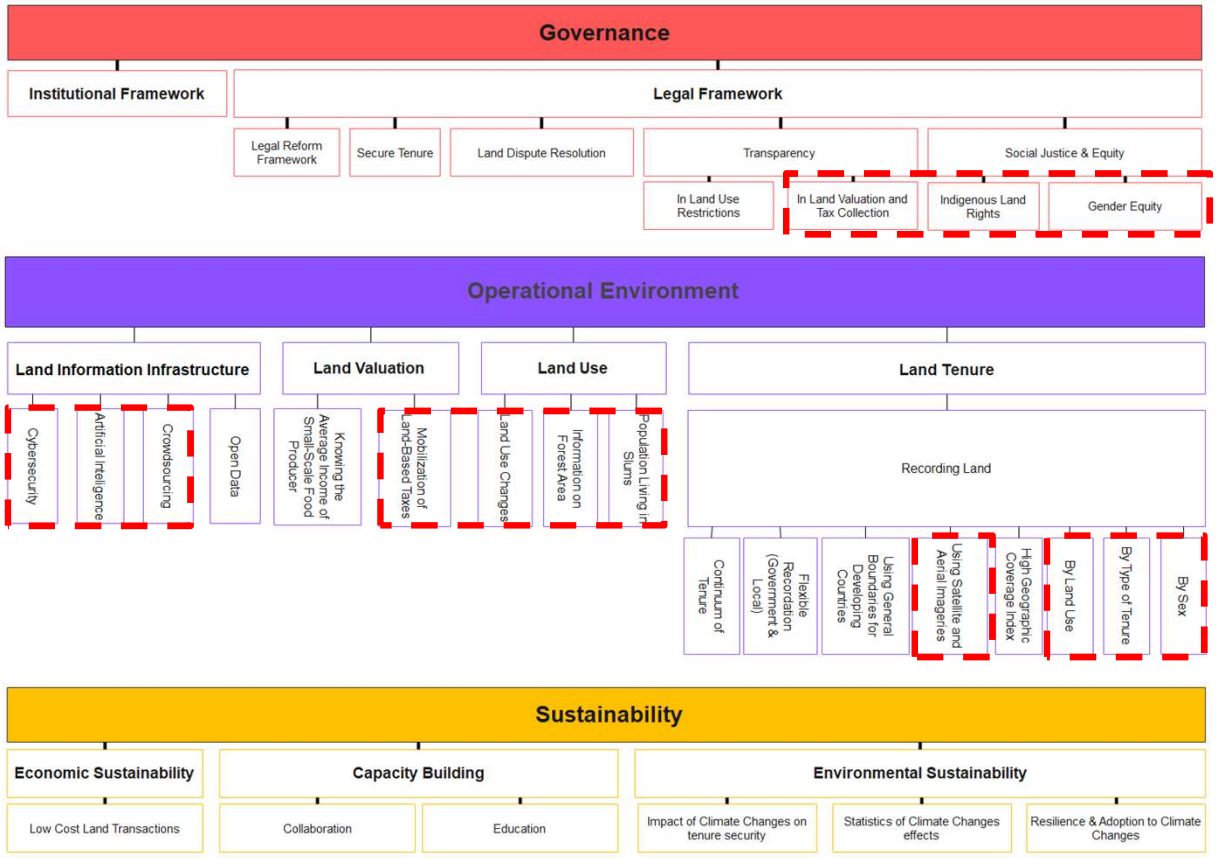
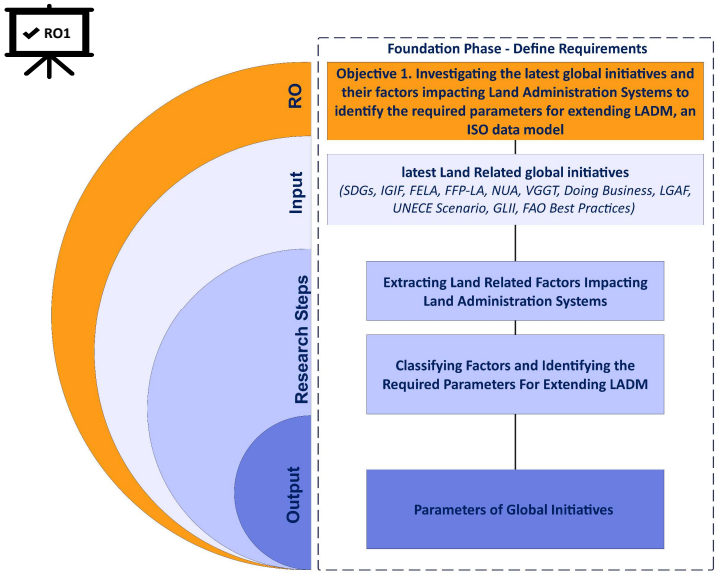
RO1

Parameters of Global Initiatives With Potential Impact on LAS



Applicable Parameters on the Data Model

- Gender of Owner
- Indigenous Land Right
- Informal Right
- Valuation and Taxation
- Land Use and Land Cover
- Boundary Type
- Data Source and Spatial Platform Source



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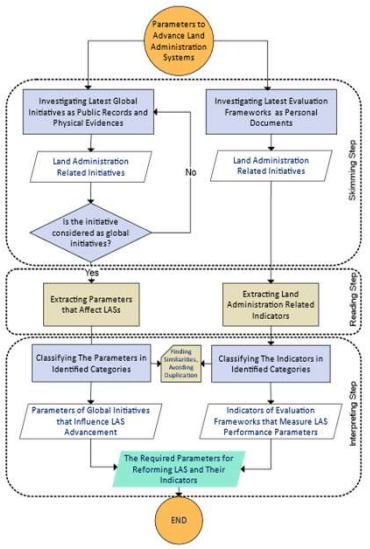

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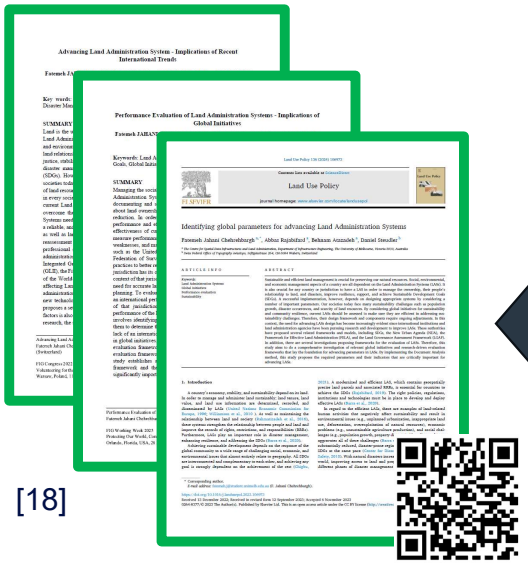

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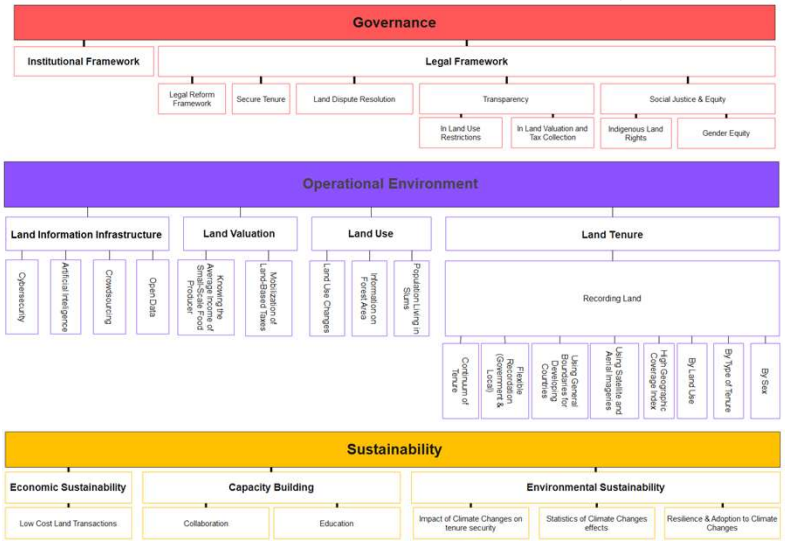
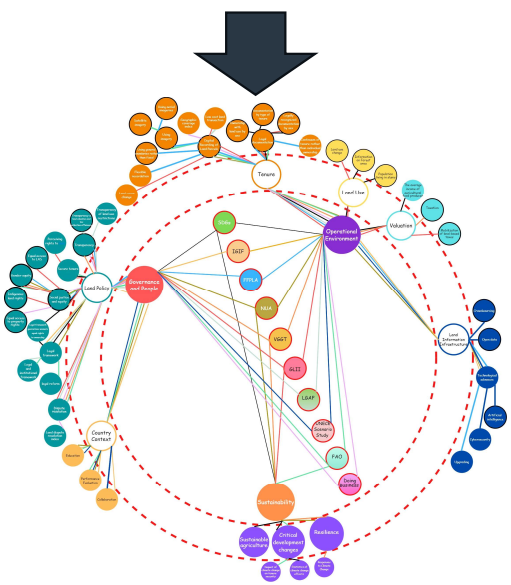
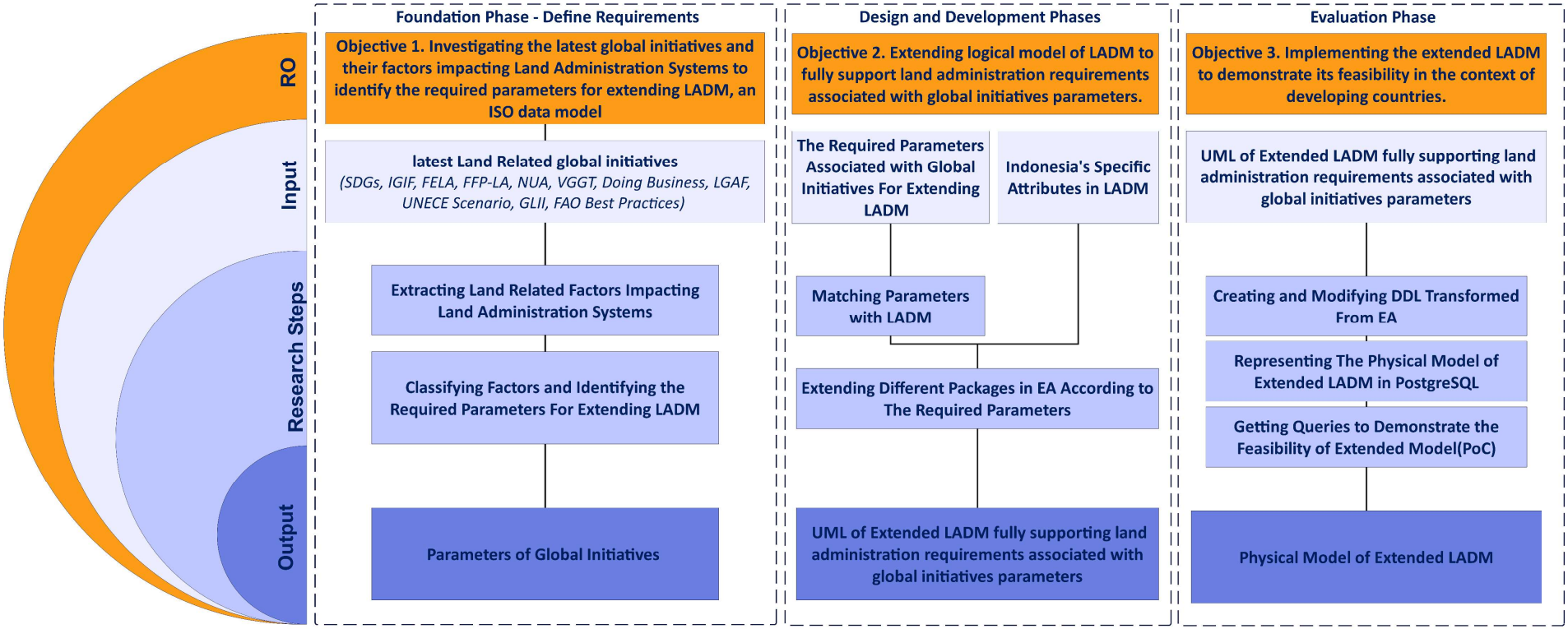
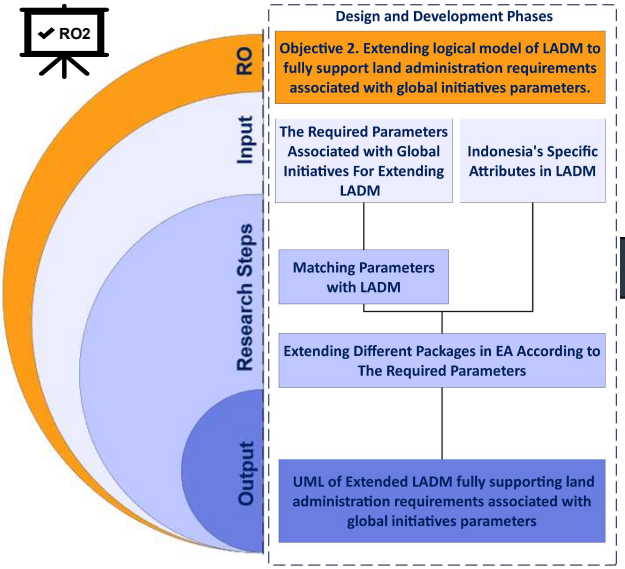
Parameters of Global Initiatives With Potential Impact on LAS





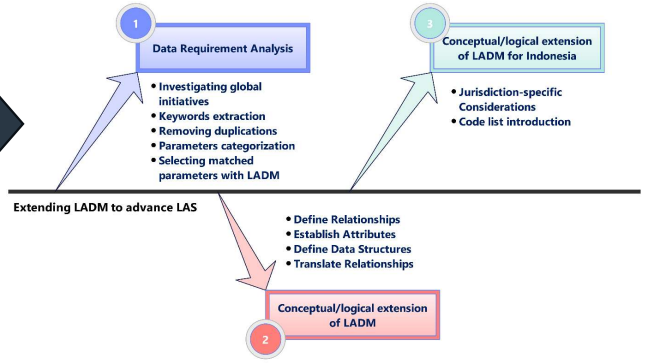
Design Science Research Methodology
Details on Outputs





RO2

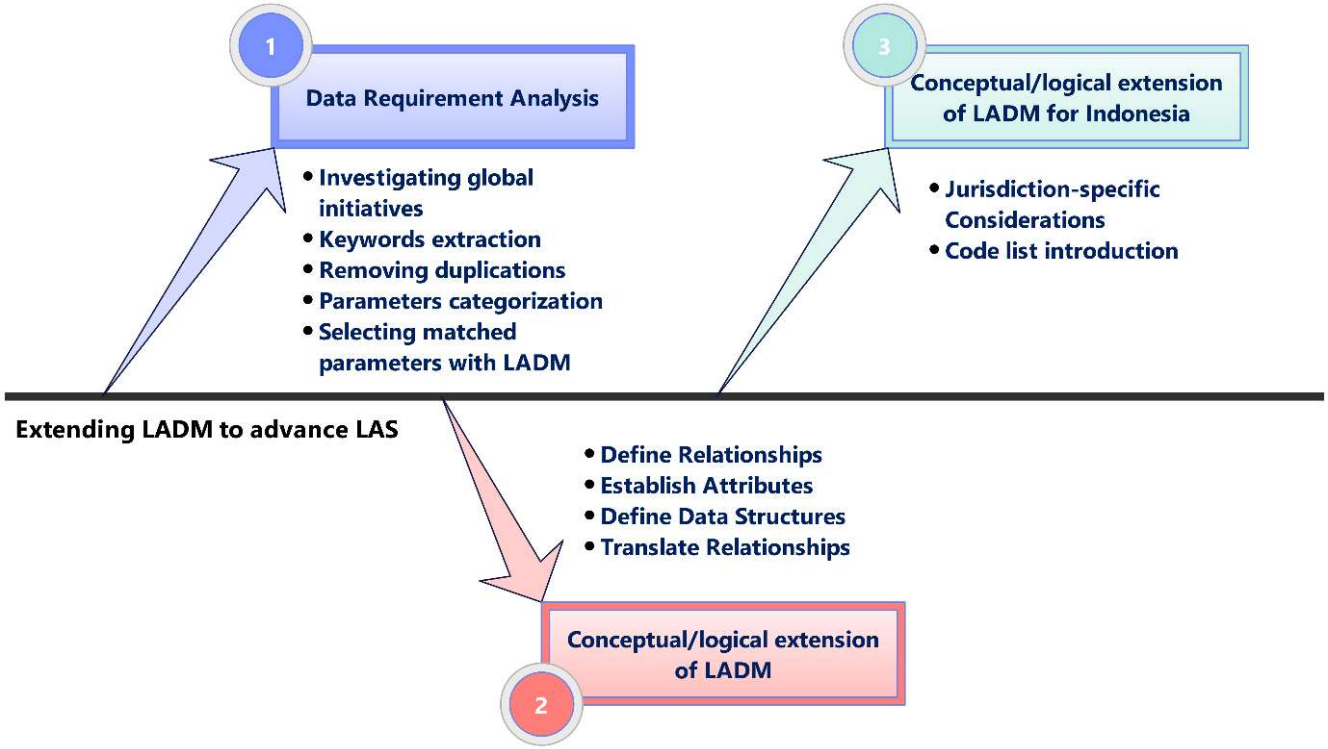
To extend the logical model of LADM to support land administration requirements associated with global initiatives parameters



The methodology of extending LADM to advance LAS

RO2

Methodology of extending LADM to advance LAS



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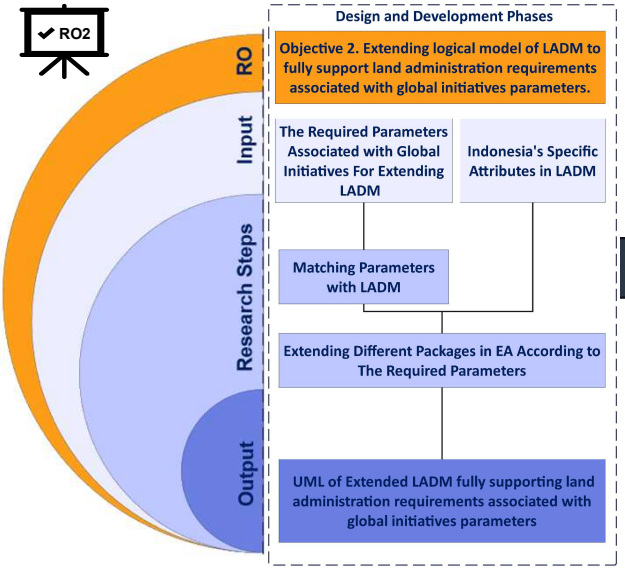

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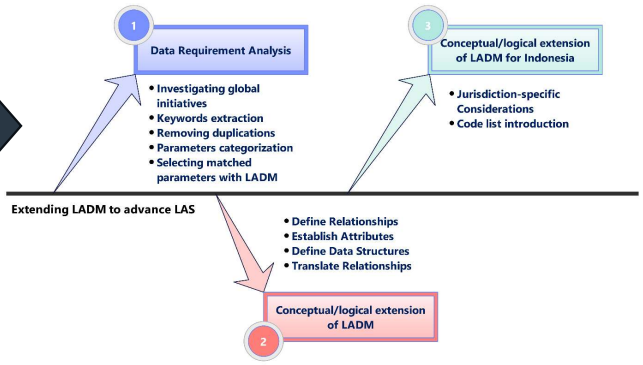
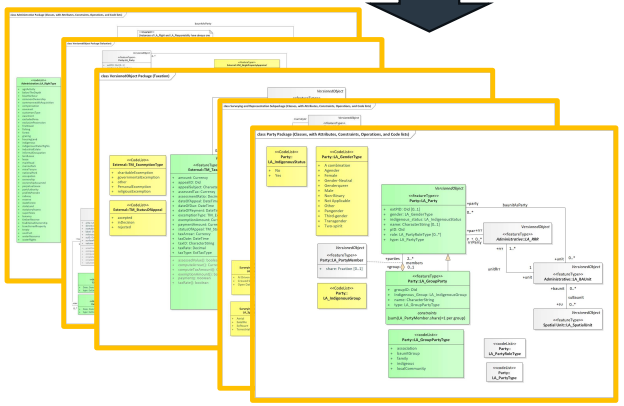
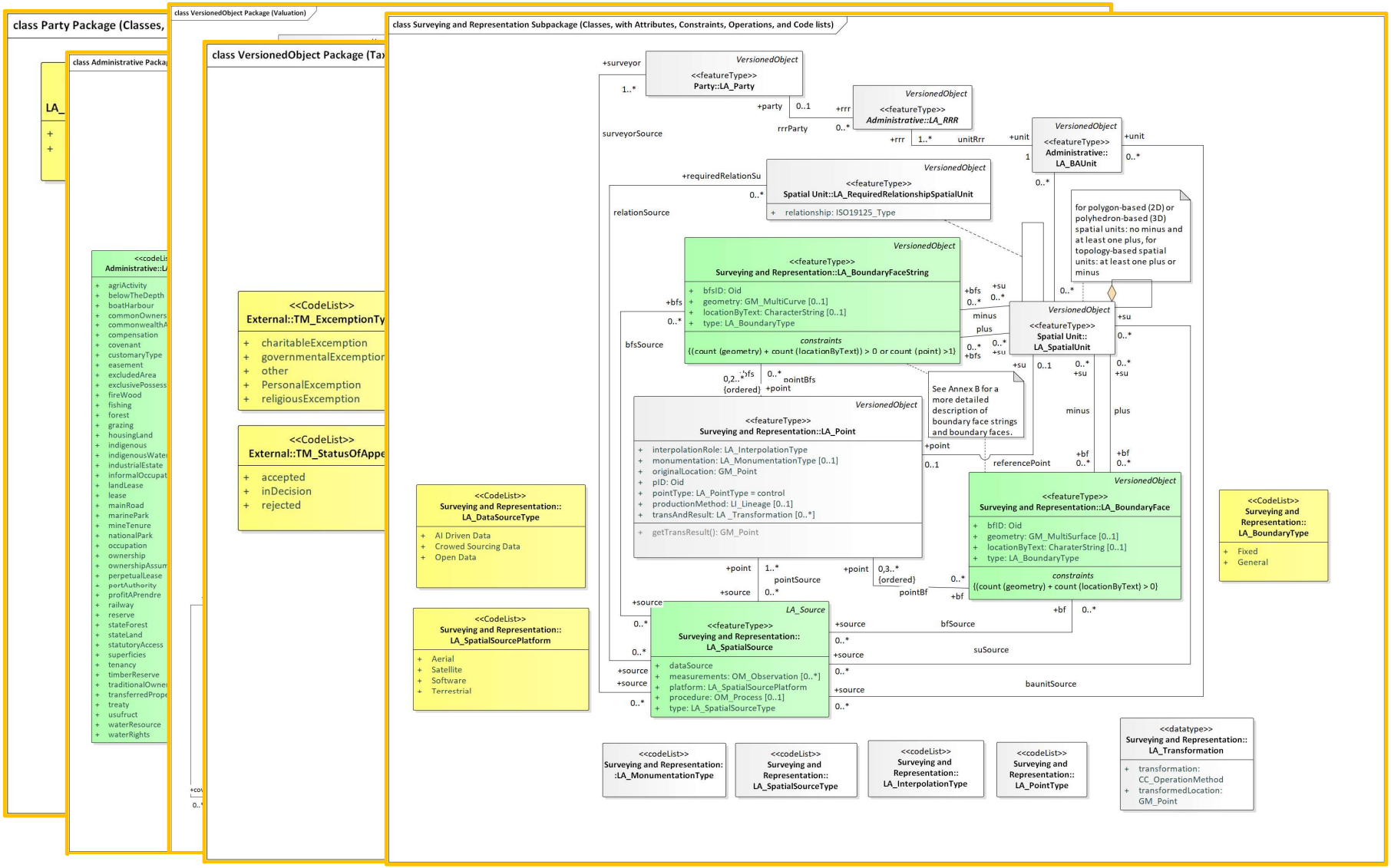


The methodology of extending LADM to advance LAS



Logical model of extended packages of LADM according to the global parameters



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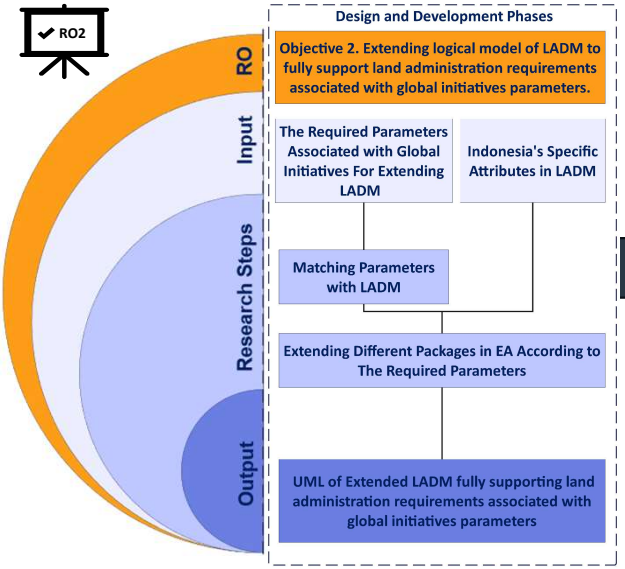
Extended surveying and representation subpackage of LADM



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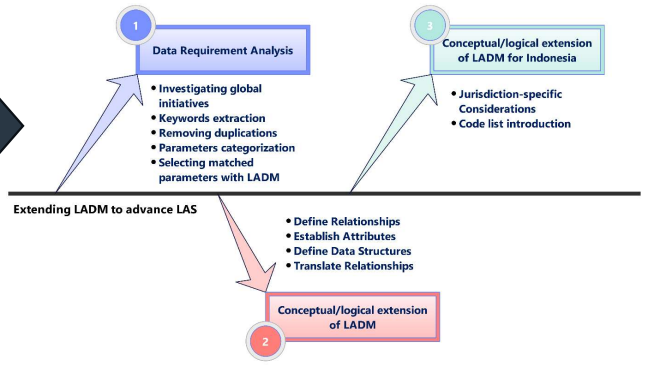
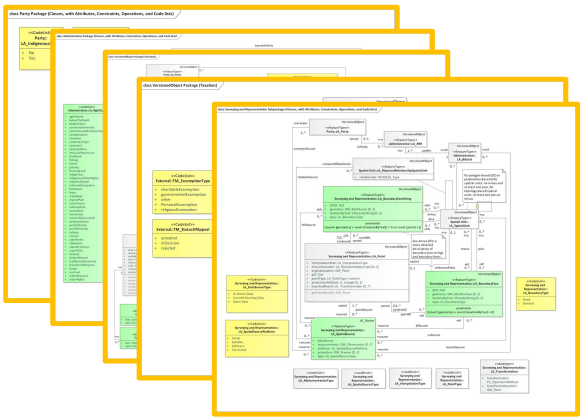
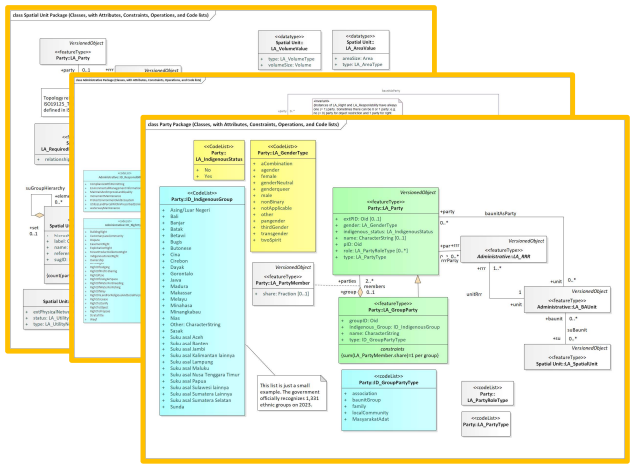


The methodology of extending LADM to advance LAS

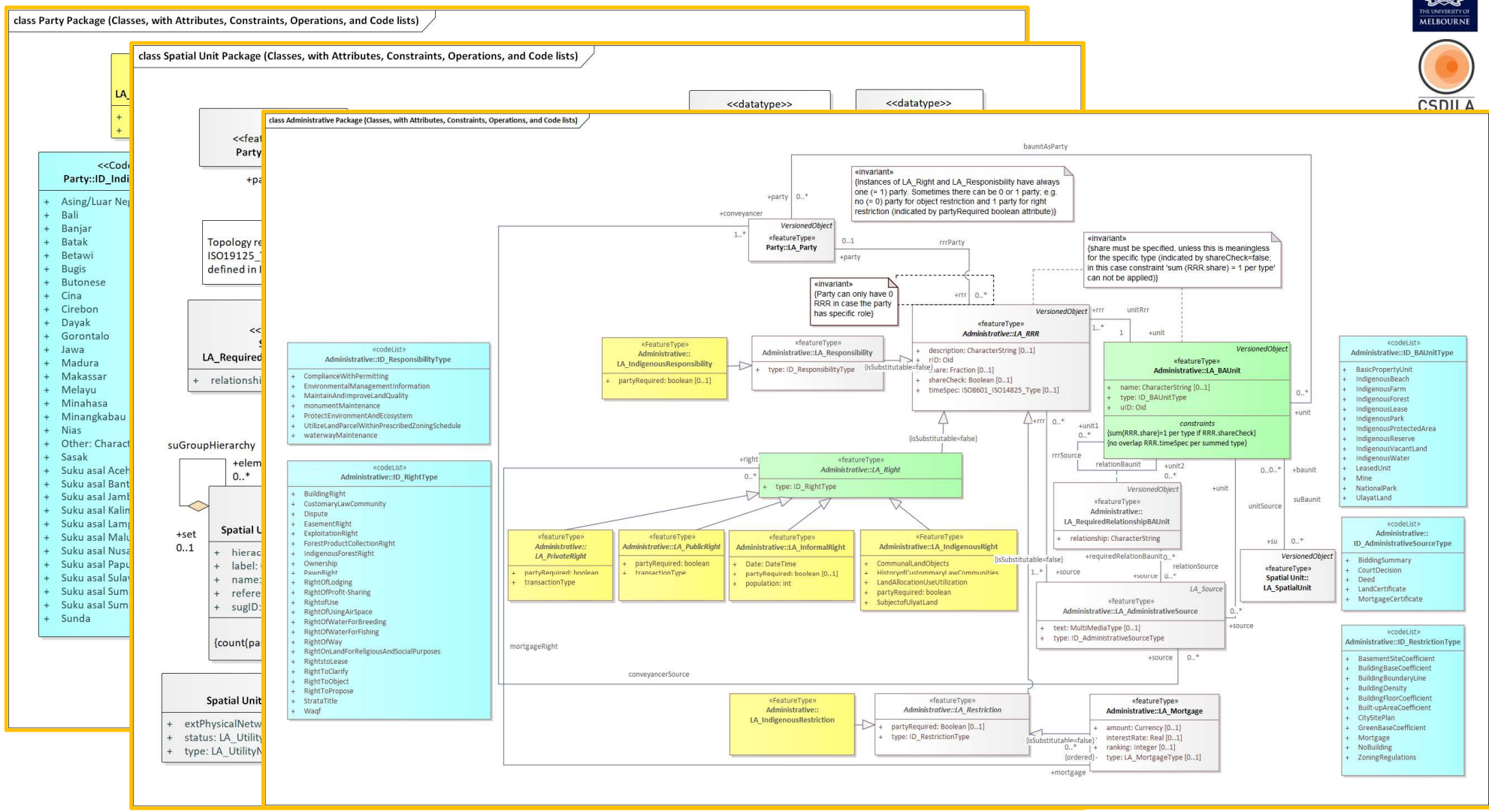


Logical model of extended packages of LADM according to the global parameters



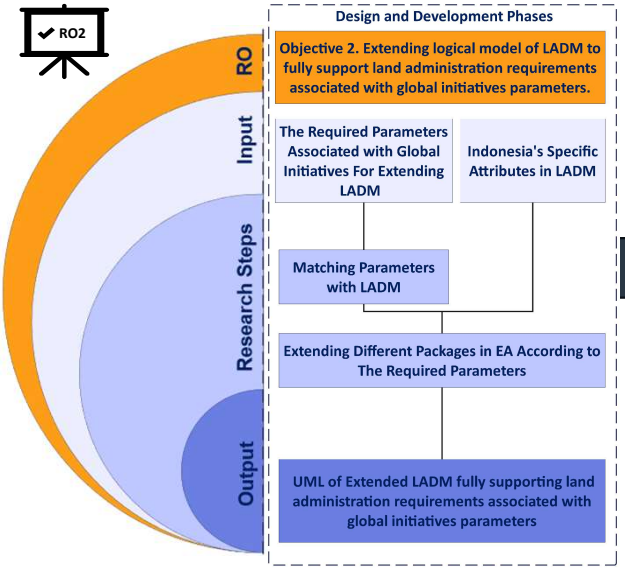
Extended LADM for Indonesia

[24]



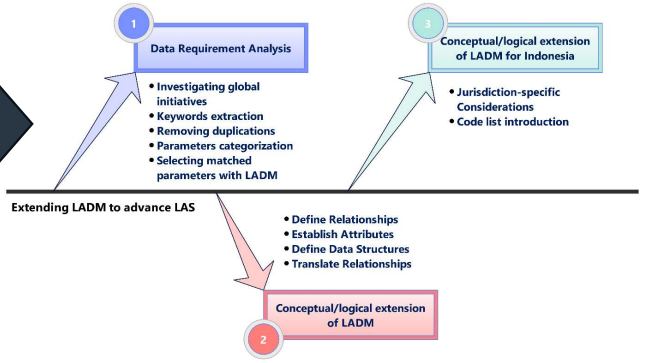
Extended LADM spatial unit package for Indonesia

Extended LADM administrative package for Indonesia



RO2

To extend the logical model of LADM to support land administration requirements associated with global initiatives parameters



The methodology of extending LADM to advance LAS

Geo-spatial Information Science (Under Review)

Extending Land Administration Domain Model to Support Global Initiatives: A Case Study of Indonesia

Fatemeh Jahani Chehrehbargh [1], Abbas Rajabifard [2], Behnam Atazadeh [3], Daniel Steudler[4], and Bagus Widya Nugraha[5]

[1] The Centre for Spatial Data Infrastructures and Land Administration, Department of Infrastructure Engineering, The University of Melbourne, Melbourne, Australia.

[2] Vice president, International Federation of Surveyors (FIG), Switzerland

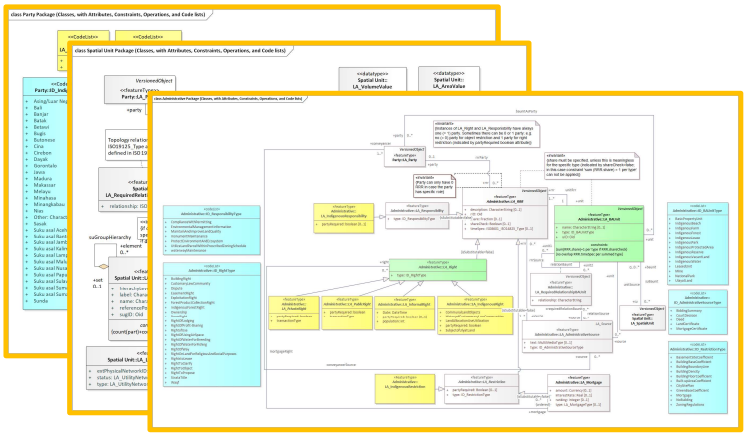
[3] Cadastral expert, The Ministry of Land Affairs and Spatial Planning (ATR/BPN), Indonesia

[4] Correspondence: fjahanic@student.unimelb.edu.au

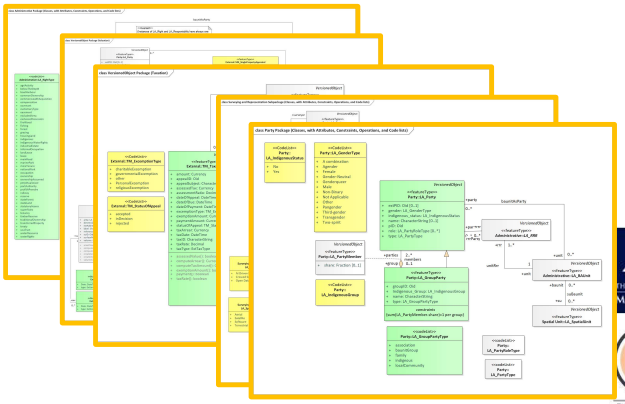
Abstract

In the pursuit of economic stability and the fulfillment of Sustainable Development Goals (SDGs), effective Land Administration Systems (LASs) play a pivotal role in accurately recording rights, restrictions, and responsibilities (RRRs). Global institutions, including the United Nations, the World Bank, and the International Federation of Surveyors, advocate for continual improvement in LASs. In particular, these institutions developed initiatives, including SDGs, New Urban Agenda, and Framework for Effective Land Administration, to specify important parameters necessitating ongoing enhancement, validation, and integration of LASs. This paper addresses an important knowledge gap in LAS by proposing a comprehensive framework, tailored specifically to Indonesia's context, to extend the functionality of the Land Administration Domain Model (LADM) as an ISO data model, based on key parameters driven from global initiatives in prior work. Employing a systematic methodology, the study conducts a continuous literature review, adaptation, conceptual model design, and logical model implementation. The proposed LADM extension specifically comprises new data elements related to gender sensitivity, indigenous land rights, informal rights, valuation, and taxation. These data elements, extracted from ten prominent global initiatives, collectively contribute to a more inclusive and effective LAS that aligns with global initiatives. Specific attributes, enumerations, and classes are introduced, enhancing LADM's adaptability and relevance to evolving global trends. The paper concludes by emphasizing the practical implications of the proposed LADM extension, emphasizing its contribution to sustainable land management practices.

Keywords: Land Administration System, Global Initiatives, LADM, Indigenous Rights, Valuation and Taxation



Extended LADM for Indonesia



Logical model of extended packages of LADM according to the global parameters

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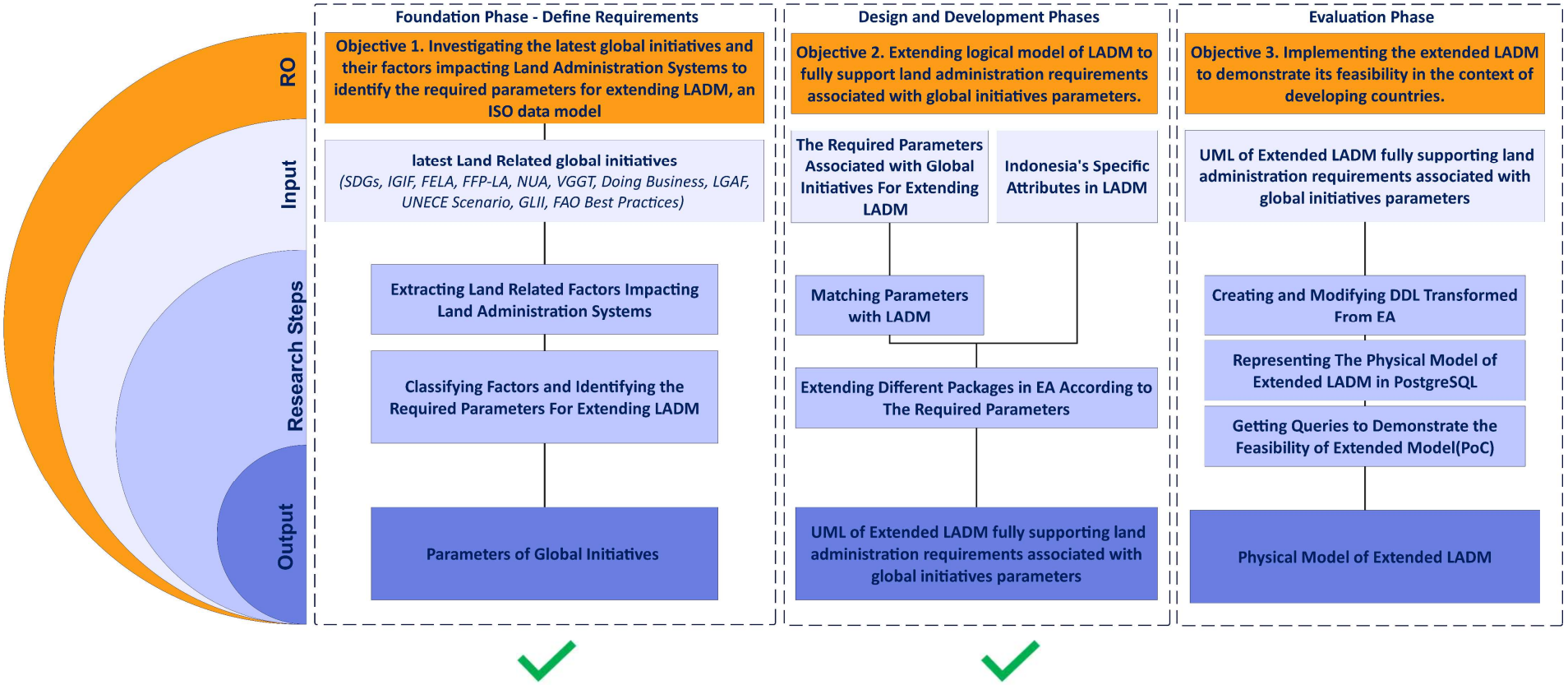
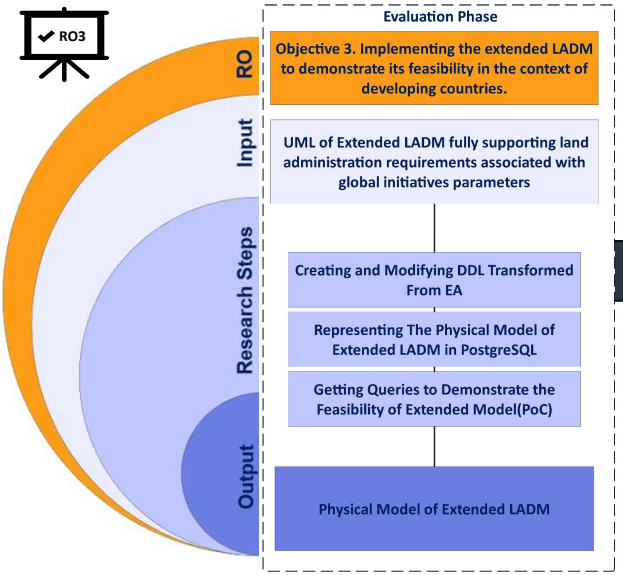
Design Science Research Methodology
Details on Outputs





RO3

To implement and assess the feasibility of the extended LADM in addressing and incorporating global land administration parameters

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2. Transforming the Model Using Enterprise Architecture (Generating DDL)
3. Database Creation in PostgreSQL via pgAdmin
4. Query Execution for Demonstrating the Feasibility of the Extended Model (Proof of Concept)

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Methodology of Implementing Physical Model

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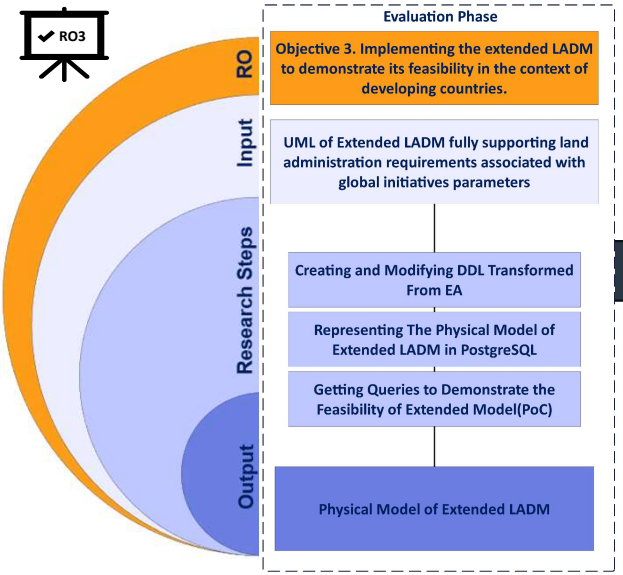

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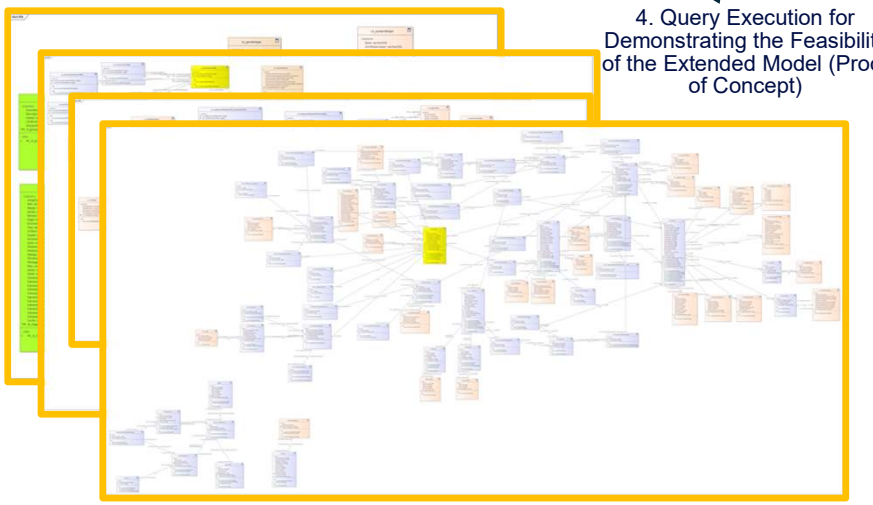
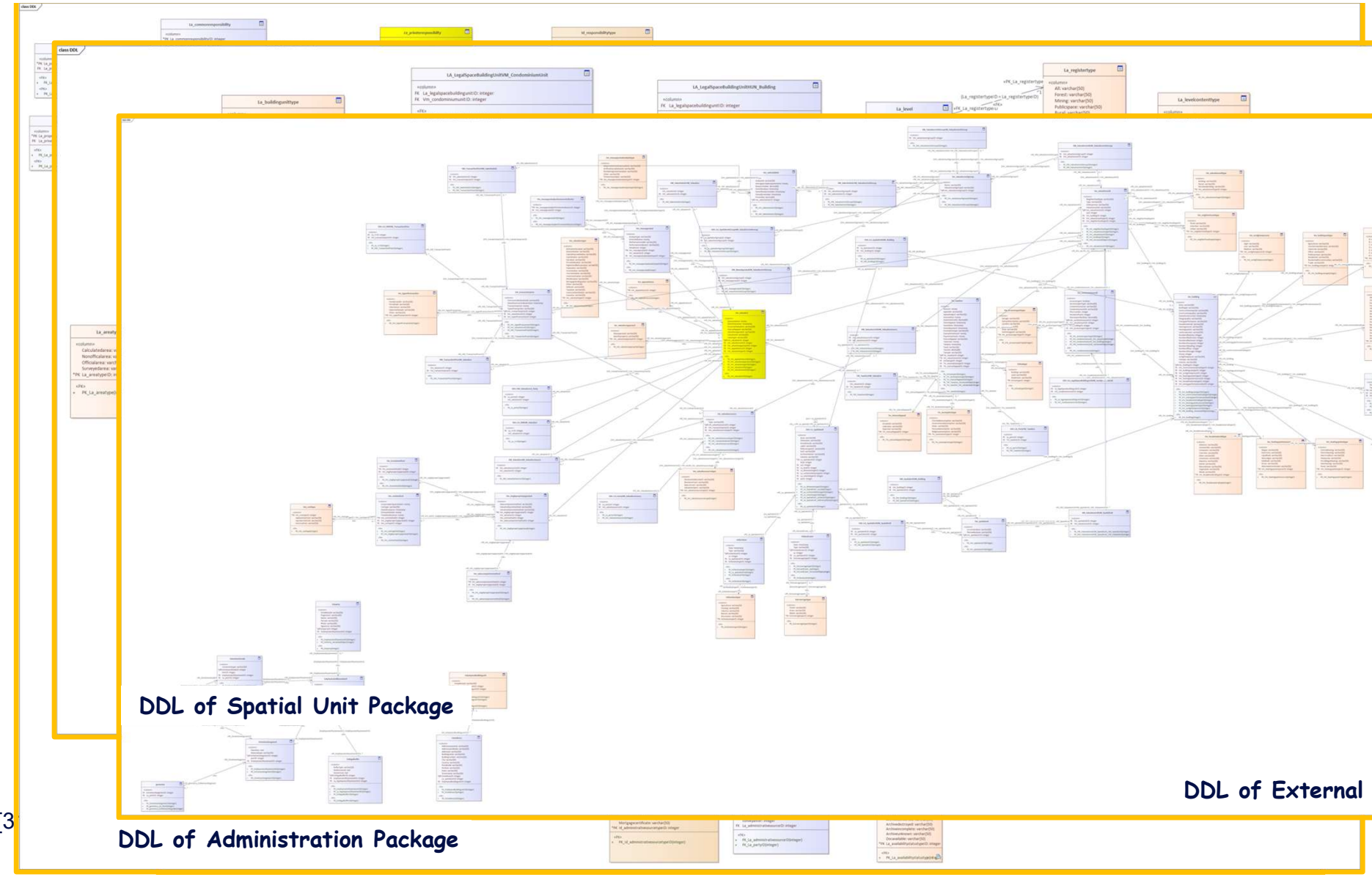
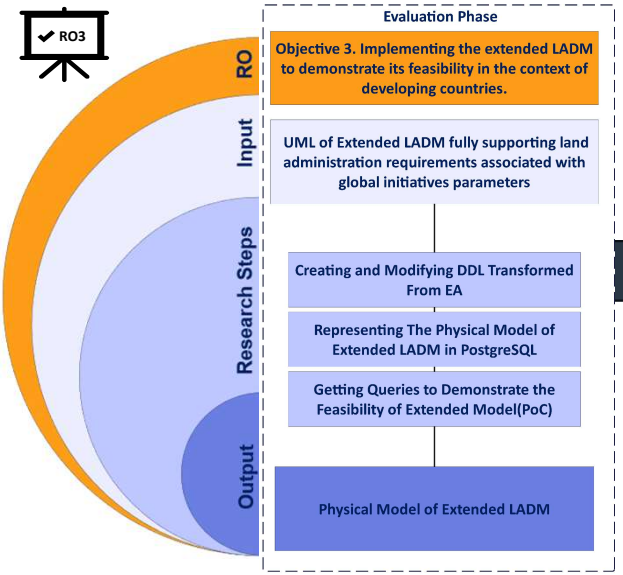


Using Enterprise Architecture Creating DDL


DDL of Spatial Unit Package
DDL of External Package
DDL of Administration Package



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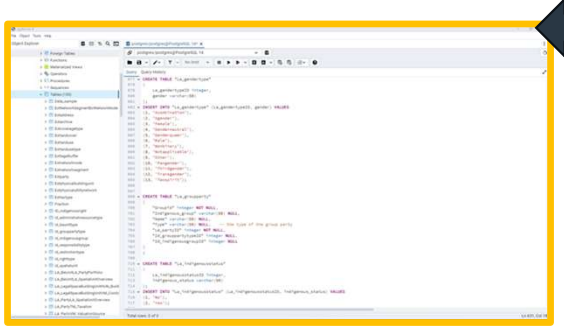
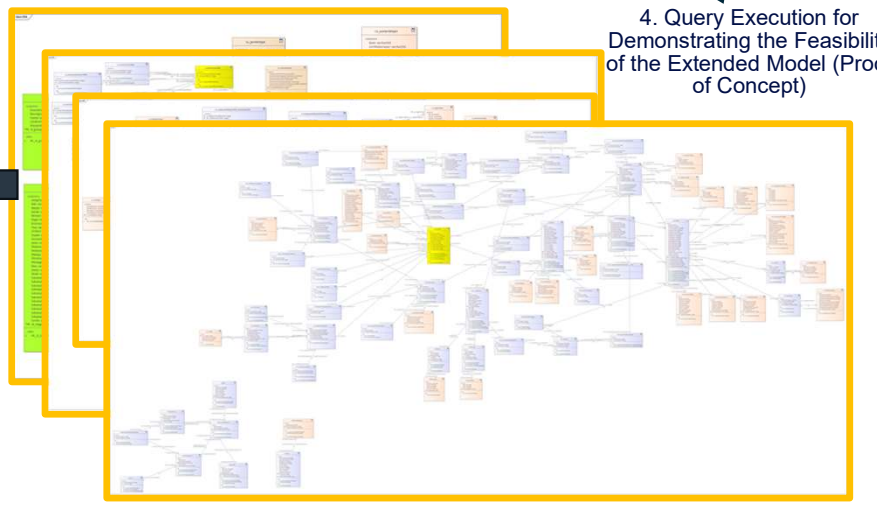


Database Creation in PostgreSQL



Using Enterprise Architecture Creating DDL

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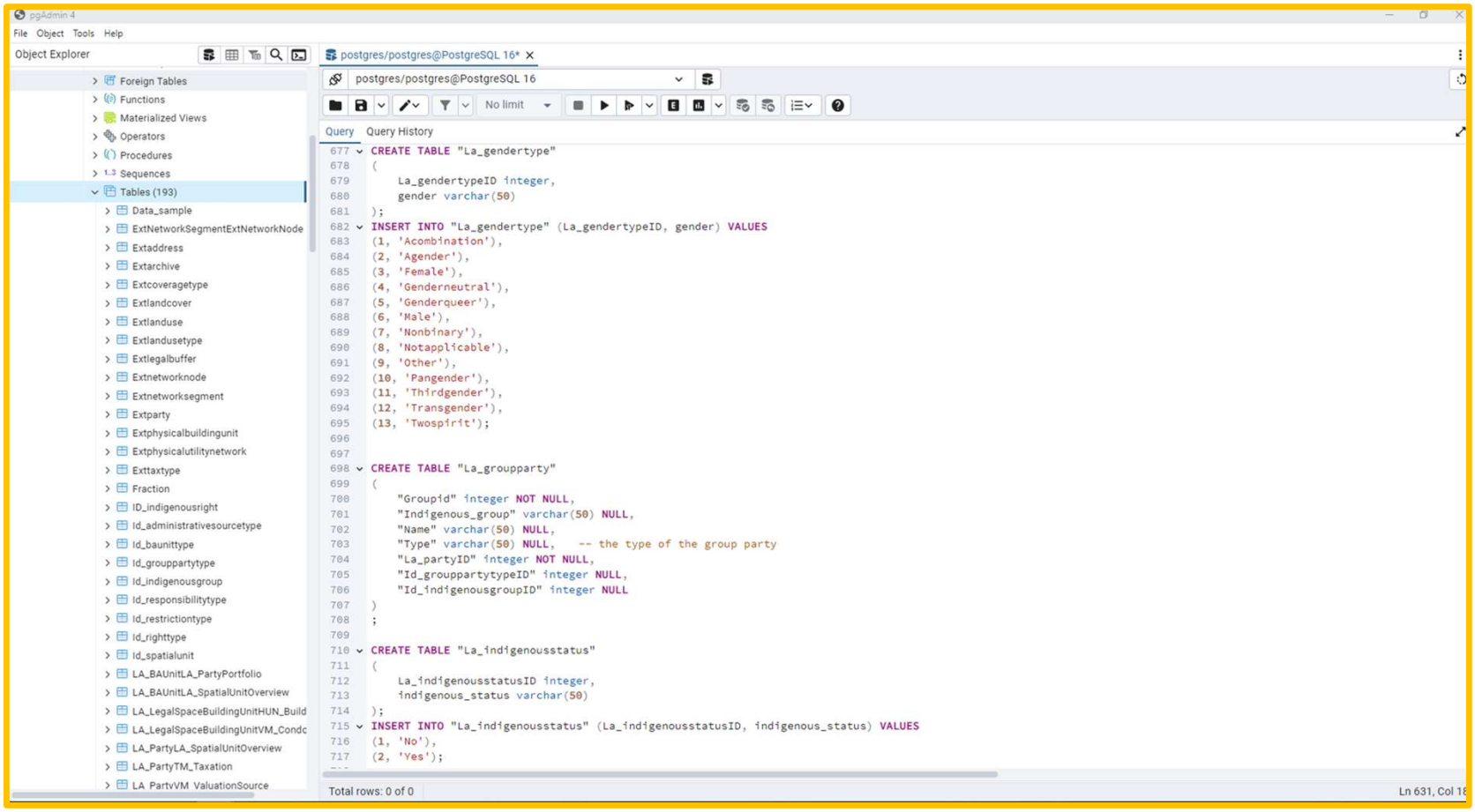
Database Creation in PostgreSQL



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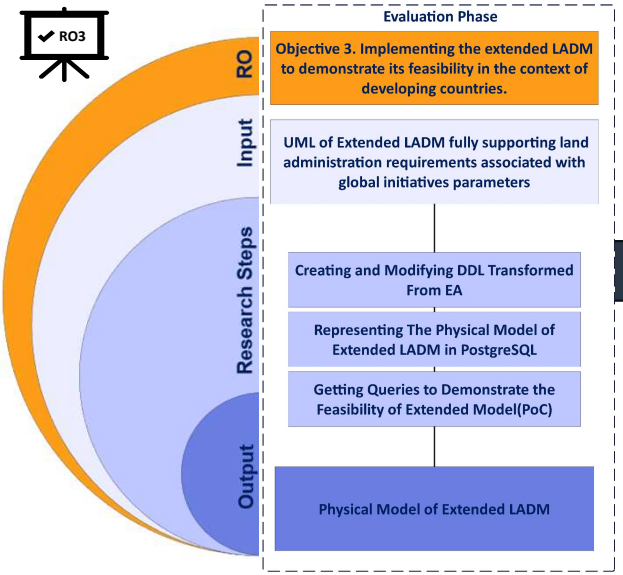

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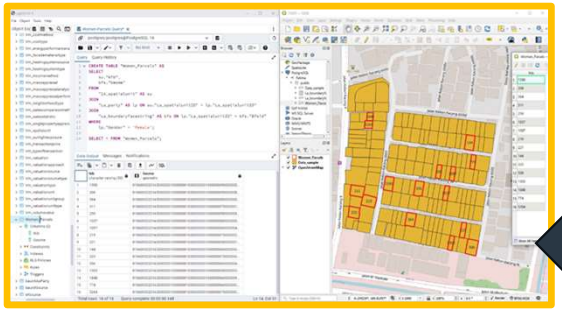
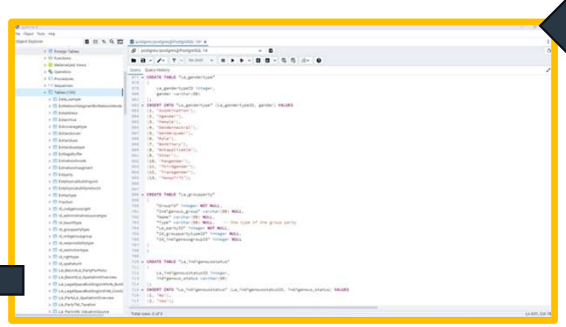
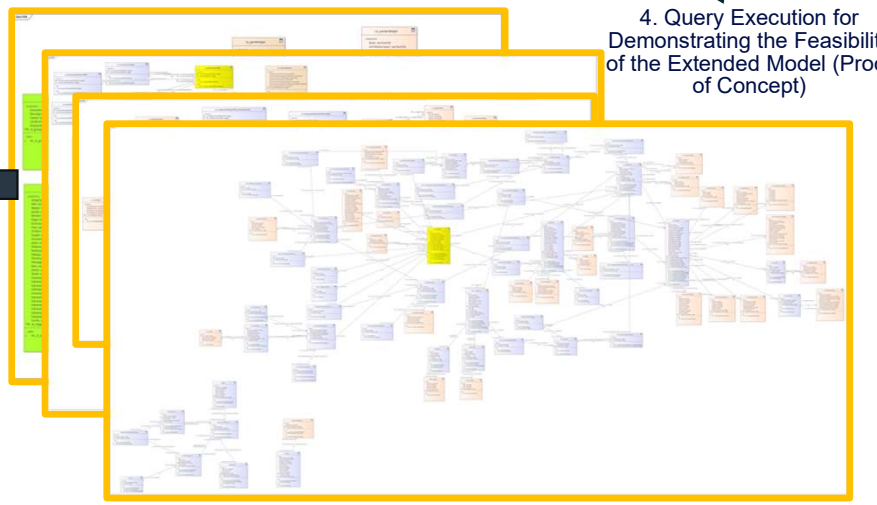


Query Execusion



Database Creation in PostgreSQL



Using Enterprise Architecture Creating DDL

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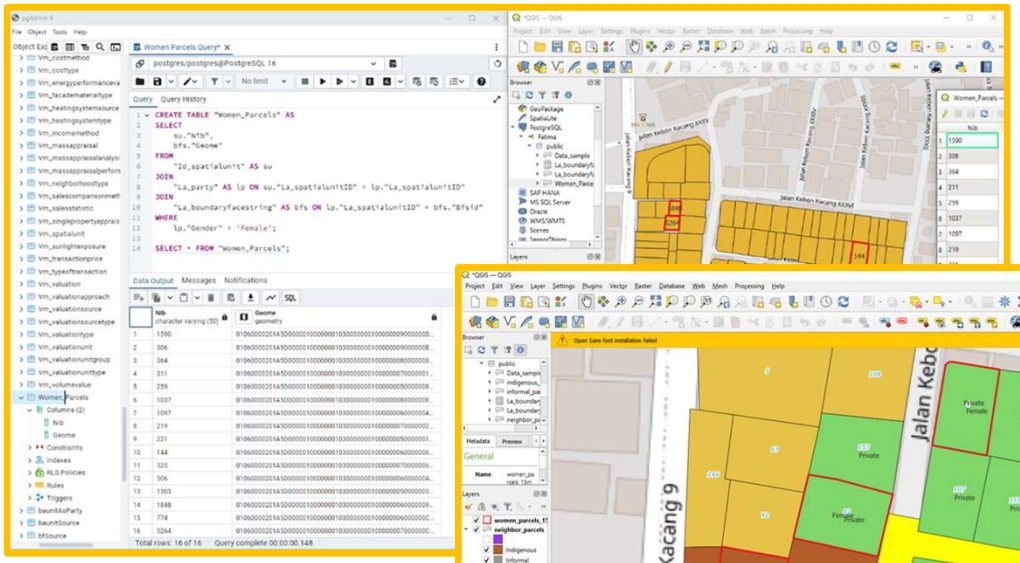
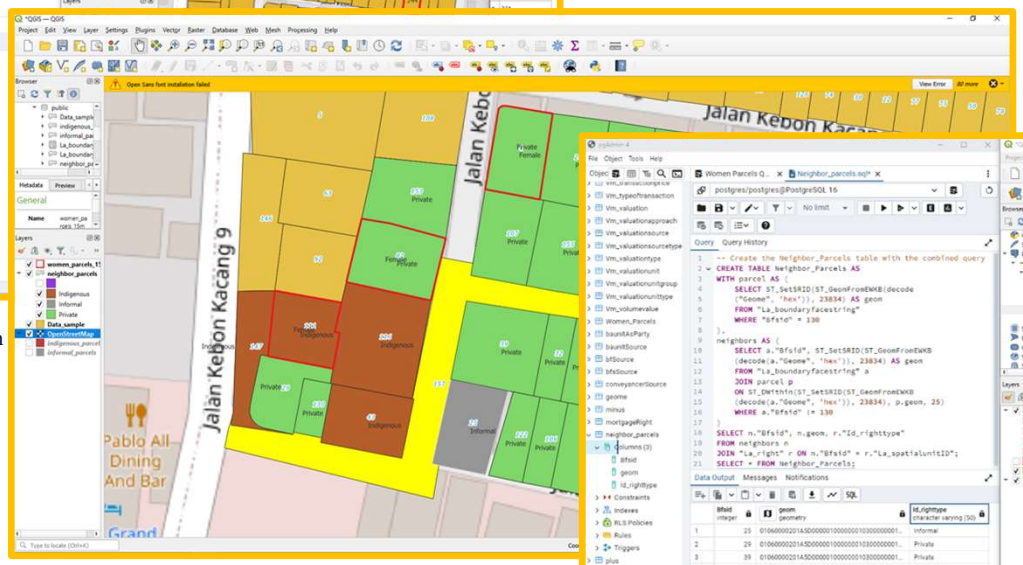
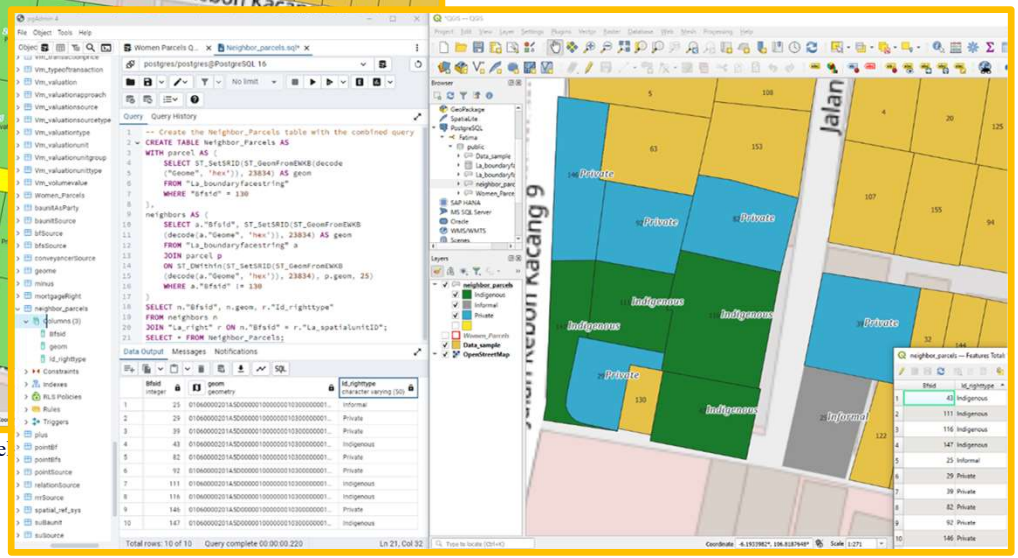


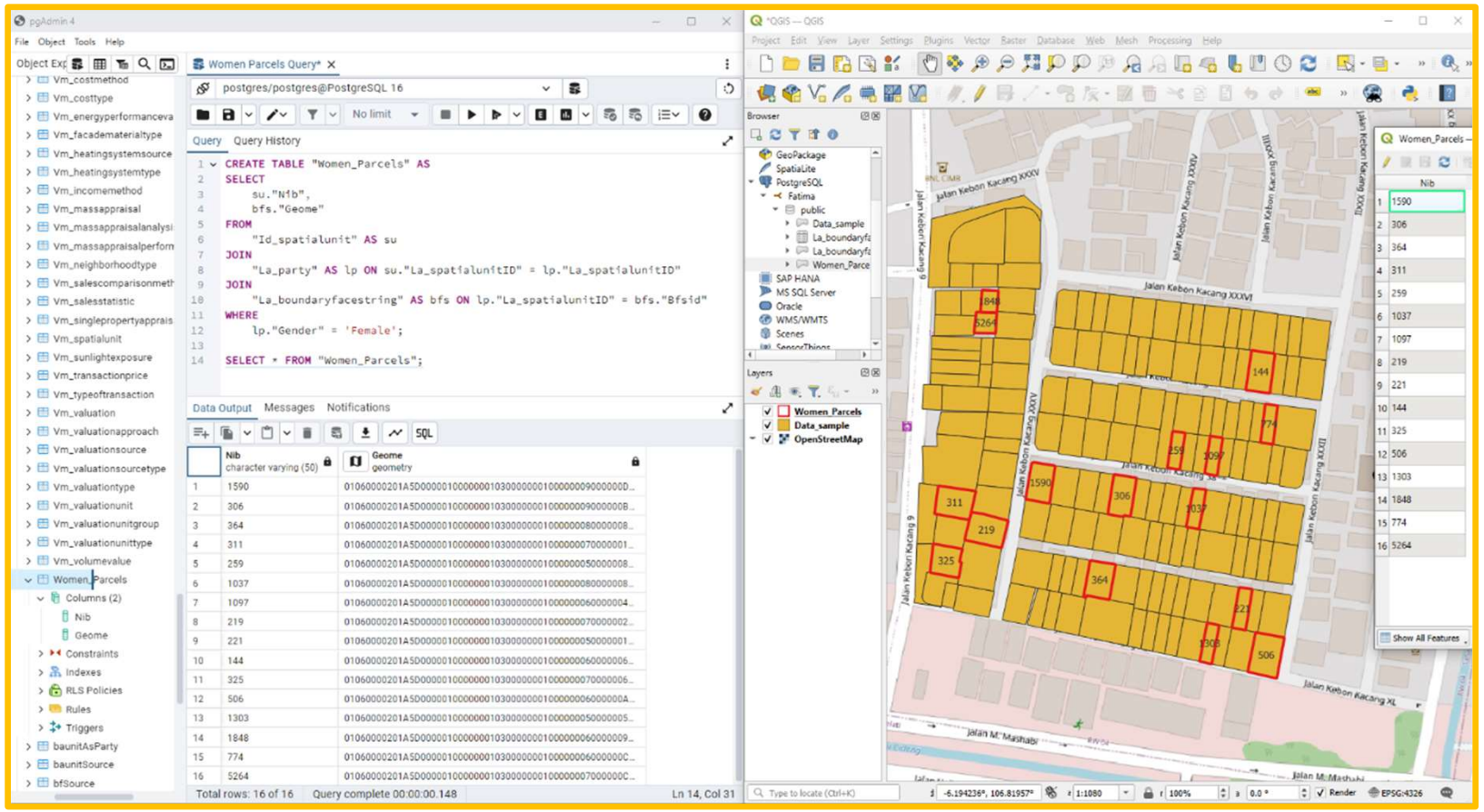
Women-owned parcels query execution



Query Execution and Spatial Distribution of Parce



Neighbouring parcels query execution in pgAdmin with the distribution and ownership rights displayed in QGIS.



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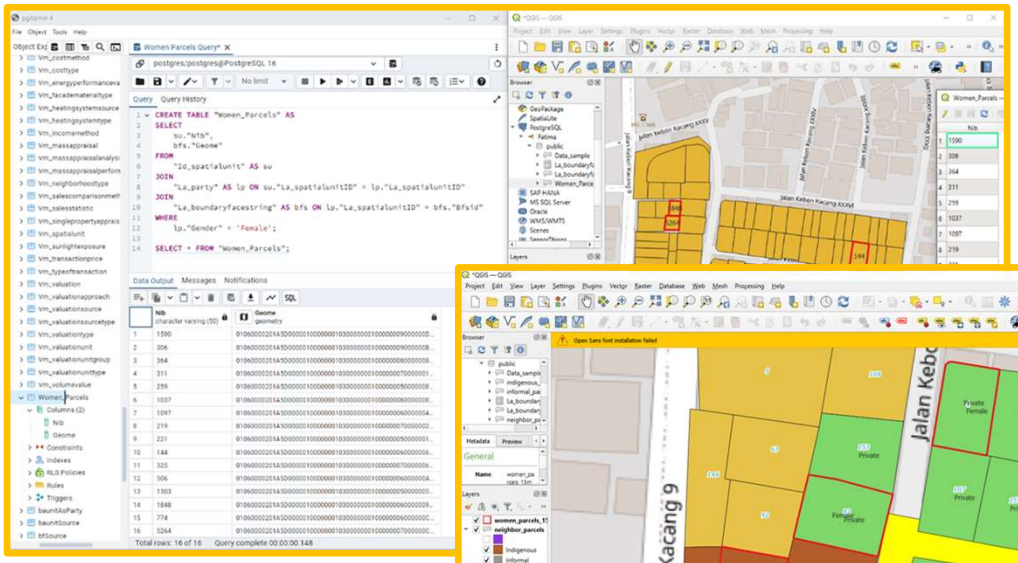

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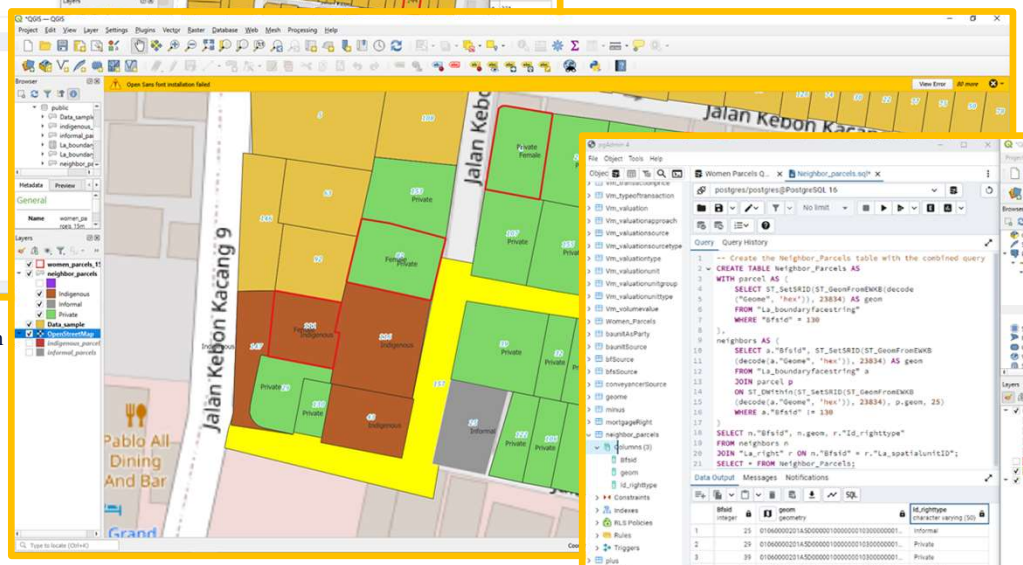

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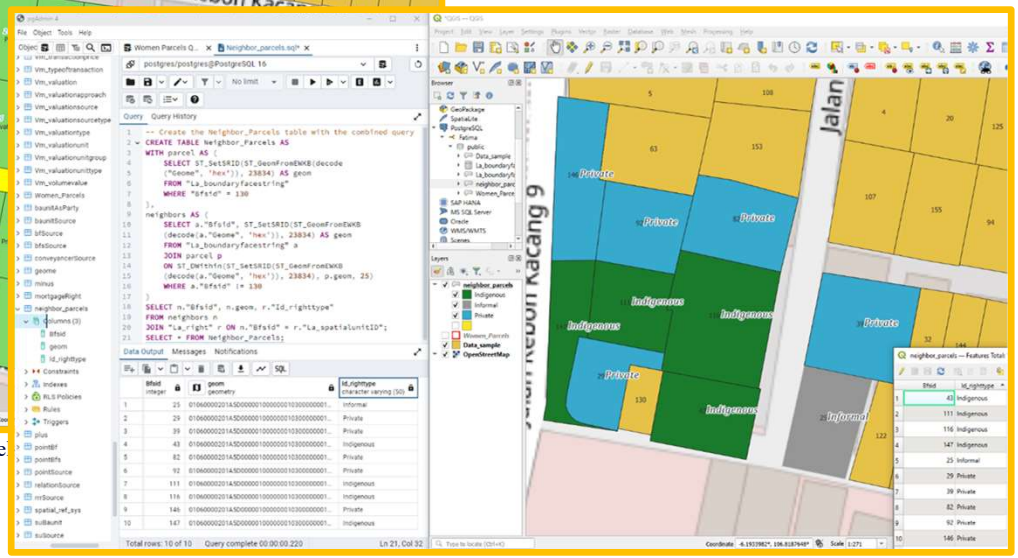

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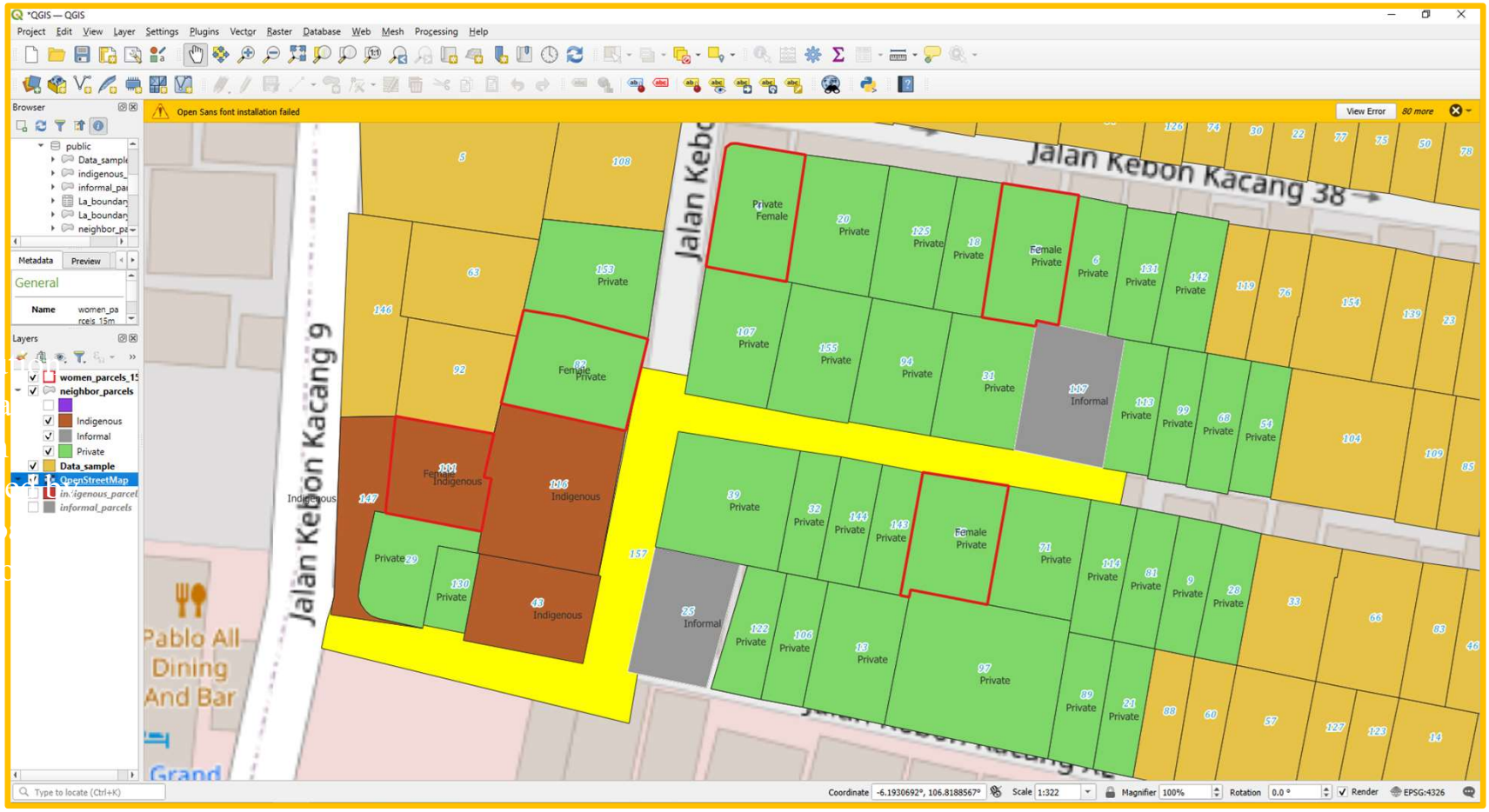
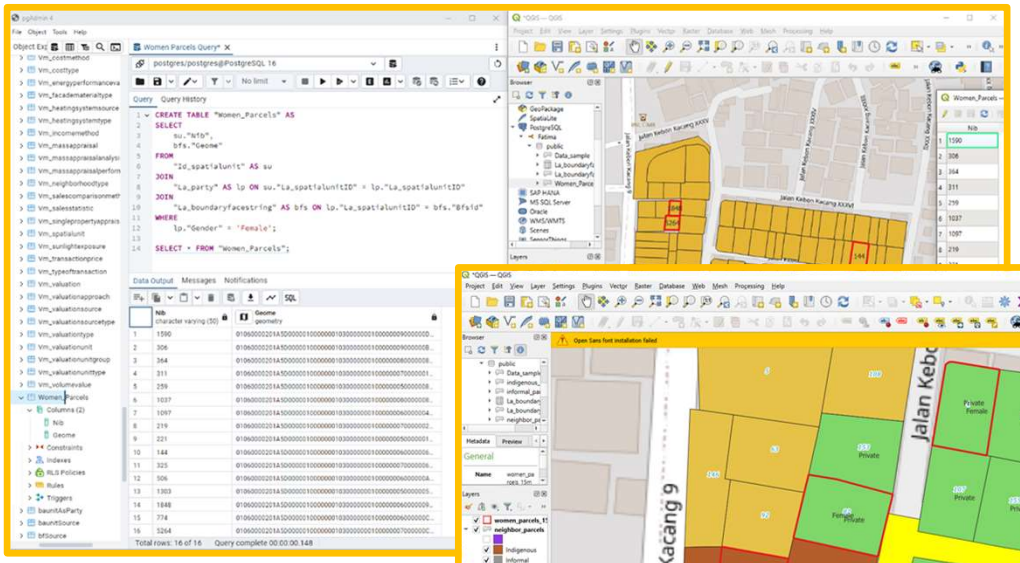


Query Execution and Spatial Distribution of Parcels Affected by Planned Road Construction

Query Execution



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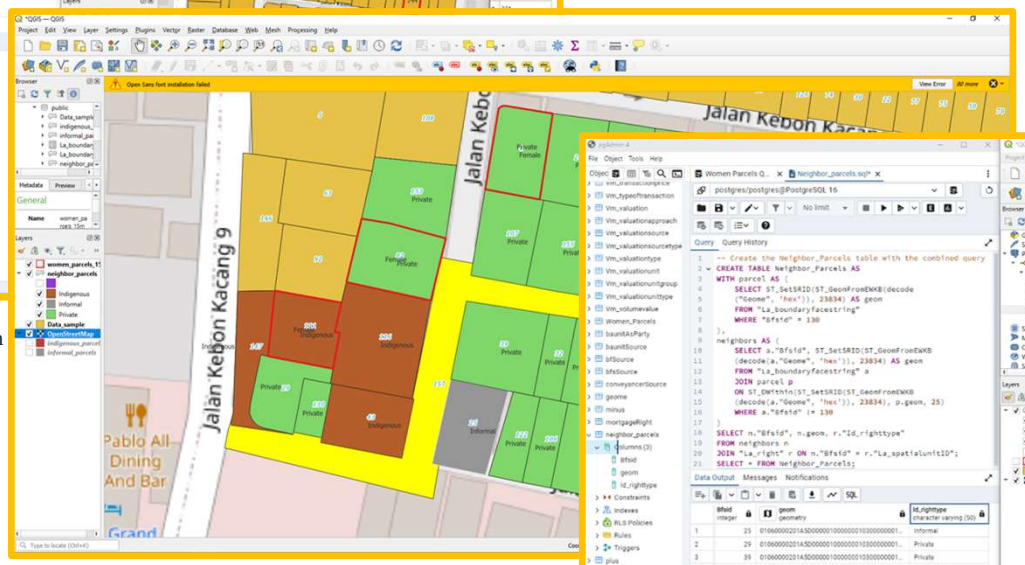

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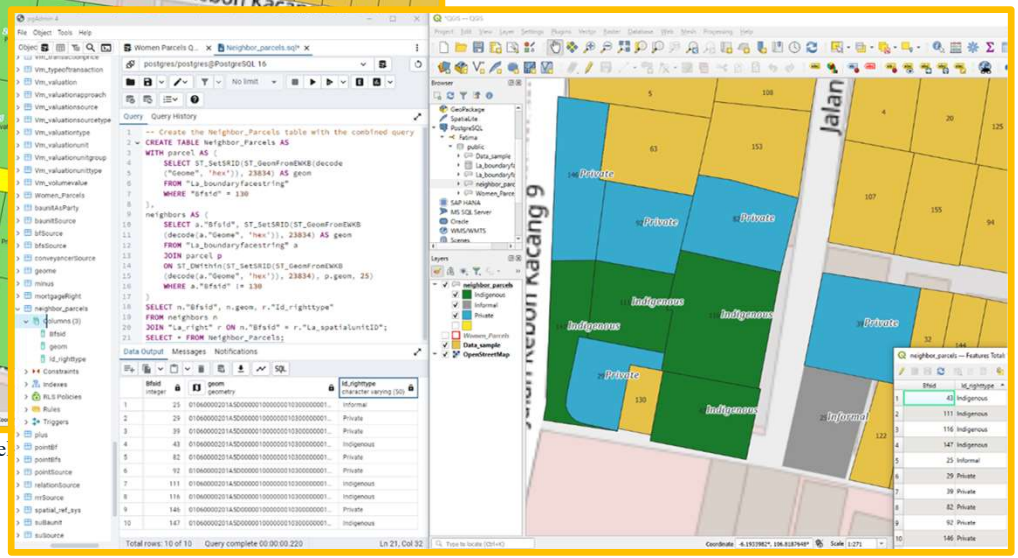

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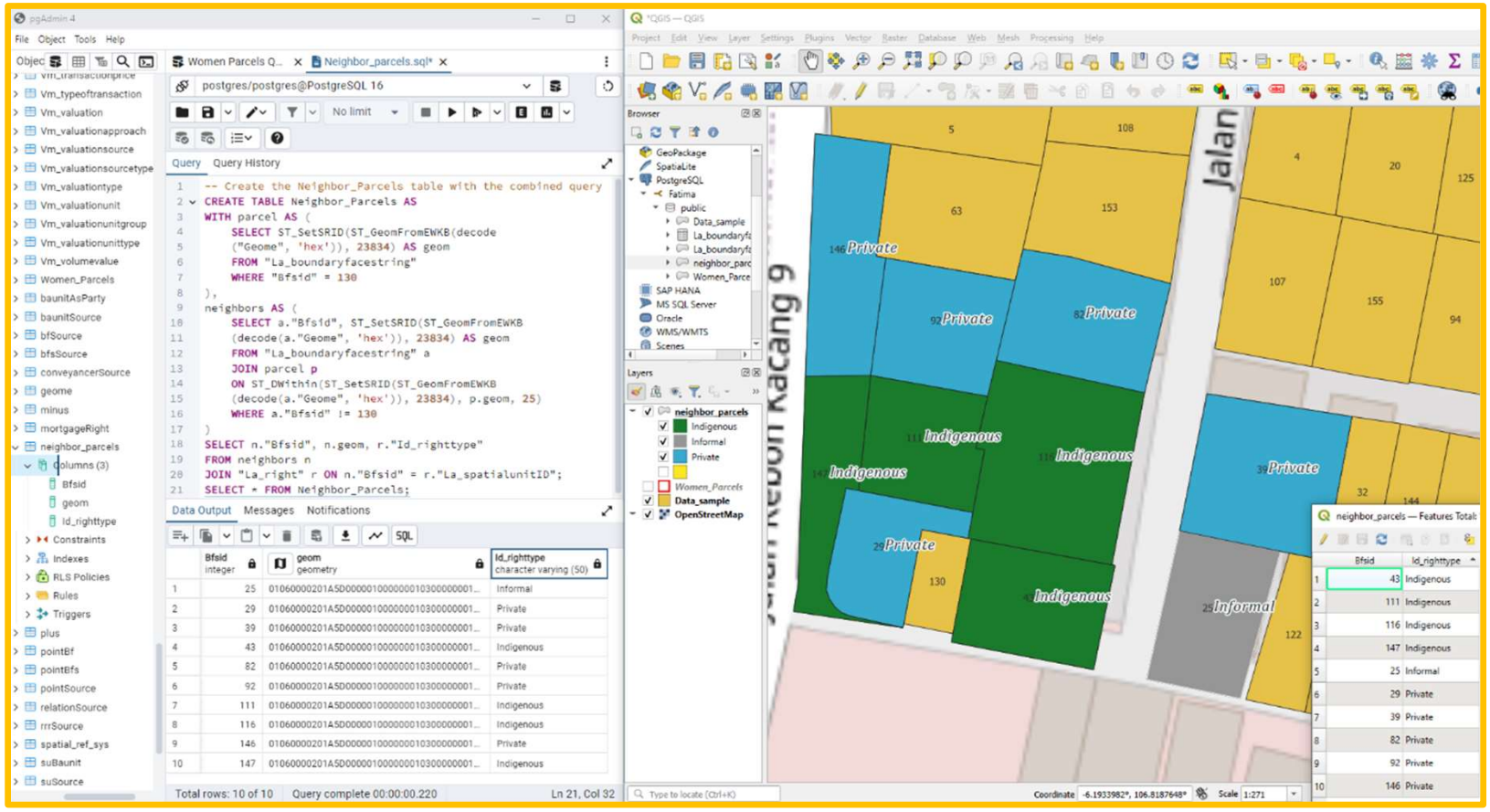
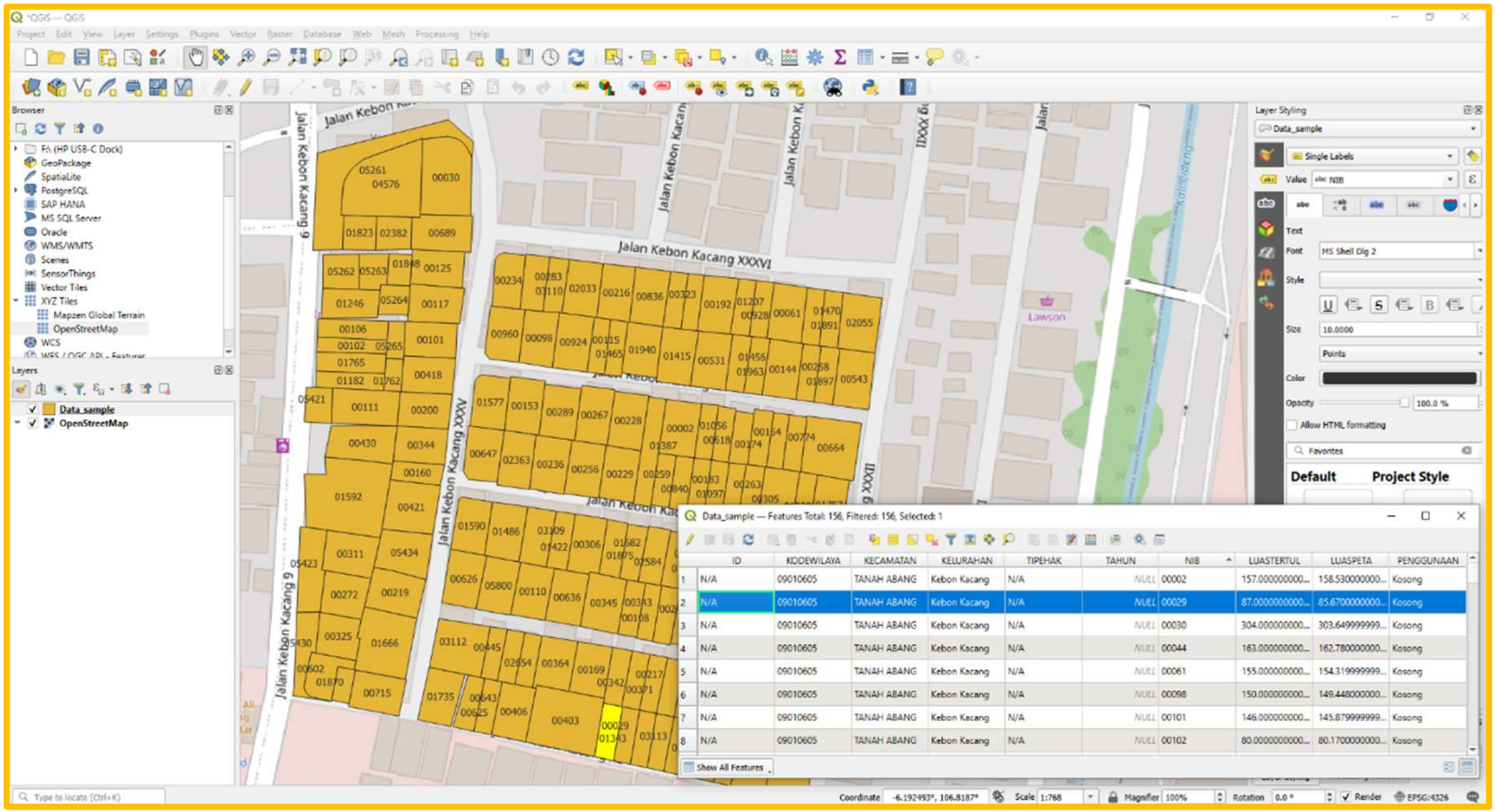


Neighbouring parcels query execution in pgAdmin with the distribution and ownership rights displayed in QGIS

Conclusion

- **Extended LADM Implementation:** Successfully extended the Land Administration Domain Model (LADM) to address critical issues of marginalised communities.
- **Feasibility Demonstrated:** The implementation using PostgreSQL and pgAdmin validated the model's enhanced capabilities, proving its practical applicability
- **Alignment with Global Initiatives:** The model aligns with global Initiatives goals, such as the SDGs and FELA, promoting more inclusive and equitable land governance.
- **Technical Feasibility:** The physical data model faced challenges, but these were overcome through careful refinement and SQL adjustments.

Challenges: Data Collection and Insertion



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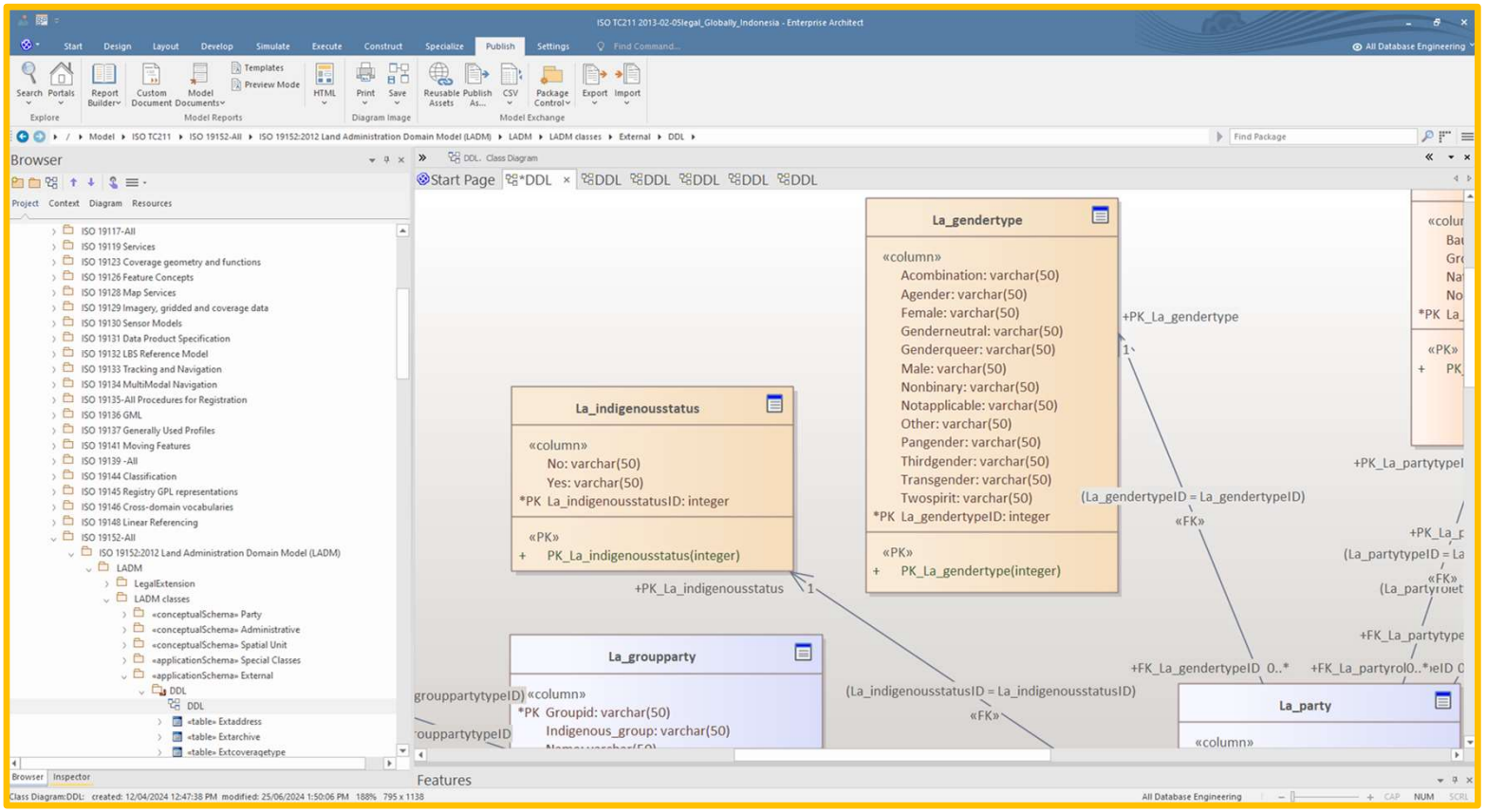
Challenges: Modification of Relationships in DDL



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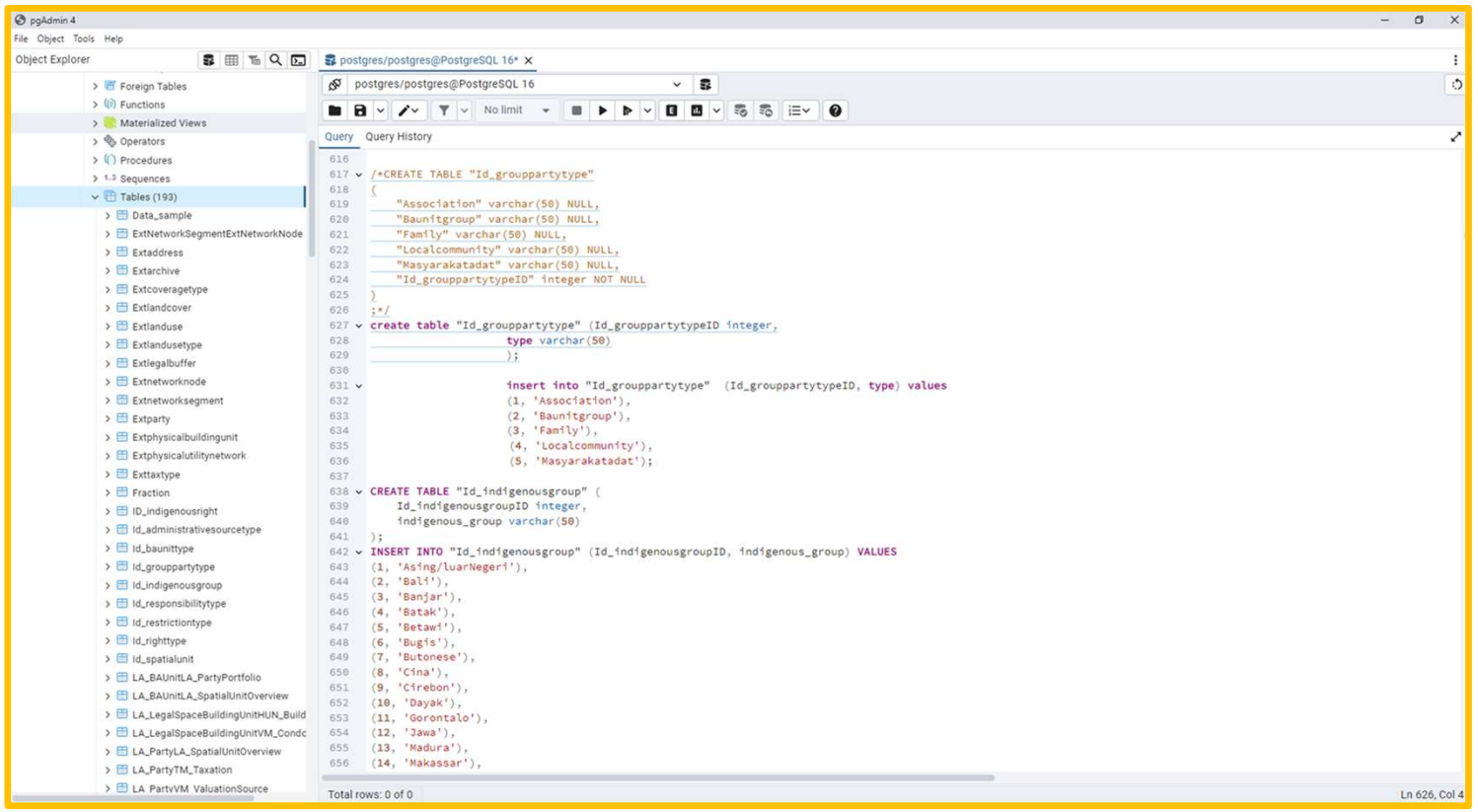
Challenges: Redundant and Unnecessary Data

Code List Representation in SQL



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Thanks

Fatemeh Jahani Chehrehbargh

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LinkedIn: www.linkedin.com/in/fatemeh-jahani

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