



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

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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

unece.org

economicsdiscussion.net

Esri.com



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

The 2030 Agenda:
Sustainable Development Goals

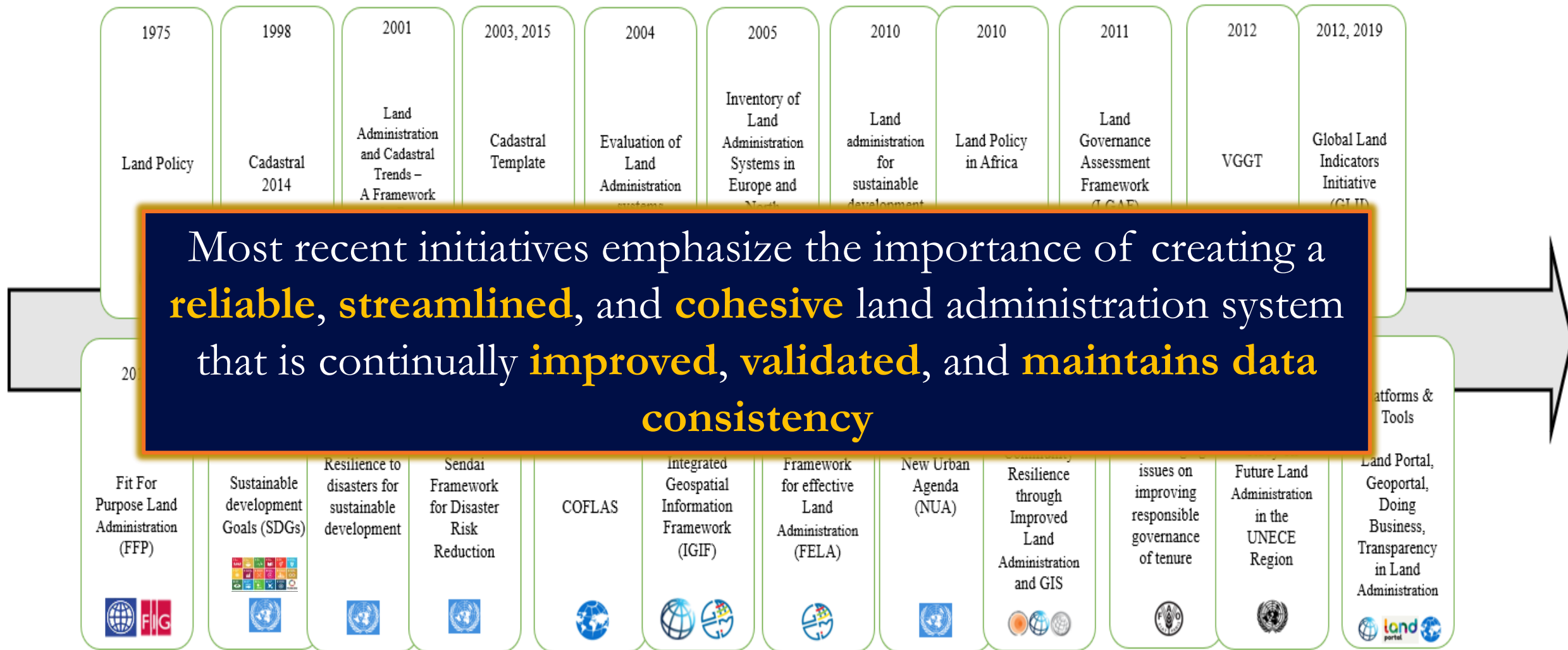
1 Agenda 17 Goals 169 Targets 232 Indicators



Transforming our world, Leave no one behind

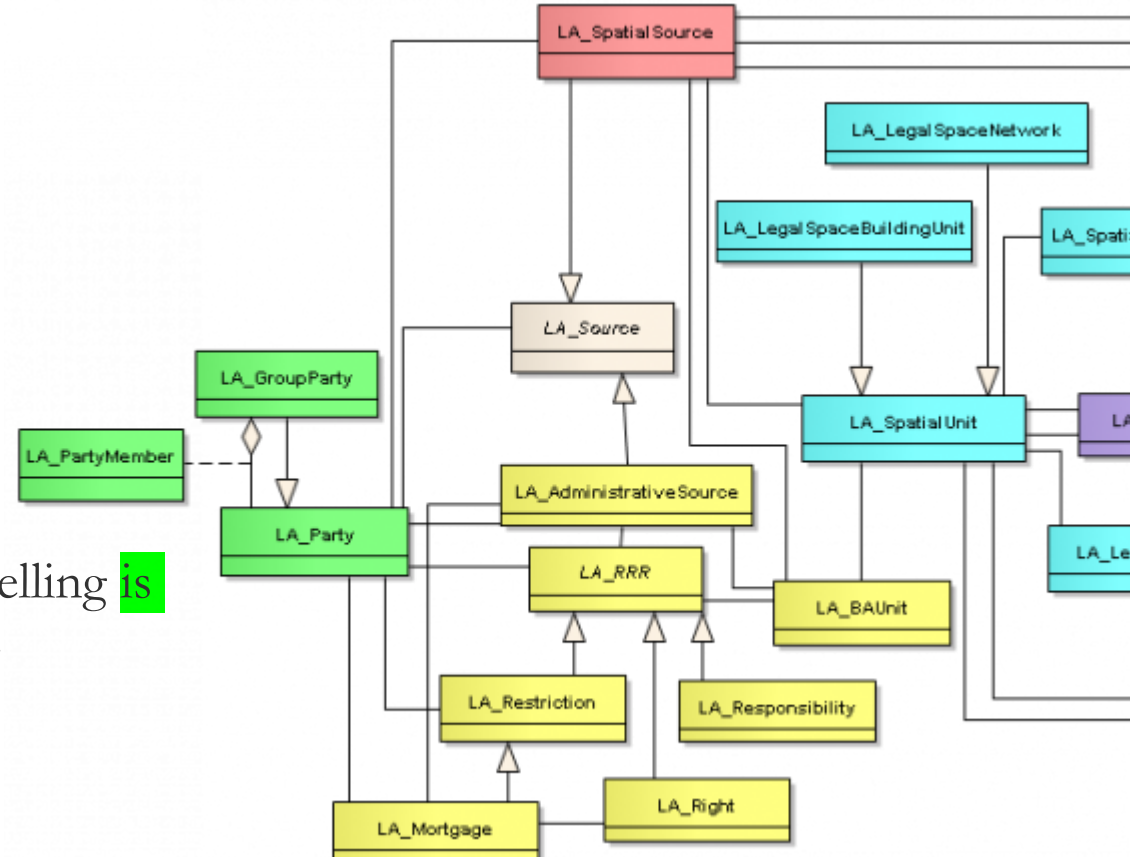
Land Matters In SDGs

Investigating Global Initiatives



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

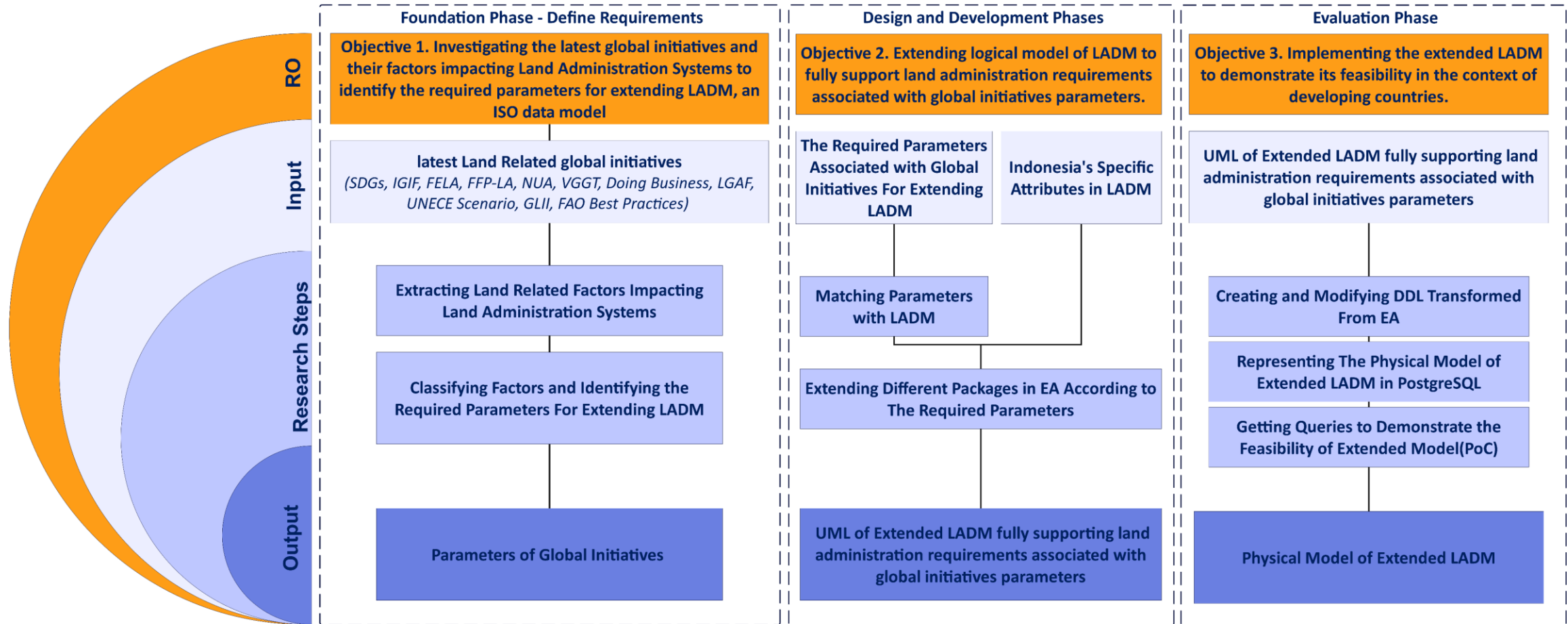
Research Objective 2

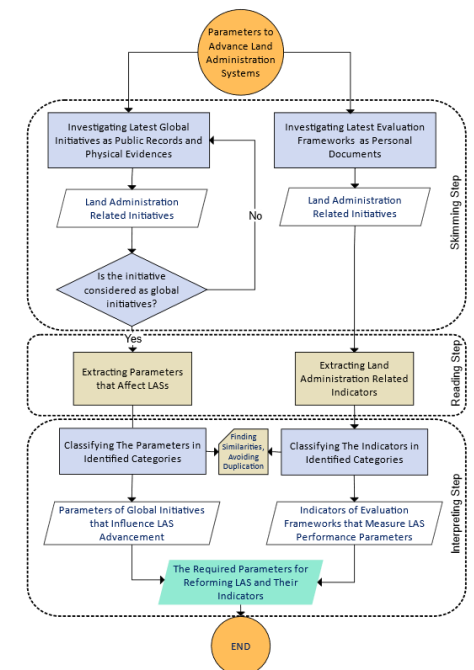
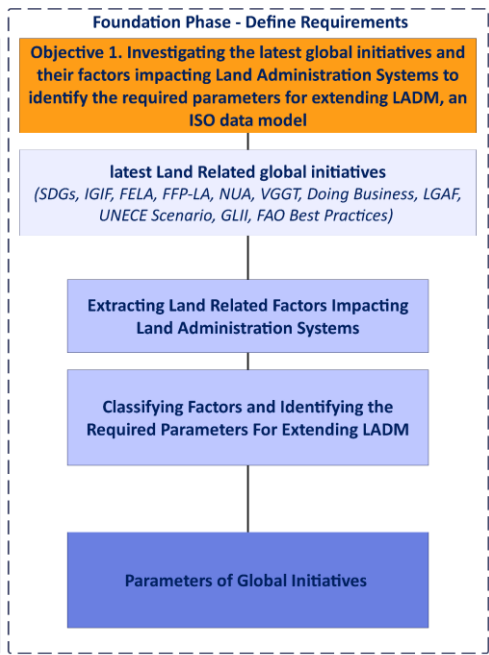
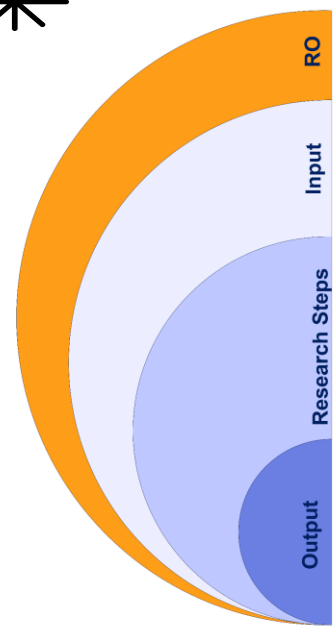
To extend the logical model of LADM to support land administration requirements associated with global initiatives parameters

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

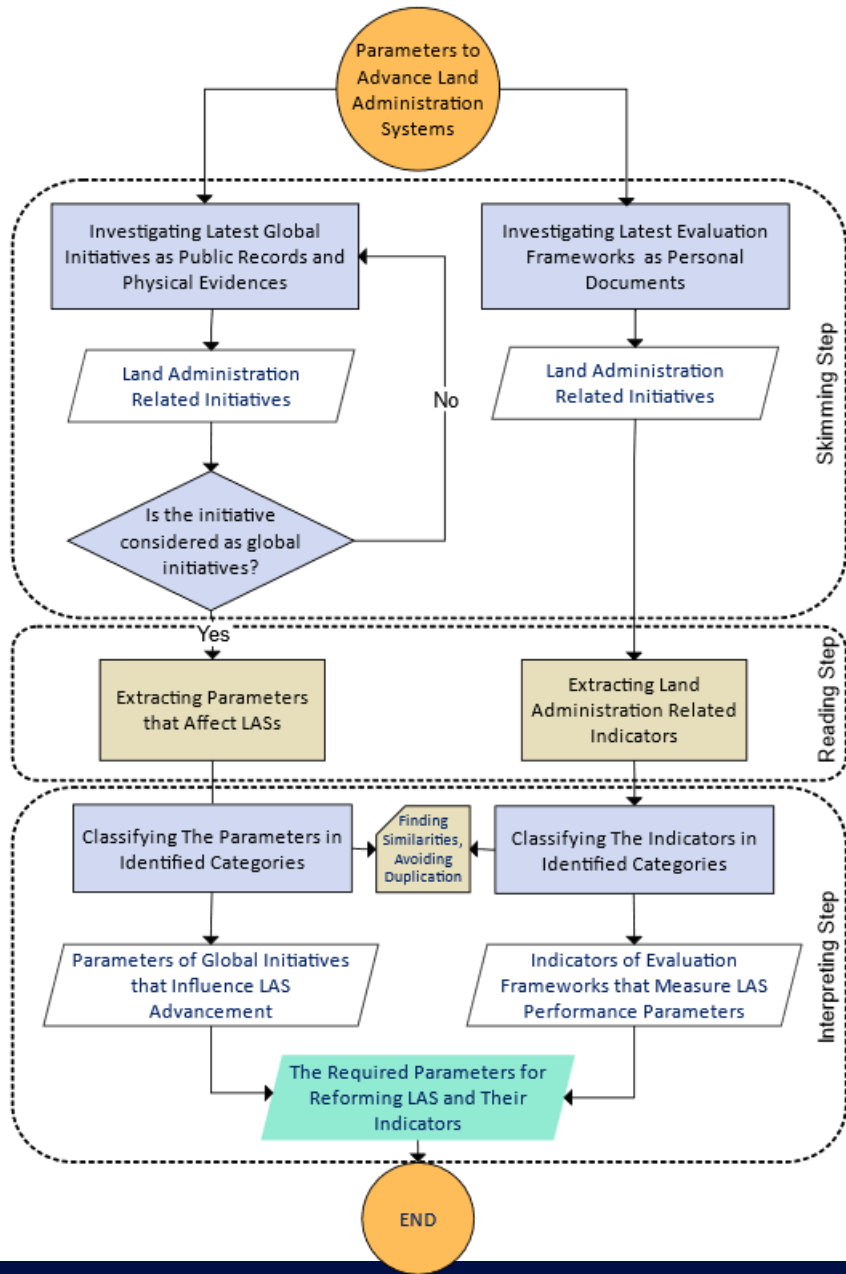


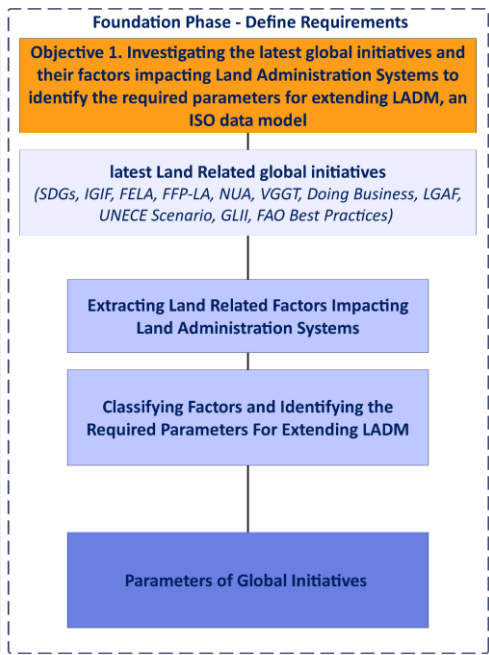
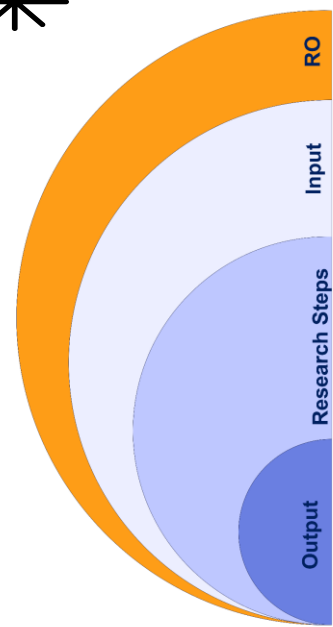


Document Analysis Method



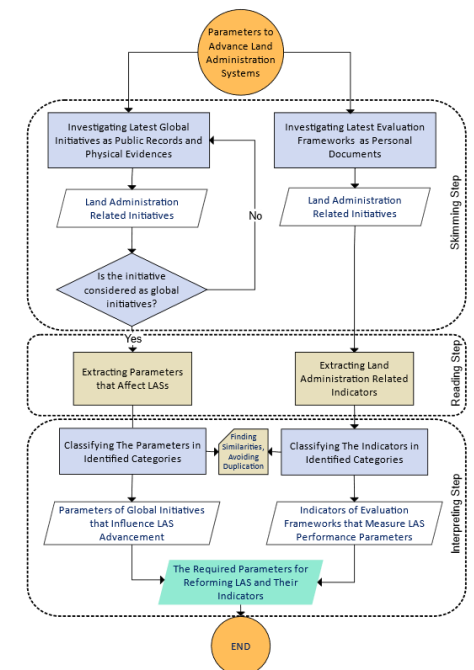
Document Analysis Method



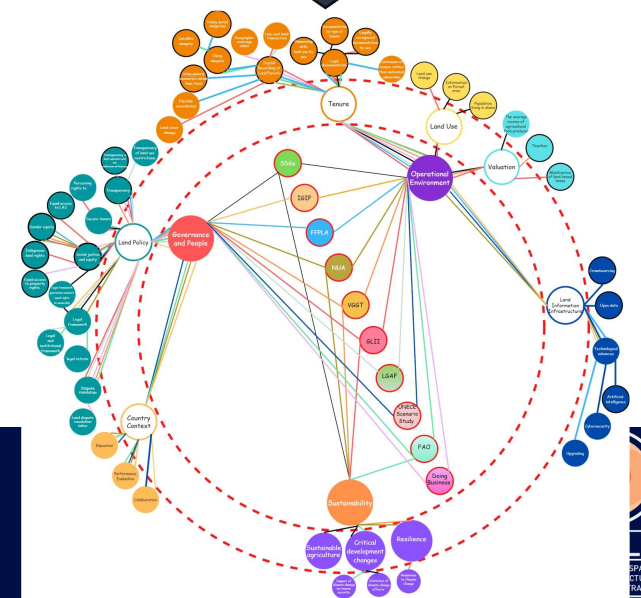


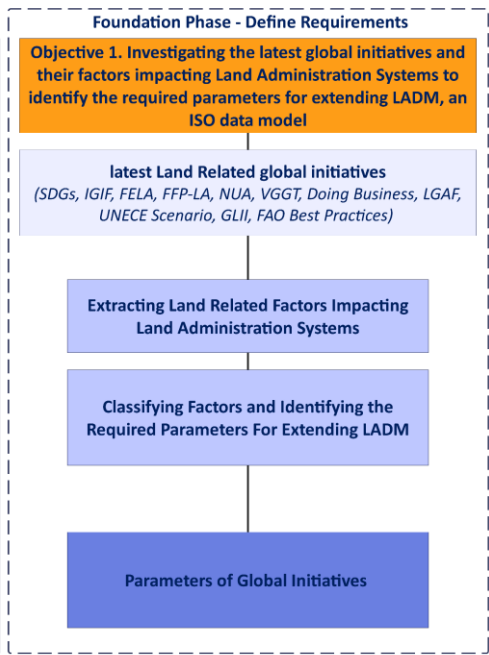
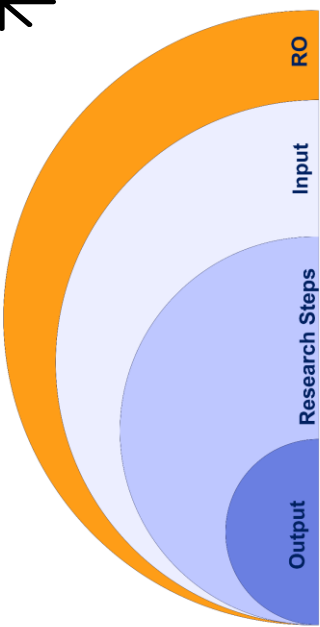
RO1

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



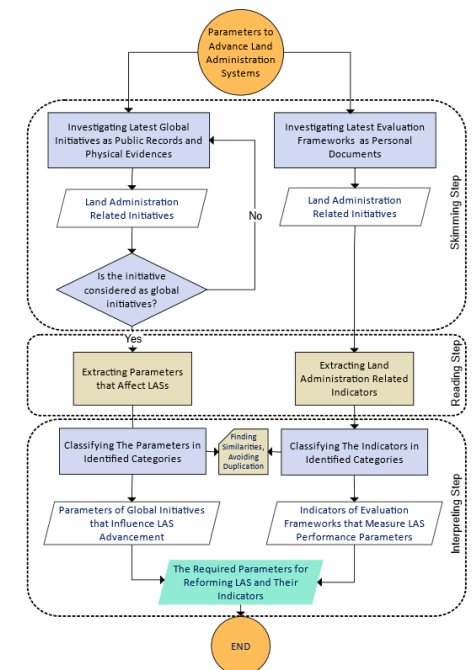
Document Analysis Method



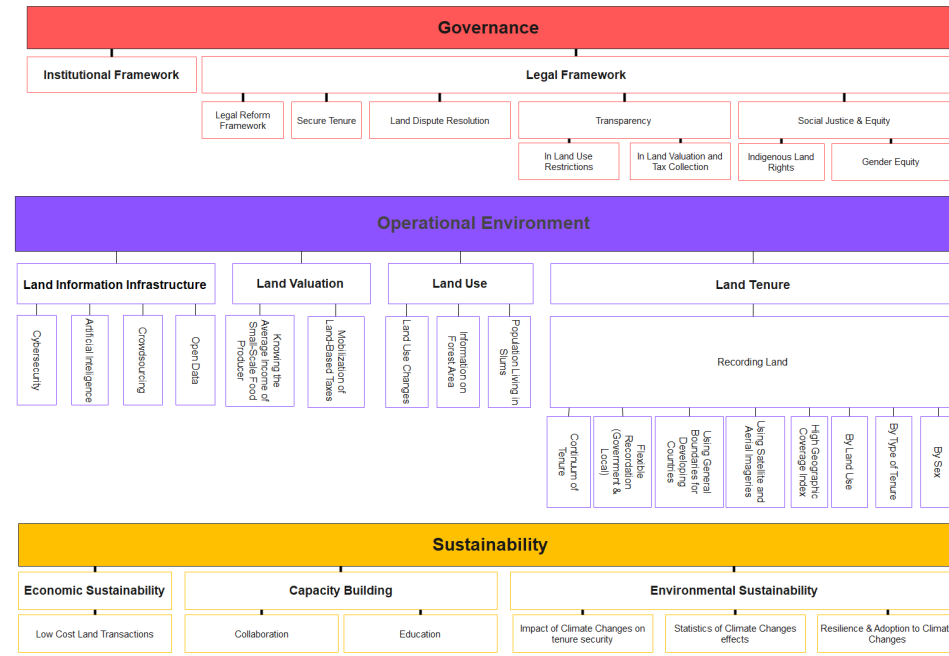
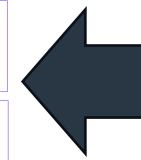
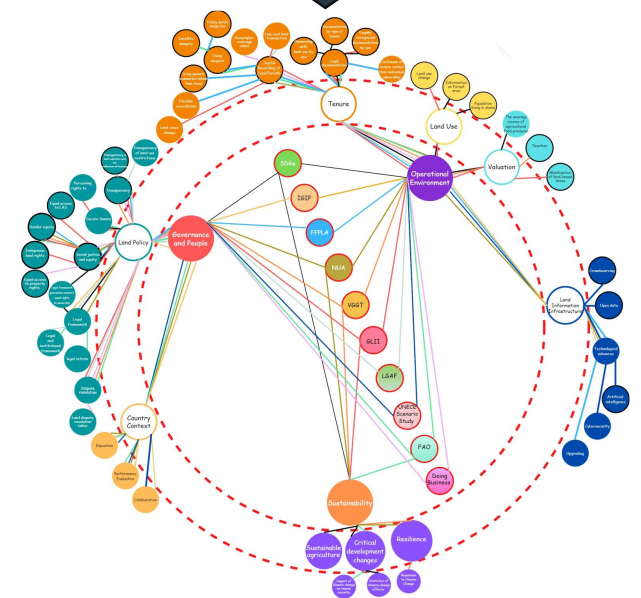


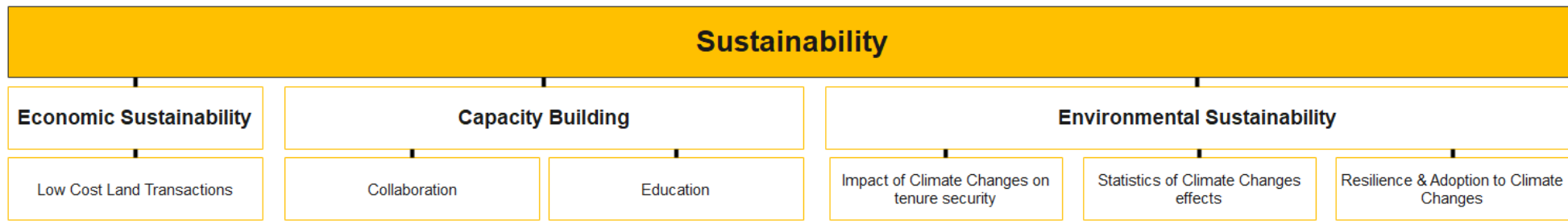
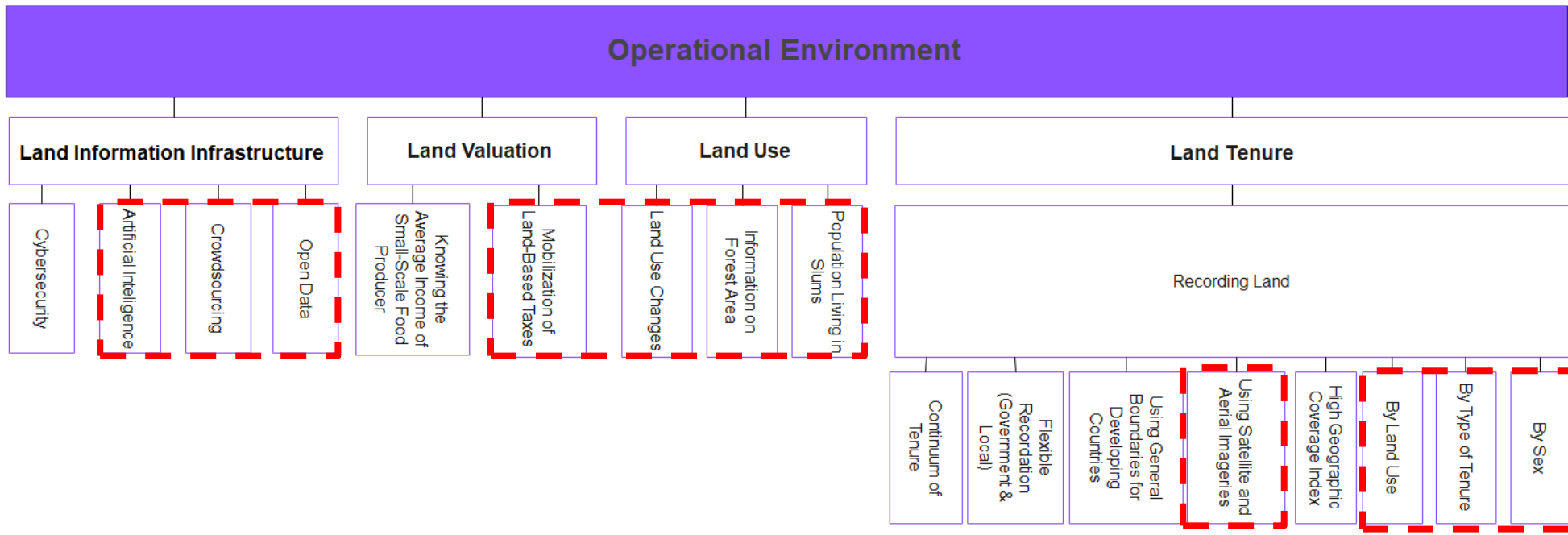
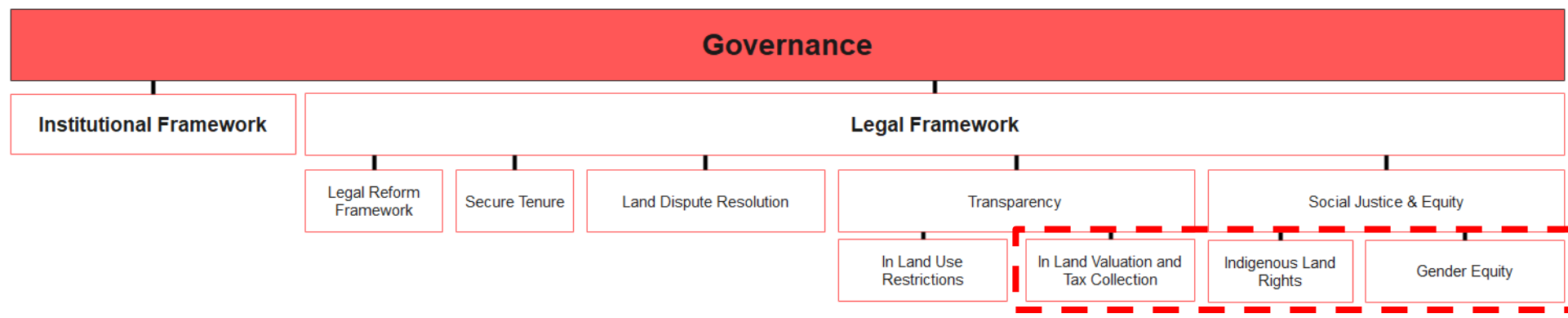
RO1

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Document Analysis Method

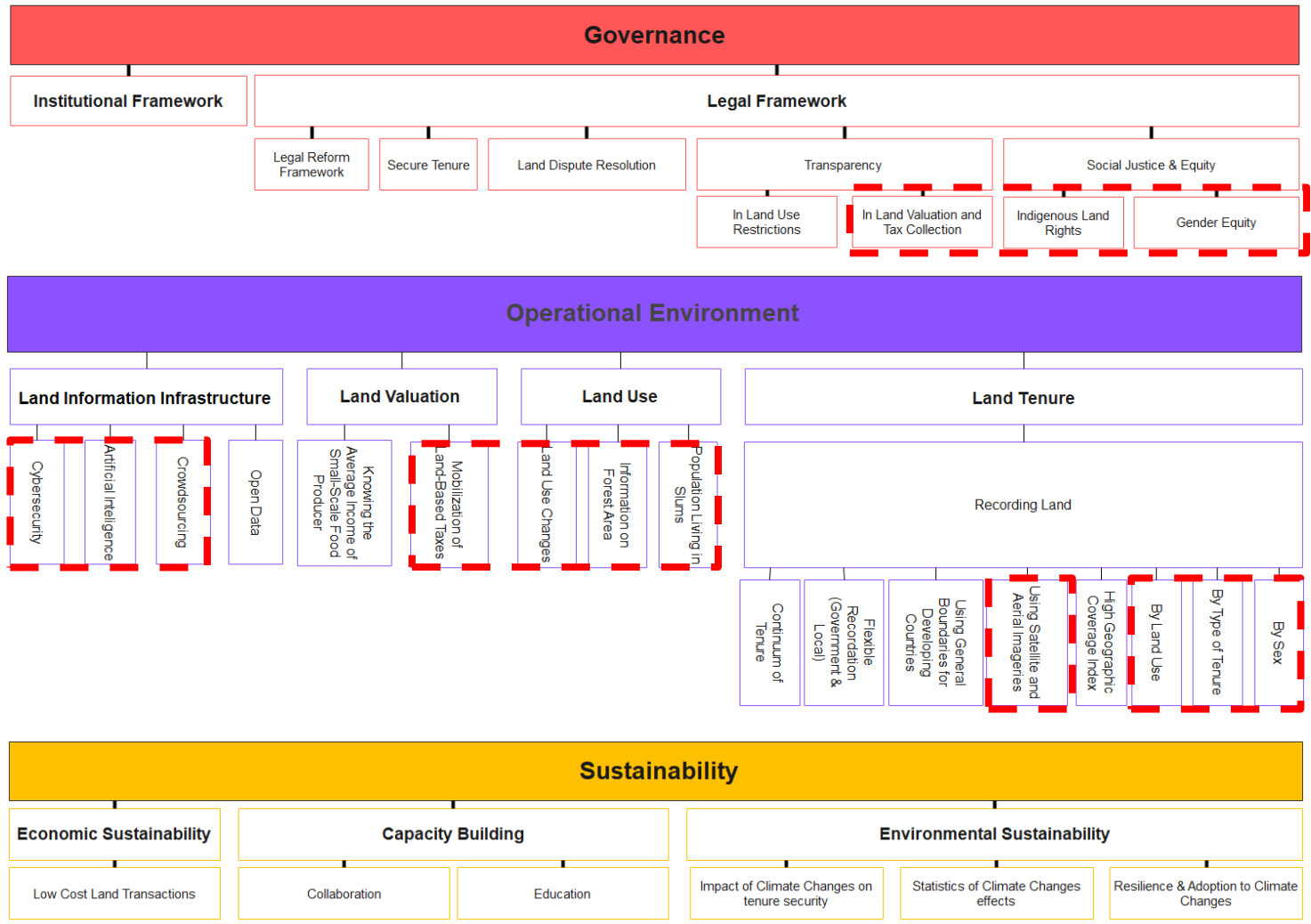




Parameters of Global Initiatives With Potential Impact on LAS

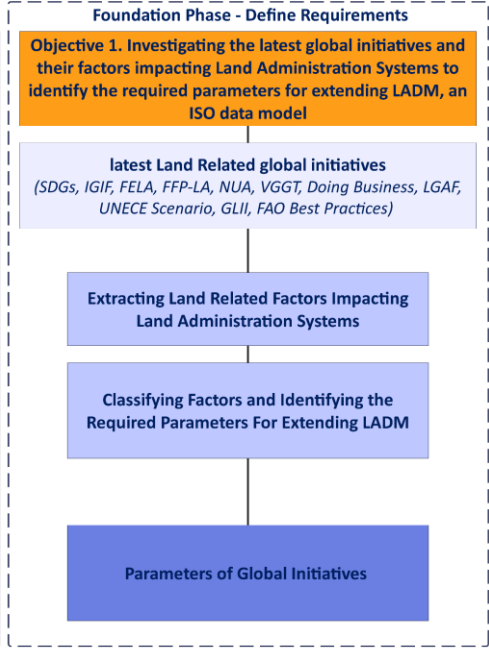


Parameters of Global Initiatives With Potential Impact on LAS



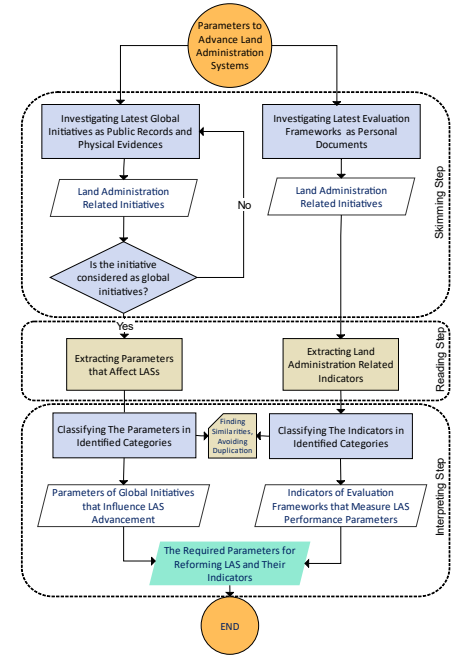
Applicable Parameters on the Data Model





RO1

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



Advancing Land Administration System - Implication of Recent International Trends

Performance Evaluation of Land Administration Systems - Implication of Global Initiatives

Identifying global parameters for advancing Land Administration Systems

Parameters: Johnas Chelobekha¹, Akhbar Rappah², Belham Amallah³, Daniel Sindiga⁴

ABSTRACT

Operational and efficient land management is critical for promoting the national economic growth, environmental sustainability, and social justice. The land administration system (LAS) is a complex system that involves the management of land resources, including land use, land ownership, and land tenure. The LAS is a critical component of the national infrastructure and is essential for the sustainable development of a country. This paper discusses the implications of recent international trends on the LAS and identifies the global parameters for advancing the LAS. The paper also discusses the challenges and opportunities for the LAS and provides recommendations for the improvement of the LAS. The paper is organized as follows: Section 1 discusses the implications of recent international trends on the LAS. Section 2 discusses the global parameters for advancing the LAS. Section 3 discusses the challenges and opportunities for the LAS. Section 4 provides recommendations for the improvement of the LAS. Section 5 concludes the paper.

1. Introduction

The land administration system (LAS) is a complex system that involves the management of land resources, including land use, land ownership, and land tenure. The LAS is a critical component of the national infrastructure and is essential for the sustainable development of a country. This paper discusses the implications of recent international trends on the LAS and identifies the global parameters for advancing the LAS. The paper also discusses the challenges and opportunities for the LAS and provides recommendations for the improvement of the LAS. The paper is organized as follows: Section 1 discusses the implications of recent international trends on the LAS. Section 2 discusses the global parameters for advancing the LAS. Section 3 discusses the challenges and opportunities for the LAS. Section 4 provides recommendations for the improvement of the LAS. Section 5 concludes the paper.

2. Global Parameters for Advancing the LAS

The global parameters for advancing the LAS are identified based on the analysis of recent international trends. The parameters are categorized into four main areas: Governance, Operational Environment, Sustainability, and Capacity Building. The parameters are discussed in detail in the following sections.

3. Challenges and Opportunities for the LAS

The LAS faces several challenges and opportunities. The challenges include the lack of data, the lack of resources, and the lack of expertise. The opportunities include the availability of new technologies, the increasing demand for land services, and the growing awareness of the importance of the LAS. The paper discusses the challenges and opportunities in detail in the following sections.

4. Recommendations for the Improvement of the LAS

The paper provides several recommendations for the improvement of the LAS. The recommendations include the need for data, the need for resources, and the need for expertise. The paper discusses the recommendations in detail in the following sections.

5. Conclusion

The paper concludes that the LAS is a critical component of the national infrastructure and is essential for the sustainable development of a country. The paper identifies the global parameters for advancing the LAS and discusses the challenges and opportunities for the LAS. The paper also provides recommendations for the improvement of the LAS. The paper is organized as follows: Section 1 discusses the implications of recent international trends on the LAS. Section 2 discusses the global parameters for advancing the LAS. Section 3 discusses the challenges and opportunities for the LAS. Section 4 provides recommendations for the improvement of the LAS. Section 5 concludes the paper.

References

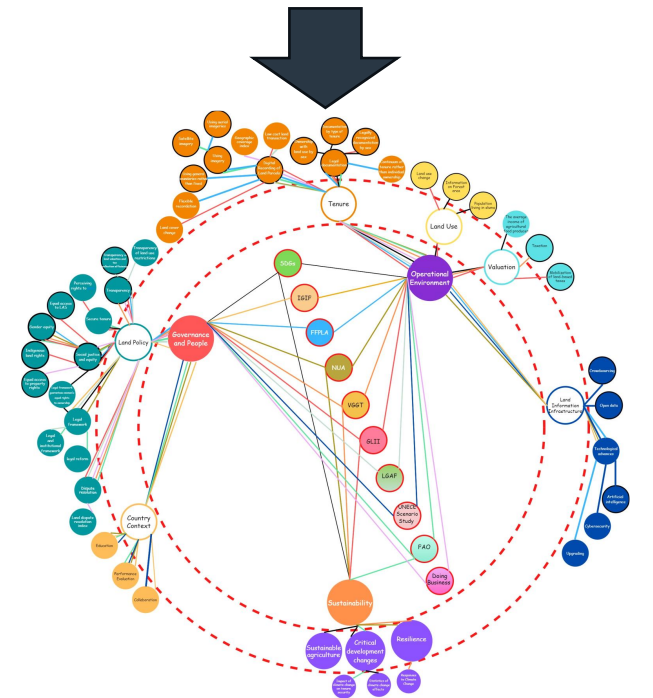
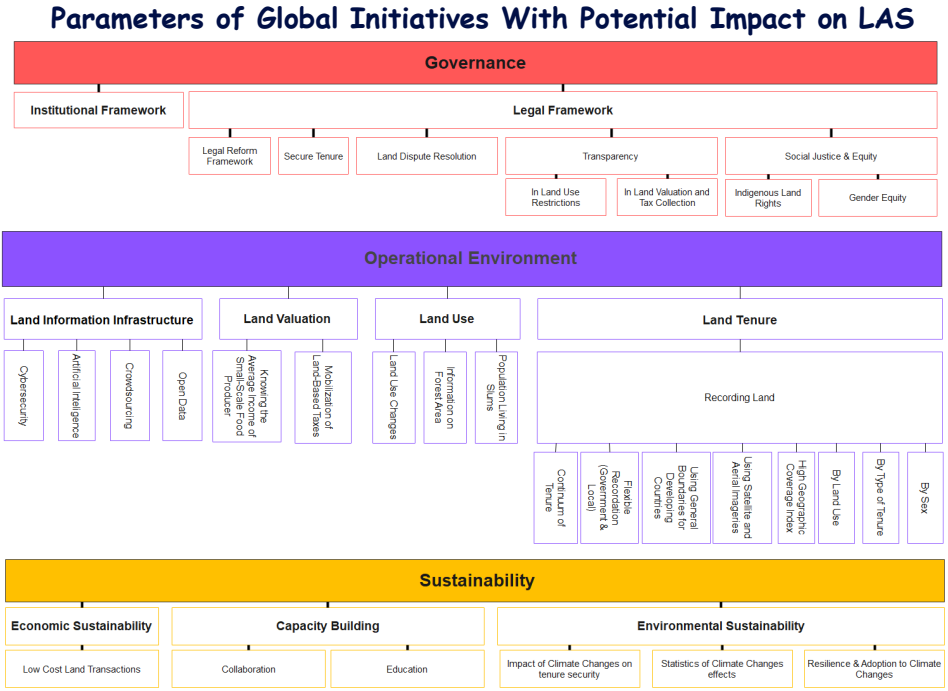
[1] Johnas Chelobekha, Akhbar Rappah, Belham Amallah, Daniel Sindiga, "Identifying global parameters for advancing Land Administration Systems", *Journal of Land Administration*, vol. 15, no. 1, pp. 1-15, 2023.

[2] Johnas Chelobekha, Akhbar Rappah, Belham Amallah, Daniel Sindiga, "Performance Evaluation of Land Administration Systems - Implication of Global Initiatives", *Journal of Land Administration*, vol. 15, no. 2, pp. 1-15, 2023.

[3] Johnas Chelobekha, Akhbar Rappah, Belham Amallah, Daniel Sindiga, "Advancing Land Administration System - Implication of Recent International Trends", *Journal of Land Administration*, vol. 15, no. 3, pp. 1-15, 2023.

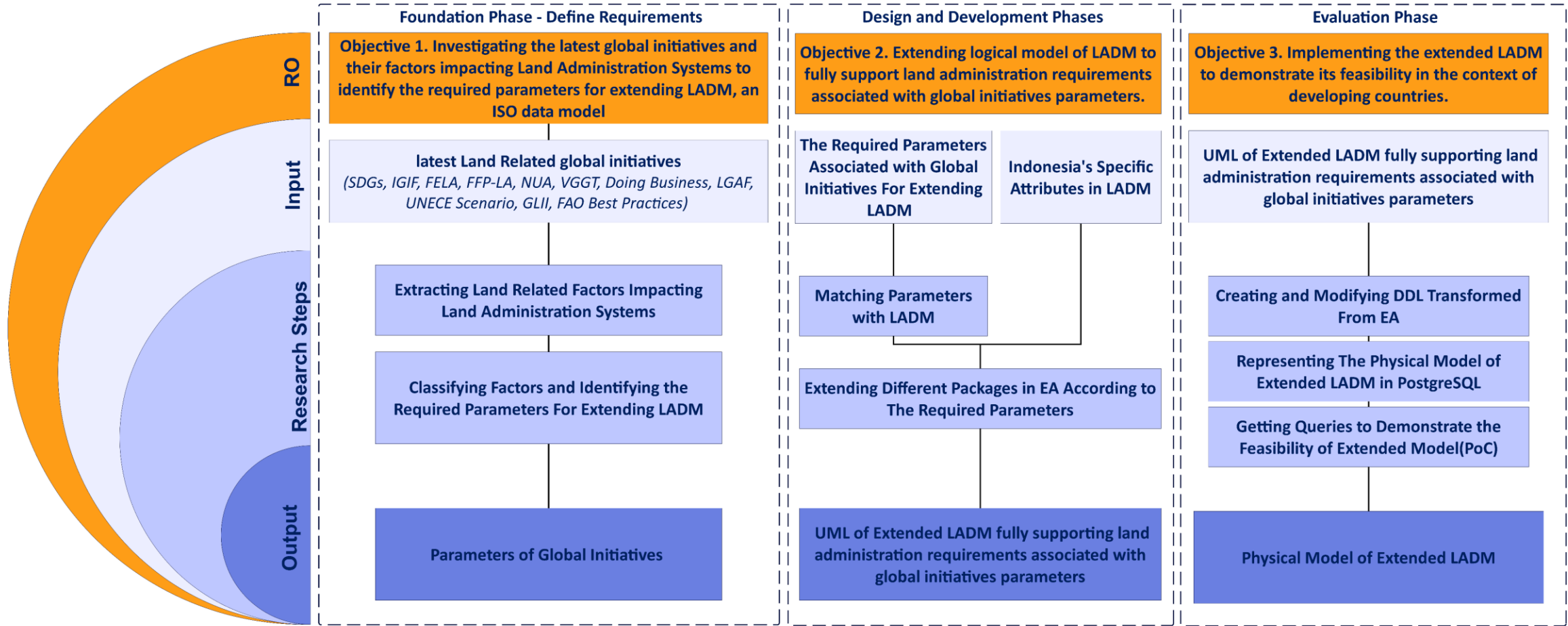
[4] Johnas Chelobekha, Akhbar Rappah, Belham Amallah, Daniel Sindiga, "Challenges and Opportunities for the Land Administration System", *Journal of Land Administration*, vol. 15, no. 4, pp. 1-15, 2023.

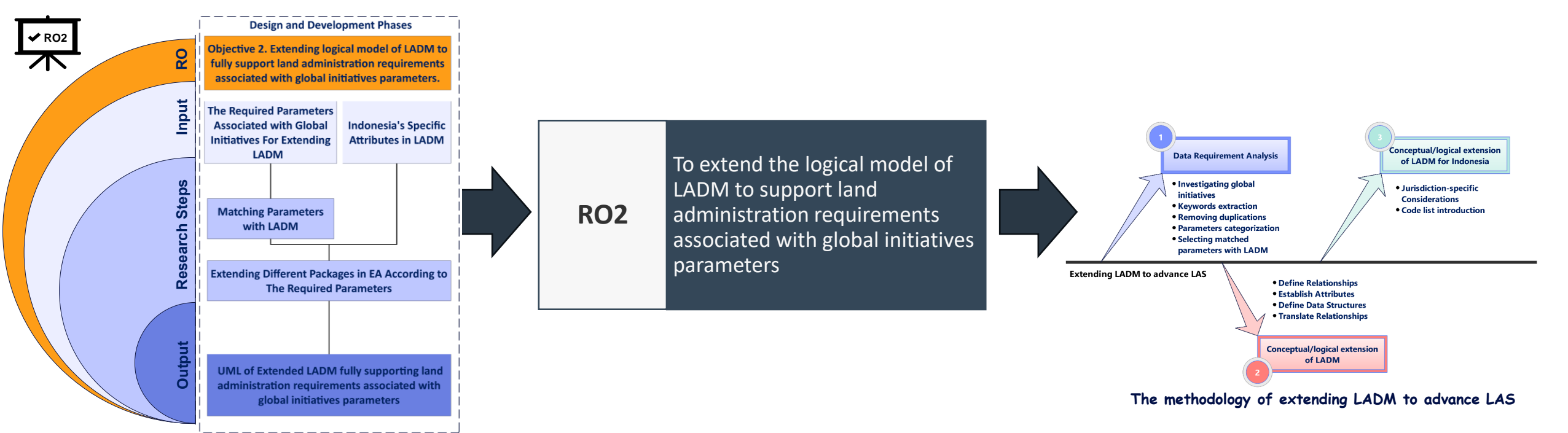
[5] Johnas Chelobekha, Akhbar Rappah, Belham Amallah, Daniel Sindiga, "Recommendations for the Improvement of the Land Administration System", *Journal of Land Administration*, vol. 15, no. 5, pp. 1-15, 2023.



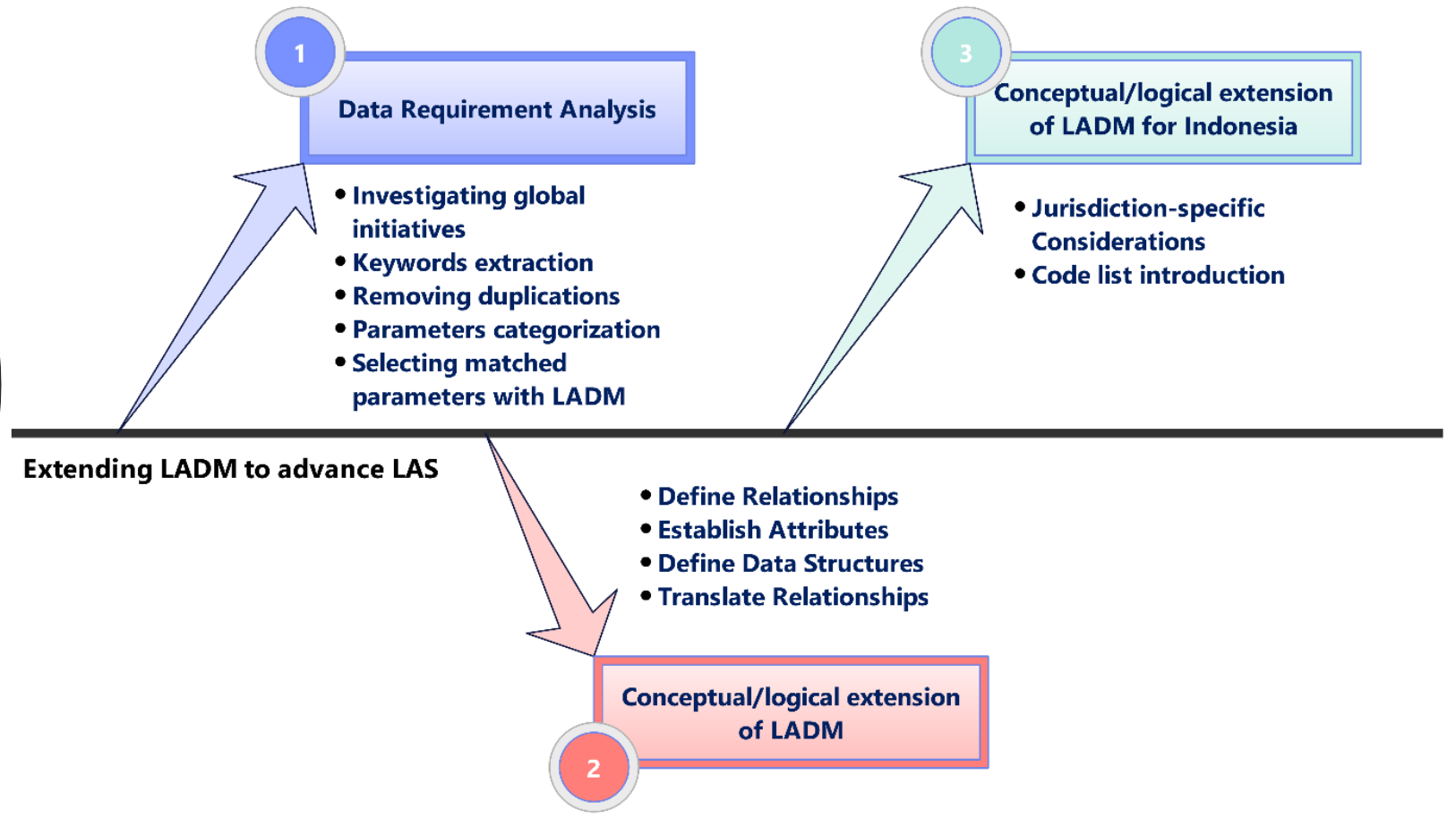
Design Science Research Methodology

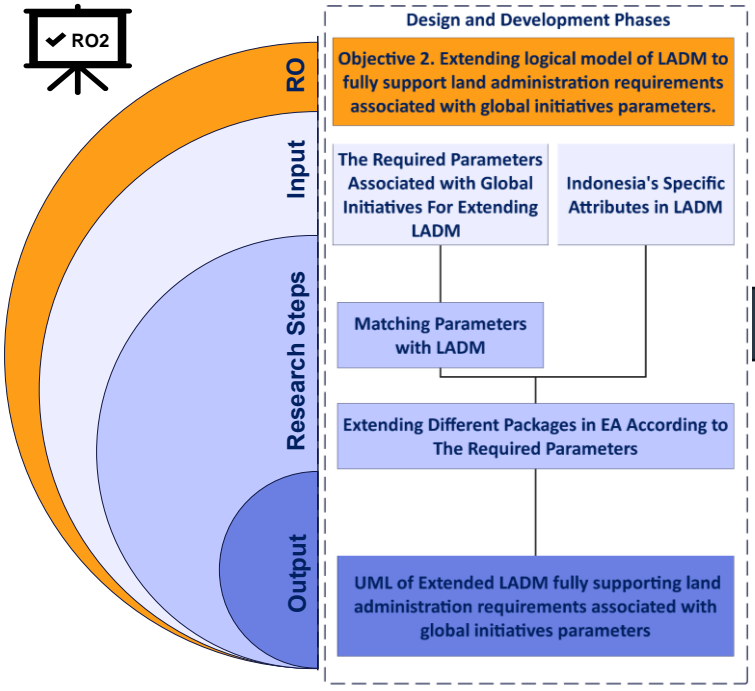
Details on Outputs





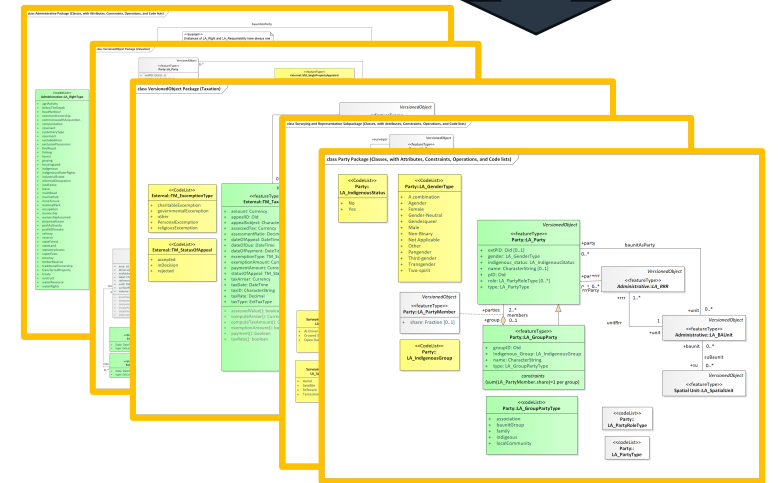
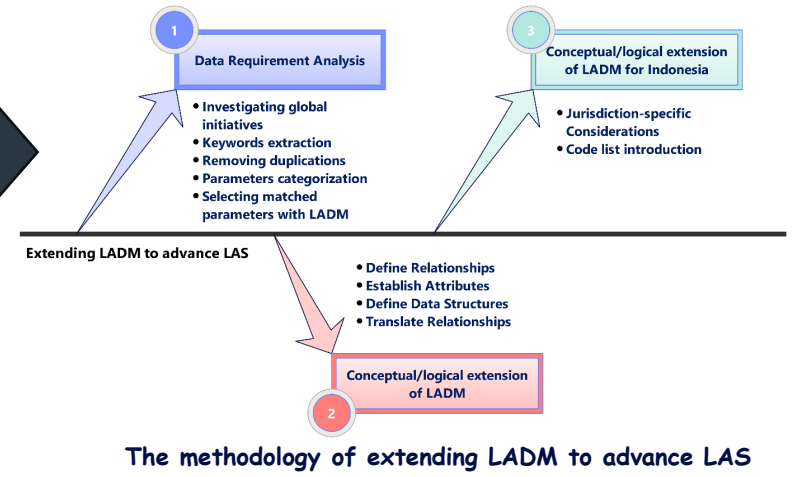
Methodology of extending LADM to advance LAS

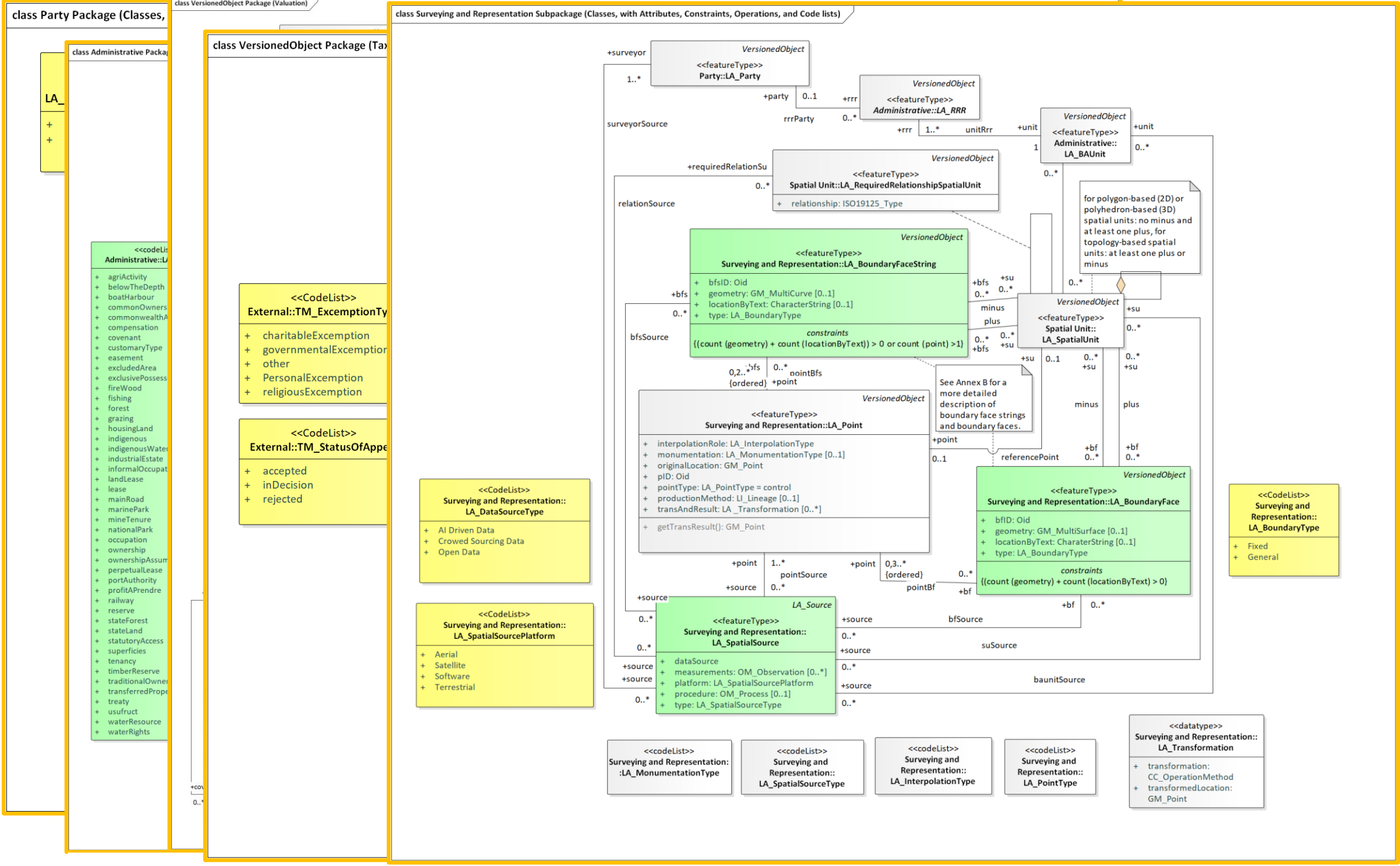


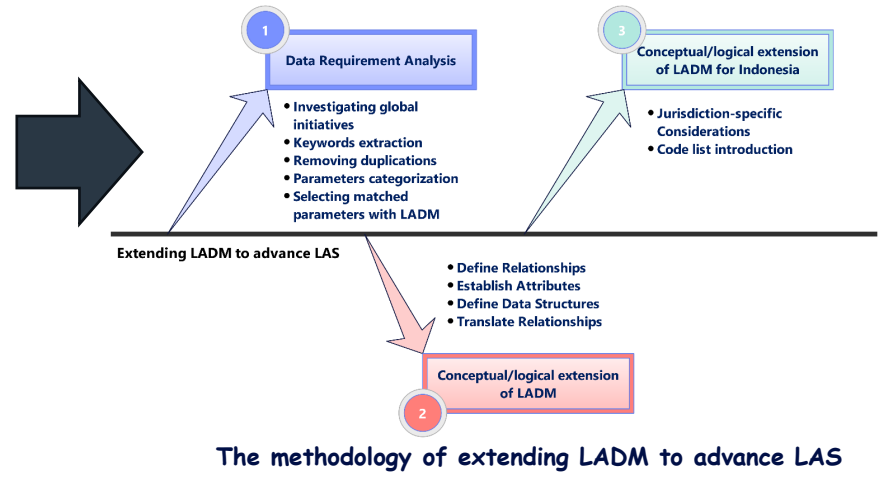
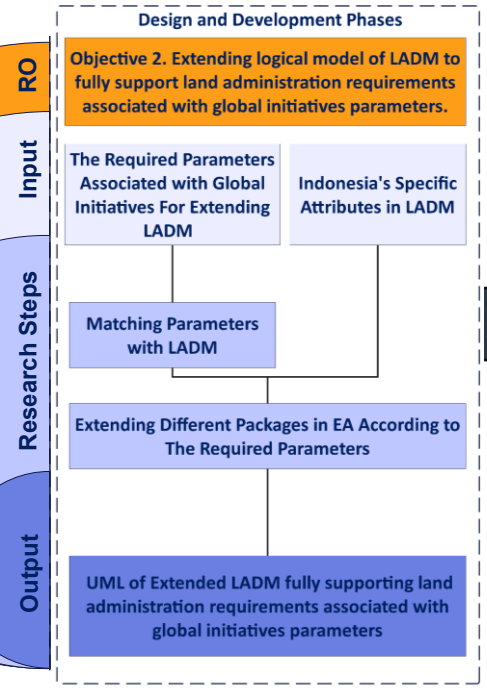


RO2

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







Geo-spatial Information Science (Under Review)

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

Fasheem Jahani Chehrbargh¹, Abbas Rajabfar², Baham Azaadeh³, Daniel Steudler⁴, and Bagus Wilaya Nugraha⁵

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

²Ukrainian Presidential Institution of Surveying (PII), Kyiv, Ukraine

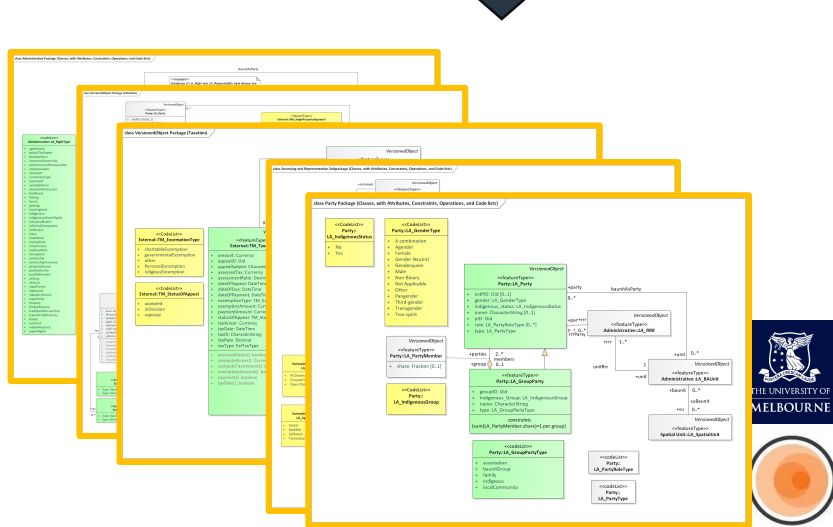
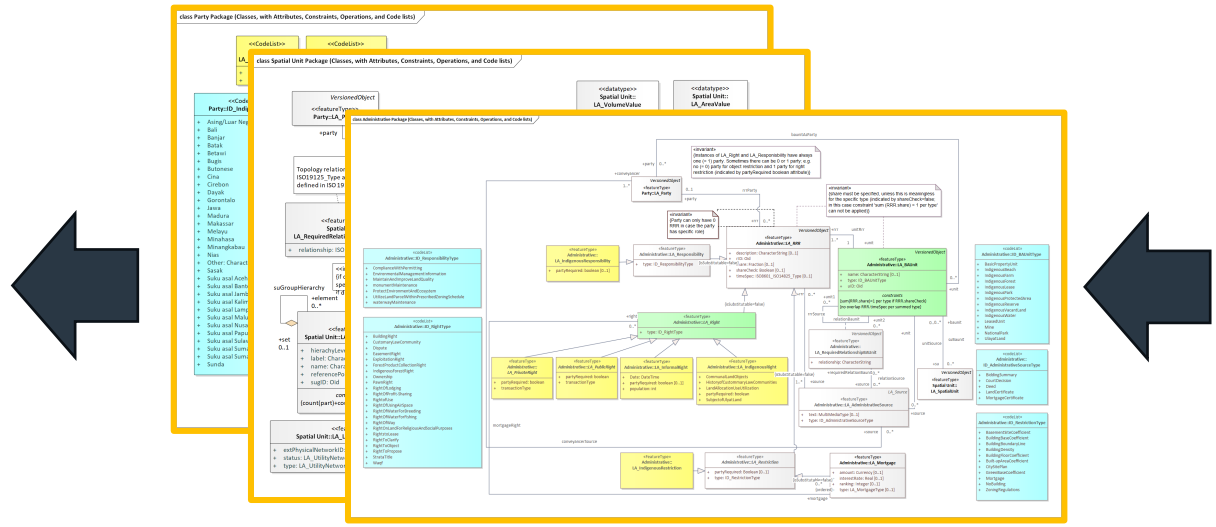
³Geomatics, The Ministry of Land Affairs and Spatial Planning (M/LAS), Indonesia

⁴Correspondence: jstue@unimelb.edu.au

Abstract

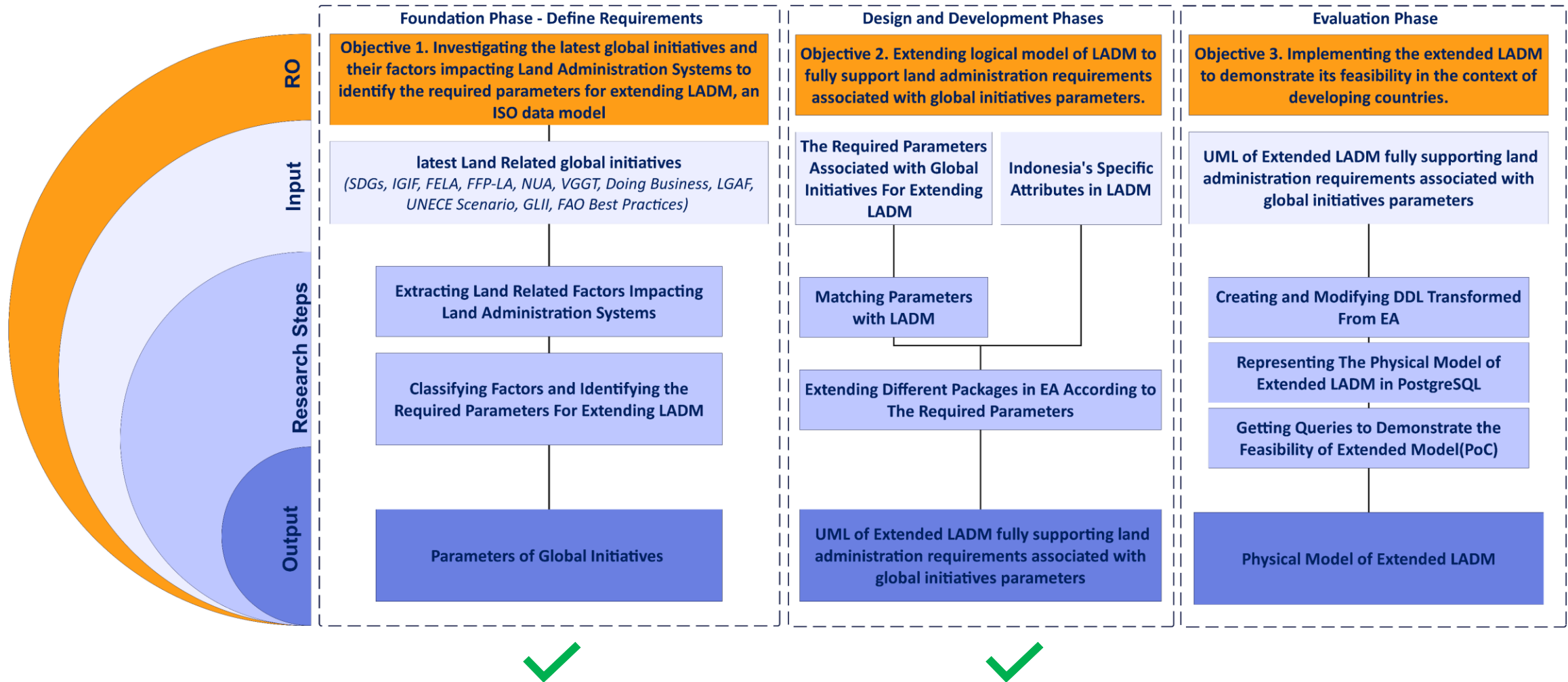
In the pursuit of economic stability and the fulfillment of Sustainable Development Goals (SDGs), effective Land Administration Systems (LASs) play a pivotal role in accurately recording rights, restrictions, and responsibilities (RRR). Global institutions, including the United Nations, the World Bank, 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.

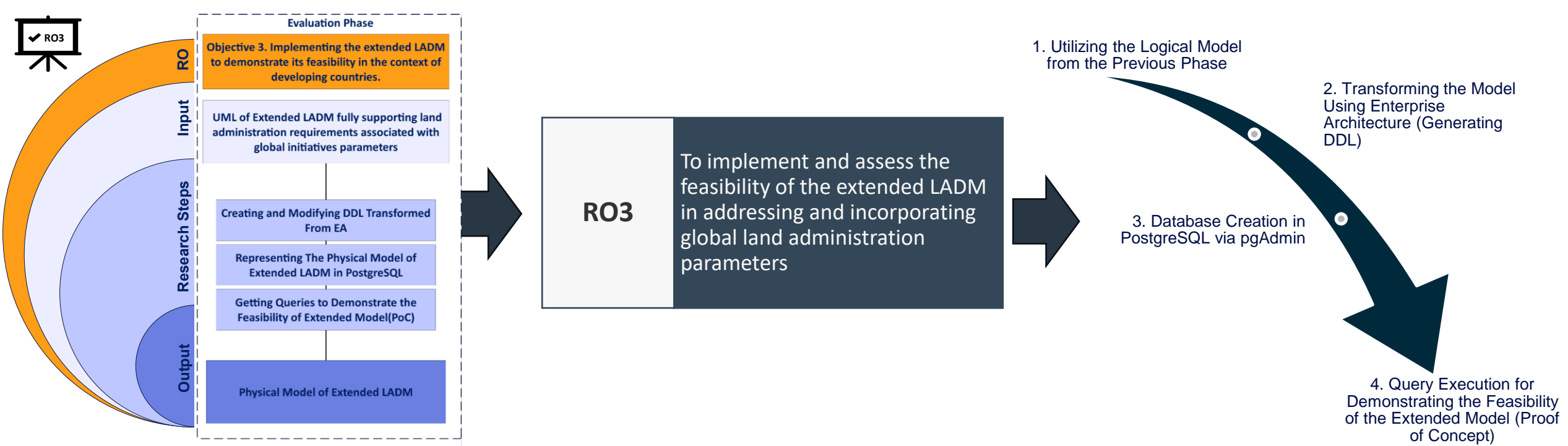
Keywords: Land Administration System, Global Initiatives, LADM, Indigenous Rights, Valuation and Taxation



Design Science Research Methodology

Details on Outputs





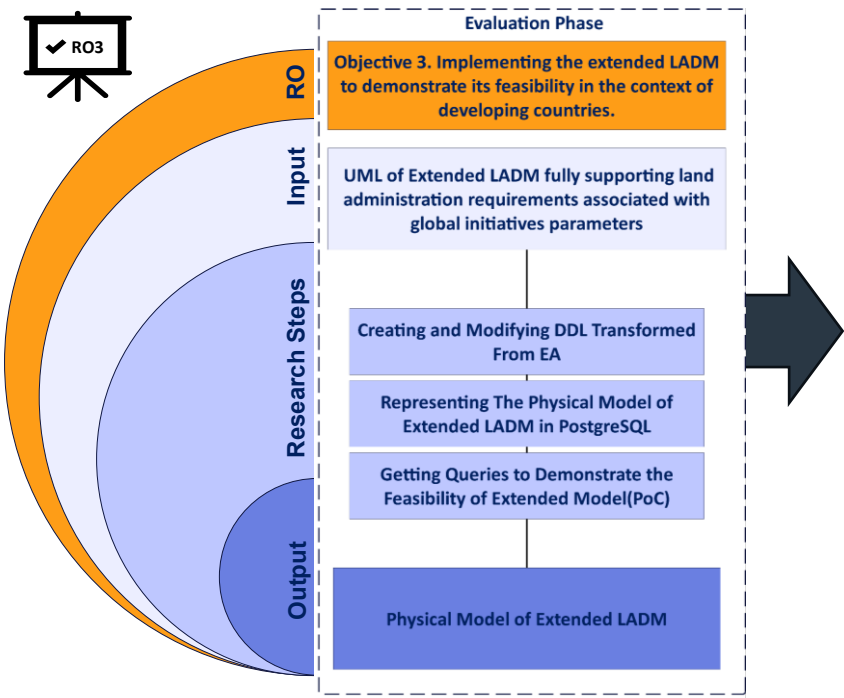
Methodology of Implementing Physical Model

1. Utilizing the Logical Model from the Previous Phase

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)

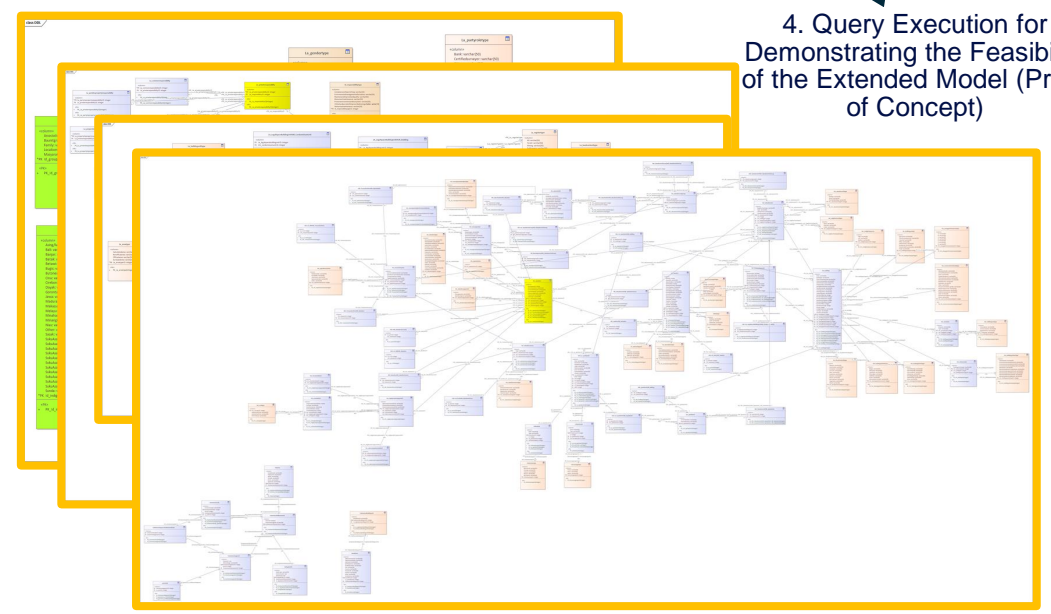


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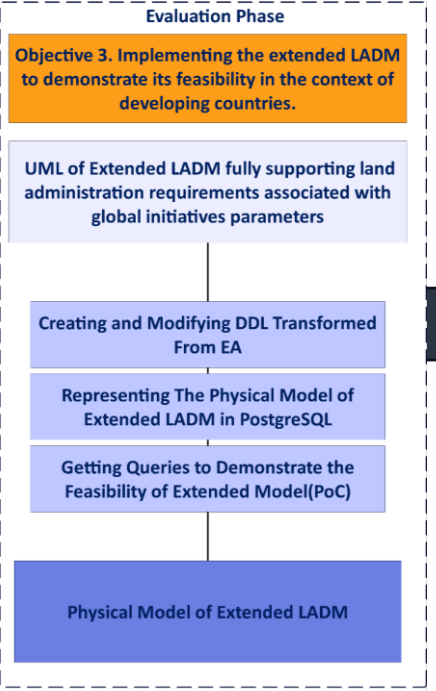


Using Enterprise Architecture Creating DDL

DDL of Spatial Unit Package

DDL of External Package

DDL of Administration Package



RO3

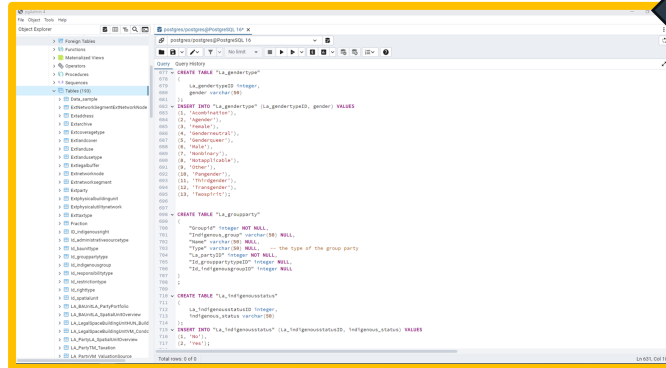
To implement and assess the feasibility of the extended LADM in addressing and incorporating global land administration parameters

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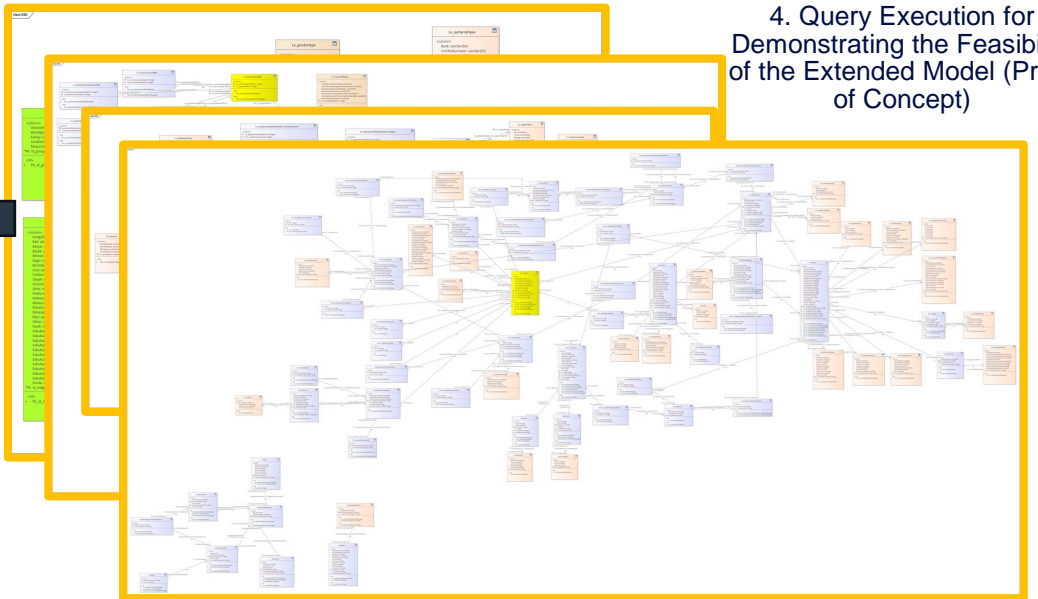
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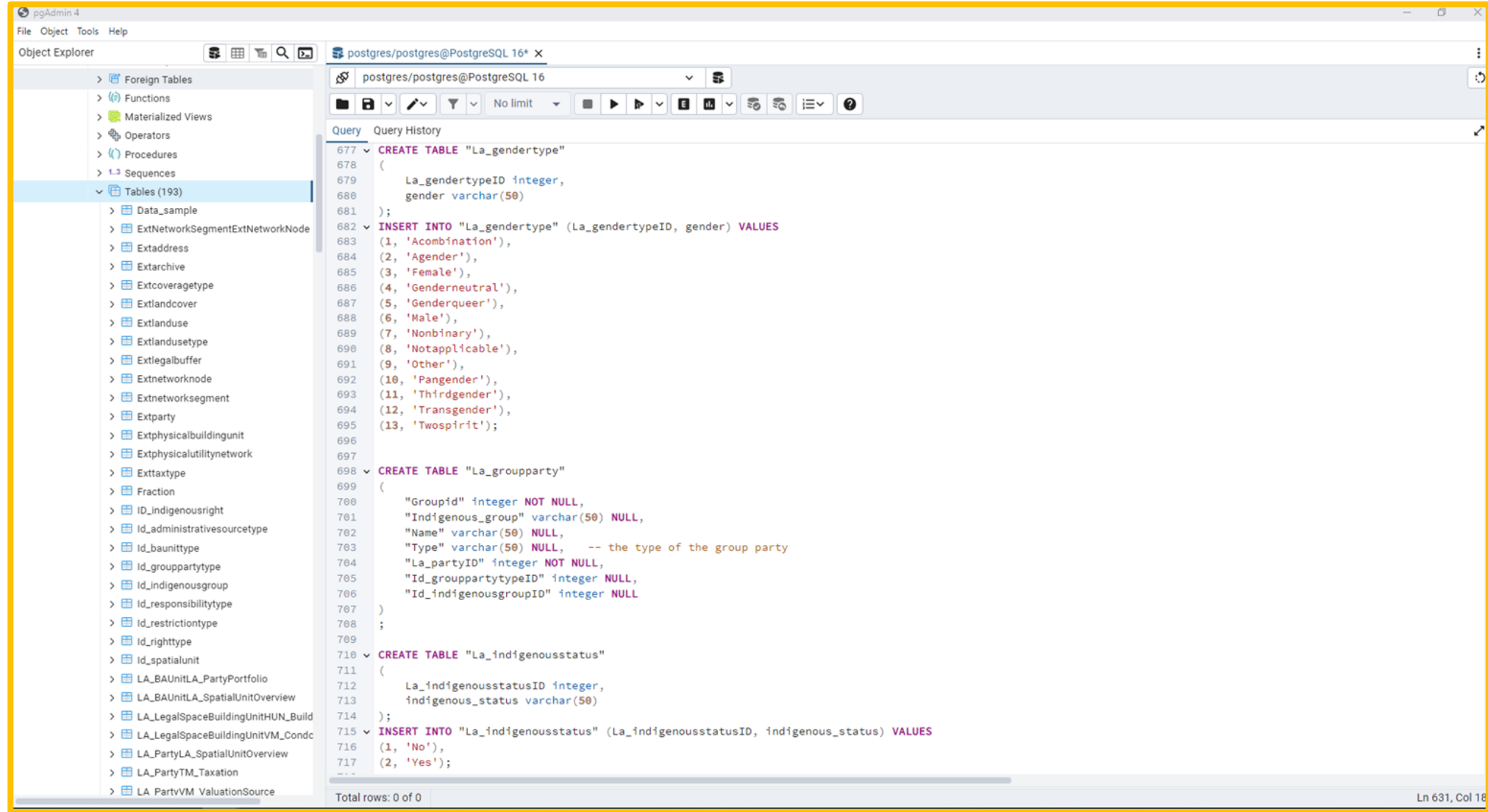


Database Creation in PostgreSQL



Using Enterprise Architecture Creating DDL

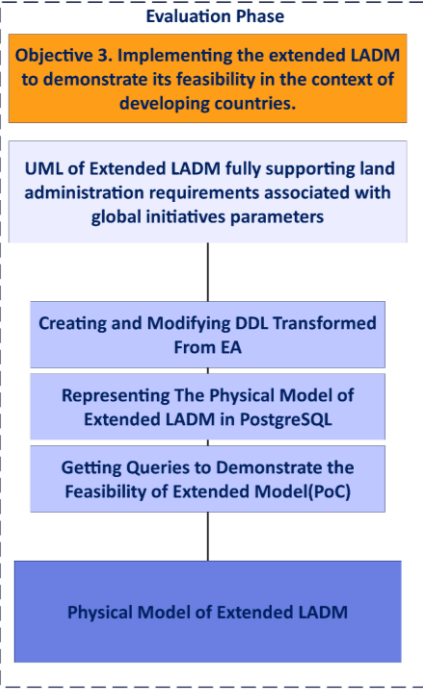
Database Creation in PostgreSQL



The screenshot displays the pgAdmin 4 interface for a PostgreSQL 16 database. The left-hand 'Object Explorer' pane shows a tree view of database objects, with 'Tables (193)' expanded to show various tables like 'Data_sample', 'ExtNetworkSegmentExtNetworkNode', and 'LA_PartyVM ValuationSource'. The main query editor window shows the following SQL code:

```
677 CREATE TABLE "La_gendertype"  
678 (  
679     La_gendertypeID integer,  
680     gender varchar(50)  
681 );  
682 INSERT INTO "La_gendertype" (La_gendertypeID, gender) VALUES  
683 (1, 'Acombination'),  
684 (2, 'Agender'),  
685 (3, 'Female'),  
686 (4, 'Genderneutral'),  
687 (5, 'Genderqueer'),  
688 (6, 'Male'),  
689 (7, 'Nonbinary'),  
690 (8, 'Notapplicable'),  
691 (9, 'Other'),  
692 (10, 'Pangender'),  
693 (11, 'Thirdgender'),  
694 (12, 'Transgender'),  
695 (13, 'Twospirit');  
696  
697  
698 CREATE TABLE "La_groupparty"  
699 (  
700     "Groupid" integer NOT NULL,  
701     "Indigenous_group" varchar(50) NULL,  
702     "Name" varchar(50) NULL,  
703     "Type" varchar(50) NULL, -- the type of the group party  
704     "La_partyID" integer NOT NULL,  
705     "Id_grouppartytypeID" integer NULL,  
706     "Id_indigenousgroupID" integer NULL  
707 )  
708 ;  
709  
710 CREATE TABLE "La_indigenousstatus"  
711 (  
712     La_indigenousstatusID integer,  
713     indigenous_status varchar(50)  
714 );  
715 INSERT INTO "La_indigenousstatus" (La_indigenousstatusID, indigenous_status) VALUES  
716 (1, 'No'),  
717 (2, 'Yes');  
---
```

The status bar at the bottom indicates 'Total rows: 0 of 0' and 'Ln 631, Col 18'.



RO3

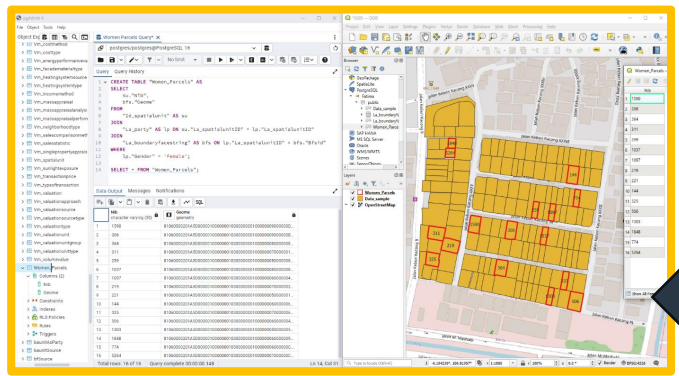
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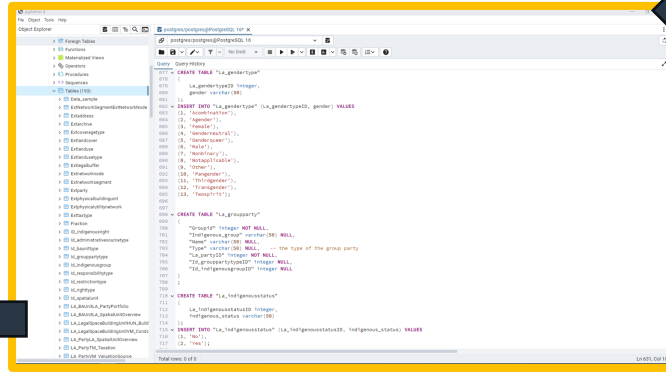
2. Transforming the Model Using Enterprise Architecture (Generating DDL)

3. Database Creation in PostgreSQL via pgAdmin

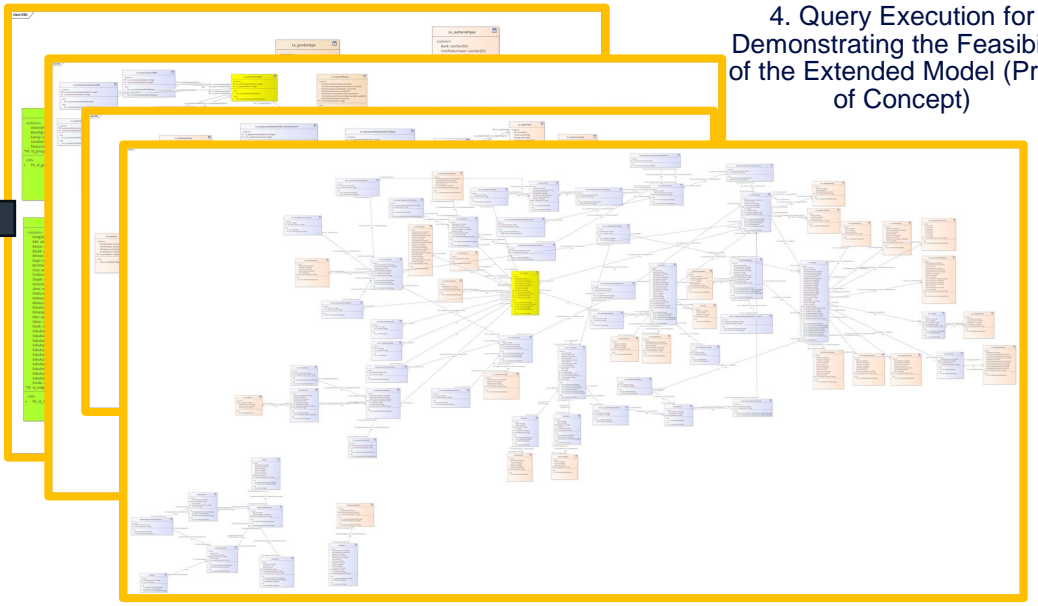
4. Query Execution for Demonstrating the Feasibility of the Extended Model (Proof of Concept)



Query Execution



Database Creation in PostgreSQL



Using Enterprise Architecture Creating DDL

The image displays two software windows. On the left is pgAdmin 4, showing a SQL query executed in a PostgreSQL database. The query filters for parcels owned by women. The results are shown in a table with columns 'Nib' and 'Geome'. On the right is QGIS, showing a map of a residential area with yellow parcels. Red boxes highlight specific parcels corresponding to the 'Nib' values in the pgAdmin results table.

pgAdmin 4 Query:

```

CREATE TABLE "Women_Parcels" AS
SELECT
  su."Nib",
  bfs."Geome"
FROM
  "Id_spatialunit" AS su
JOIN
  "La_party" AS lp ON su."La_spatialunitID" = lp."La_spatialunitID"
JOIN
  "La_boundaryfacestring" AS bfs ON lp."La_spatialunitID" = bfs."Bfsid"
WHERE
  lp."Gender" = 'Female';
SELECT * FROM "Women_Parcels";

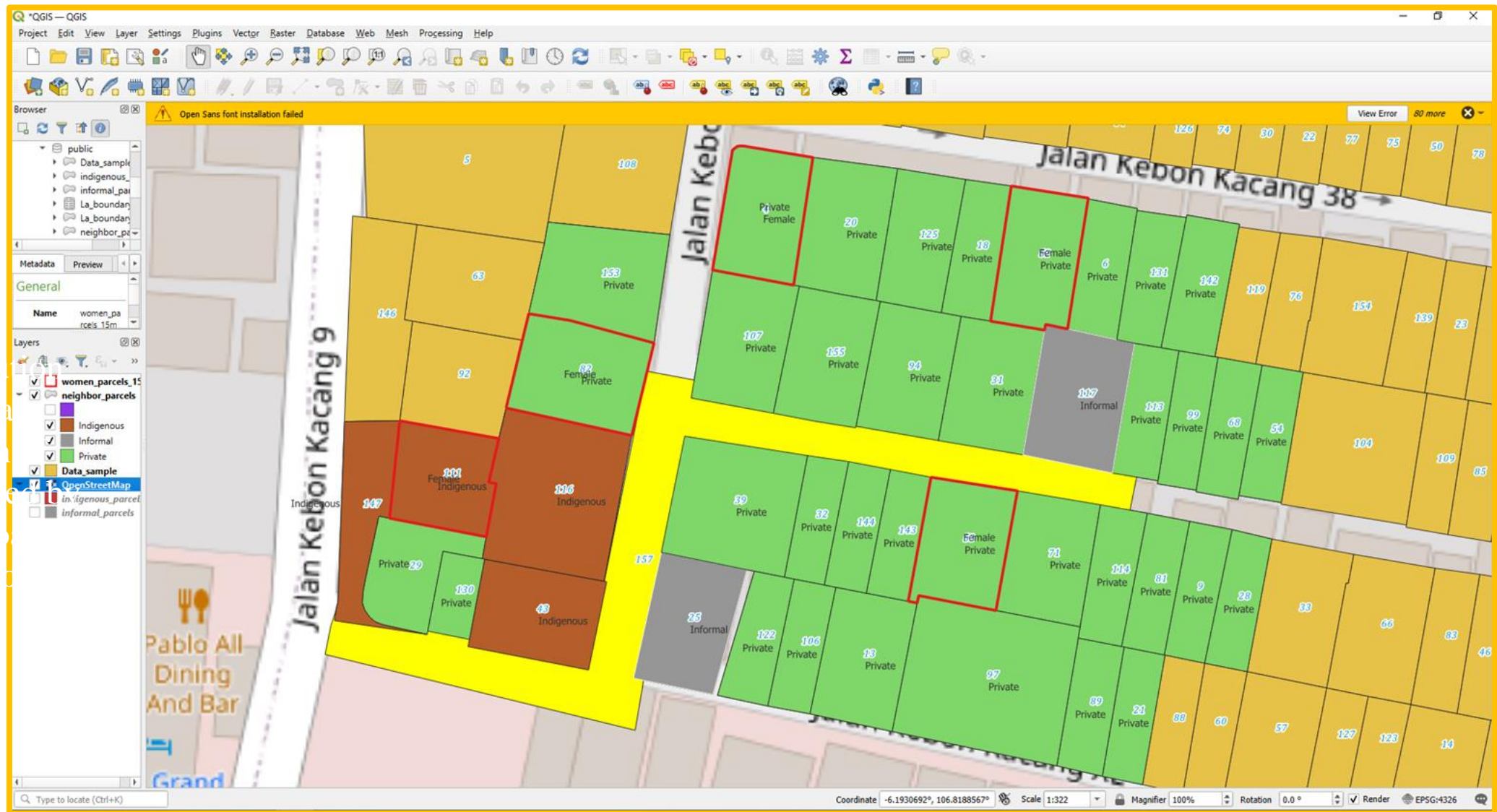
```

pgAdmin 4 Data Output:

Nib	Geome
1	1590
2	306
3	364
4	311
5	259
6	1037
7	1097
8	219
9	221
10	144
11	325
12	506
13	1303
14	1848
15	774
16	5264

QGIS Map: The map shows a residential area with yellow parcels. Red boxes highlight parcels with Nib values: 848, 5264, 144, 774, 259, 1097, 311, 219, 1037, 306, 325, 364, 221, 1303, 506, 1848, and 774.

Women-owned parcels query execution in pgAdmin with the distribution displayed in QGIS



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

The screenshot shows the execution of a SQL query in pgAdmin 4, which creates a table named 'Neighbor_Parcel' and populates it with parcel data. The query is as follows:

```

1 -- Create the Neighbor_Parcel table with the combined query
2 CREATE TABLE Neighbor_Parcel AS
3 WITH parcel AS (
4     SELECT ST_SetSRID(ST_GeomFromEWKB(decode
5     ("Geom", 'hex')), 23834) AS geom
6     FROM "La_boundaryfacestring"
7     WHERE "Bfsid" = 130
8 ),
9 neighbors AS (
10    SELECT a."Bfsid", ST_SetSRID(ST_GeomFromEWKB
11    (decode(a."Geom", 'hex')), 23834) AS geom
12    FROM "La_boundaryfacestring" a
13    JOIN parcel p
14    ON ST_DWithin(ST_SetSRID(ST_GeomFromEWKB
15    (decode(a."Geom", 'hex')), 23834), p.geom, 25)
16    WHERE a."Bfsid" != 130
17 )
18 SELECT n."Bfsid", n.geom, r."Id_righttype"
19 FROM neighbors n
20 JOIN "La_right" r ON n."Bfsid" = r."La_spatialunitID";
21 SELECT * FROM Neighbor_Parcel;

```

The QGIS interface displays the results of this query as a map of parcels. The parcels are color-coded by ownership type: Indigenous (green), Informal (grey), and Private (blue). The map shows a grid of parcels with various Bfsid values and ownership types. A data table in the bottom right of the QGIS window provides the following information:

Bfsid	Id_righttype
1	43 Indigenous
2	111 Indigenous
3	116 Indigenous
4	147 Indigenous
5	25 Informal
6	29 Private
7	39 Private
8	82 Private
9	92 Private
10	146 Private

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

Conclusion

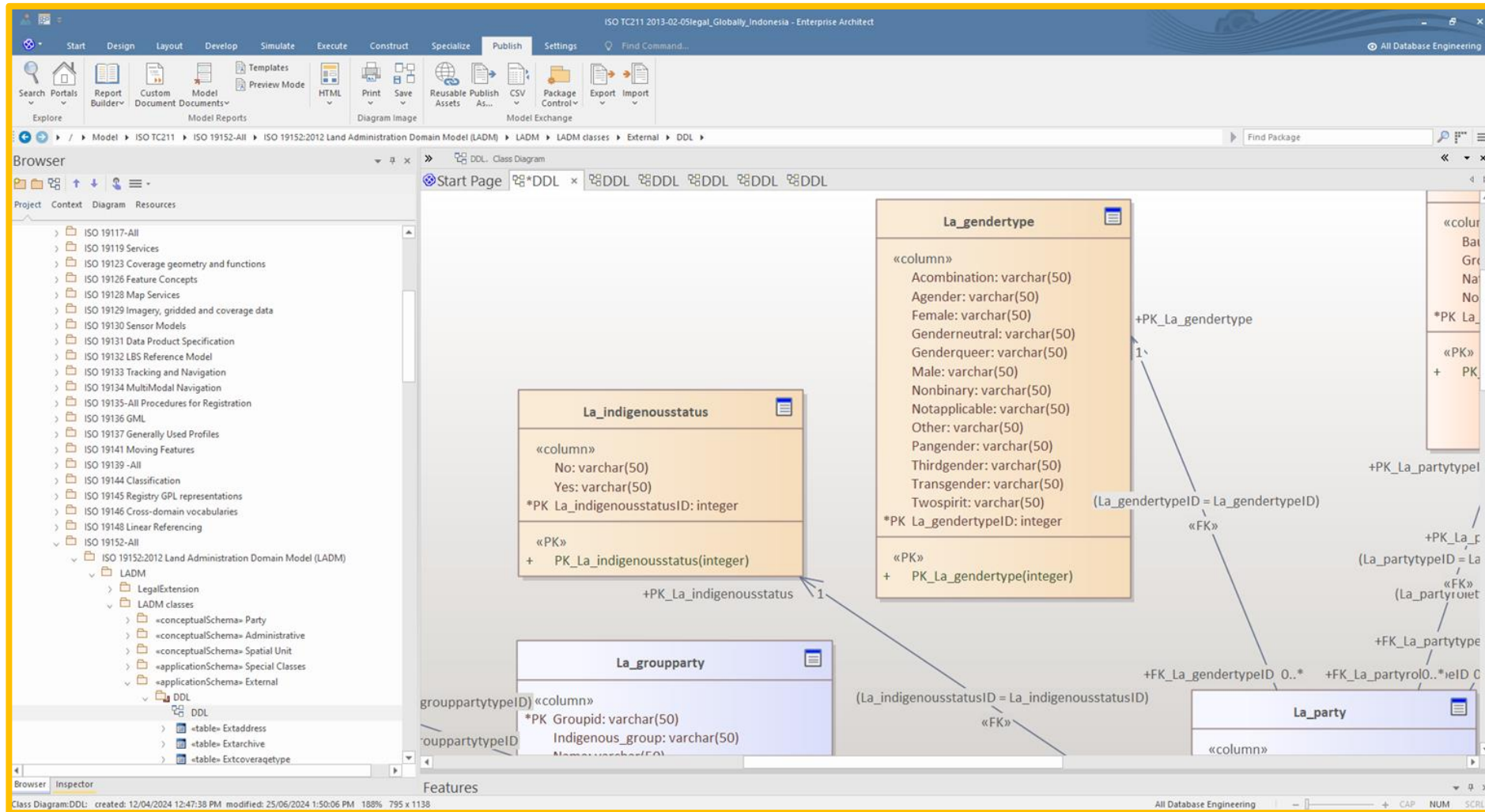
- **Extended LADM Implementation:** Successfully extended the Land Administration Domain Model (LADM) to address critical issues of marginalised communities.
- **Feasibility Demonstrated:** The implementation using PostgreSQL and pgAdmin validated the model's enhanced capabilities, proving its practical 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

The screenshot shows the QGIS interface with a map of land parcels in Kebon Kacang. A data table is overlaid on the map, showing details for 8 selected parcels. The table columns are: ID, KODEWILAYAH, KECAMATAN, KELURAHAN, TIPEHAK, TAHUN, NIB, LUASTERTUL, LUASPETA, and PENGGUNAAN.

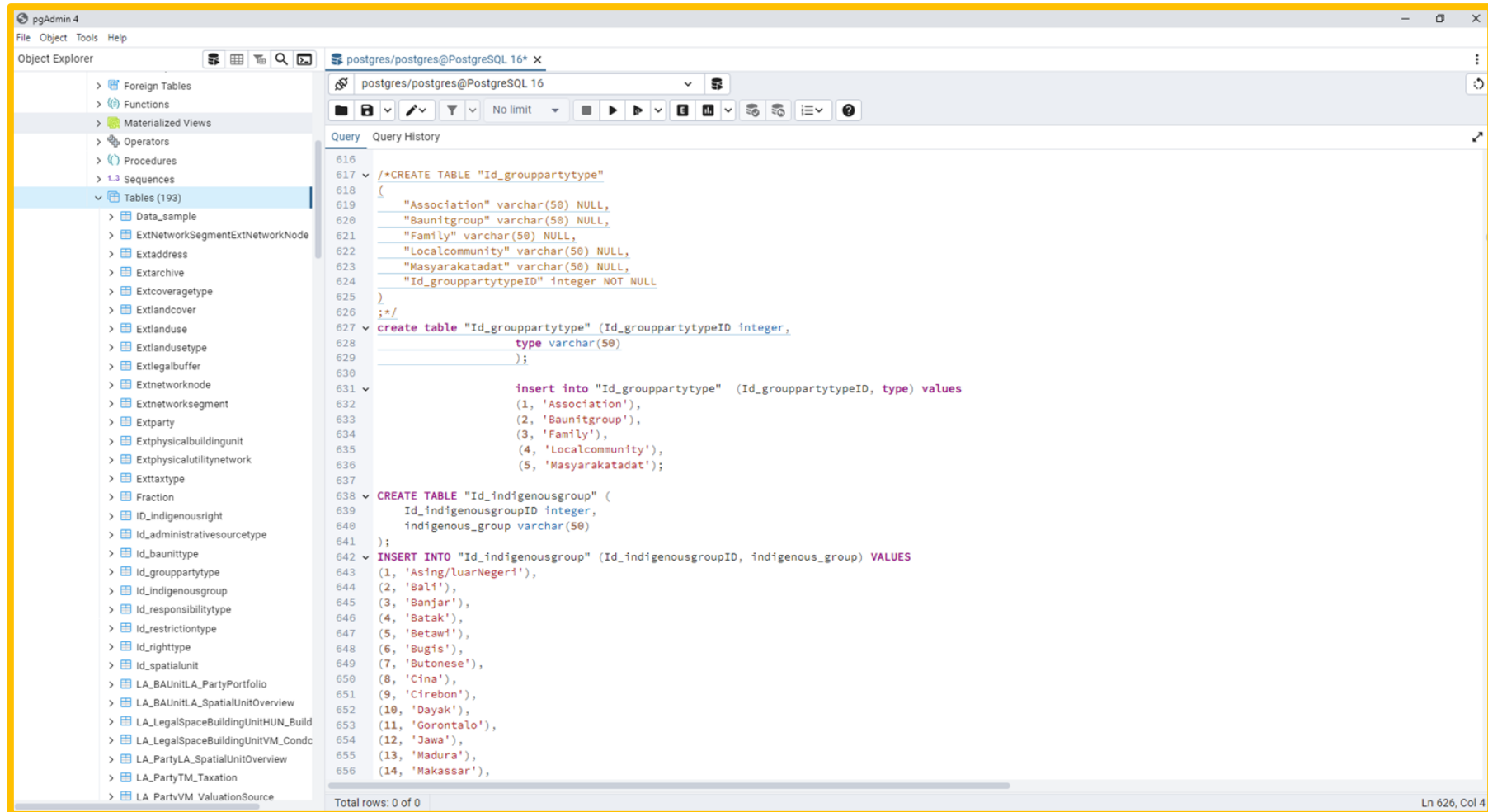
ID	KODEWILAYAH	KECAMATAN	KELURAHAN	TIPEHAK	TAHUN	NIB	LUASTERTUL	LUASPETA	PENGGUNAAN	
1	N/A	09010605	TANAH ABANG	Kebon Kacang	N/A	NULL	00002	157.0000000000...	158.5300000000...	Kosong
2	N/A	09010605	TANAH ABANG	Kebon Kacang	N/A	NULL	00029	87.0000000000...	85.6700000000...	Kosong
3	N/A	09010605	TANAH ABANG	Kebon Kacang	N/A	NULL	00030	304.0000000000...	303.6499999999...	Kosong
4	N/A	09010605	TANAH ABANG	Kebon Kacang	N/A	NULL	00044	163.0000000000...	162.7800000000...	Kosong
5	N/A	09010605	TANAH ABANG	Kebon Kacang	N/A	NULL	00061	155.0000000000...	154.3199999999...	Kosong
6	N/A	09010605	TANAH ABANG	Kebon Kacang	N/A	NULL	00098	150.0000000000...	149.4480000000...	Kosong
7	N/A	09010605	TANAH ABANG	Kebon Kacang	N/A	NULL	00101	146.0000000000...	145.8799999999...	Kosong
8	N/A	09010605	TANAH ABANG	Kebon Kacang	N/A	NULL	00102	80.0000000000...	80.1700000000...	Kosong

Challenges: Modification of Relationships in DDL



Challenges: Redundant and Unnecessary Data

Code List Representation in SQL



The screenshot shows the pgAdmin 4 interface with a SQL query editor. The query editor contains the following SQL code:

```
616
617 /*CREATE TABLE "Id_grouppartytype"
618 {
619     "Association" varchar(50) NULL,
620     "Baunitgroup" varchar(50) NULL,
621     "Family" varchar(50) NULL,
622     "Localcommunity" varchar(50) NULL,
623     "Masyarakatadat" varchar(50) NULL,
624     "Id_grouppartytypeID" integer NOT NULL
625 }
626 ;*/
627 create table "Id_grouppartytype" (Id_grouppartytypeID integer,
628                                 type varchar(50)
629                                 );
630
631 insert into "Id_grouppartytype" (Id_grouppartytypeID, type) values
632 (1, 'Association'),
633 (2, 'Baunitgroup'),
634 (3, 'Family'),
635 (4, 'Localcommunity'),
636 (5, 'Masyarakatadat');
637
638 CREATE TABLE "Id_indigenousgroup" (
639     Id_indigenousgroupID integer,
640     indigenous_group varchar(50)
641 );
642 INSERT INTO "Id_indigenousgroup" (Id_indigenousgroupID, indigenous_group) VALUES
643 (1, 'Asing/luarNegeri'),
644 (2, 'Bali'),
645 (3, 'Banjar'),
646 (4, 'Batak'),
647 (5, 'Betawi'),
648 (6, 'Bugis'),
649 (7, 'Butonese'),
650 (8, 'Cina'),
651 (9, 'Cirebon'),
652 (10, 'Dayak'),
653 (11, 'Gorontalo'),
654 (12, 'Jawa'),
655 (13, 'Madura'),
656 (14, 'Makassar');
```

Thanks



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More Info