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ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY  
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## THE LAND ADMINISTRATION DOMAIN MODEL: ADVANCEMENT AND IMPLEMENTATION

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## **Abstract**

The Open Geospatial Consortium published a White Paper on Land Administration. This white paper provides an overview of the land administration domain and proposes actions needed for design and development of implementation standards for this domain – this includes as main reference, the Land Administration Domain Model (LADM).

This paper uses developments across a global range of case countries to justify the updates and explain likely implementations. The aim is to provide readers a state-of-play LADM snapshot, and also provide information on likely future additions, modifications, and functionalities.

## **Key Words:**

Land Administration Domain Model, LADM implementation



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## Introduction

Worldwide, effective and efficient land administration is an ongoing concern, inhibiting economic growth and property tenure. In many nations, land administration systems are either non-existent or manual paper-based or semi-automated systems subject to limited public access. All of these approaches are at significant risk of data loss and failure due to lack of interoperability.

The Open Geospatial Consortium published a White Paper on Land Administration. This white paper provides an overview of the land administration domain and proposes actions needed for design and development of implementation standards for this domain – this includes as main reference, the Land Administration Domain Model (LADM). Close cooperation between the Open Geospatial Consortium (OGC) and ISO is expected to accelerate these developments. The charter members of the OGC Landinfra Domain Working Group seek to identify enabling standards and best practices to guide countries in a programmatic way, to establish more cost effective, efficient and interoperable land administration capability, to upgrade current manual to semi-automated processes, and to suggest solutions that are more automated and flexible to new data sources technologies.

Countries are developing and implementing LADM profiles and several software vendors are implementing LADM compliant data structures.

ISO TC 211 on Geographic Information is developing a new edition of the LADM. This paper discusses the developments and its implementations. It was discussed and agreed in ISO TC 211 to publish LADM Edition II as multipart – as follows:

Part 1 - Land Administration Fundamentals

Part 2 - Land Tenure or Land Registration or Land Interest

Part 3 - Marine Space or Marine Geo-Regulation

Part 4 - Land Valuation

Part 5 - Spatial Planning

Part 6 - Implementations

It is now time to provide proposals for new LADM parts. Based on current experiences and future expectations, the need and content of possible extensions will be addressed in this paper.

Edition II of the Land Administration Domain Model is backwards compatible with Edition I.



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The scope of LADM requires extension with a valuation and fiscal perspective. This concerns a conceptual data model in a LADM Valuation Package; one that can be used to construct information systems for immovable property valuation and taxation and offer a data exchange option.

Spatial planning/zoning with legal implications is a further extension of the scope. This new LADM package implies integration of spatial planning and land administration environments. Re-use of zones from spatial planning into restrictions to land rights is possible.

Both extensions have impact on the definition of land administration in the standard: land administration is the process of determining, recording and disseminating information about relationships between people and land - informal, customary and formal use and property rights - and about value and planned use of land.

Encodings/technical models towards LADM implementation include further integration with BIM/IFC, GML, CityGML, LandXML, LandInfra, IndoorGML, RDF/linked data, GeoJSON, and: 4. Process models for survey proceed. The scope of LandInfra is land development and civil engineering infrastructure facilities. LandInfra V1.0, with an emphasis on infrastructure and on surveying, additionally supports the legal-administrative aspects of land development. This is achieved by modelling what is needed from a subset of the LADM to account for the surveying related activities, including defining the legal entities, the boundary of which are measured, as well as identification of the signing parties. A LandInfra based LADM implementation is under discussion.

This paper expands upon all the above intended updates and adaptations of LADM. It uses developments across a global range of case countries to justify the updates and explain likely implementations. The aim is to provide readers a state-of-play LADM snapshot, and also provide information on likely future additions, modifications, and functionalities.

Real country implementations (Indonesia, Colombia, Mozambique, Malaysia) will be presented and discussed.

In spite of all of the developments in standardization at the conceptual level and at the data exchange level, it remains a challenge to implement land registration systems that really help countries in having an effective an efficient land administration.

A special approach was followed in Colombia where the implementation sliced through the LADM model creating multiple levels which were optimized for the different stages of the various LA processes.



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Implementation of LADM extensions are supported in currently available geographic information systems through both commercial off the shelf configurable solutions which can be customized to further fit country requirements and completely customized open source systems. Configurable ISO compliant solutions available include field collection by surveyors and para-surveyors and parcel management tools leveraging topology. Collected and managed data can then be shared via OGC compliant web services to be included in dashboards and other web mapping applications.

Advancements in hardware technology and GIS software now provide for further interoperability between external systems such as registries by utilizing robust application programming interfaces (APIs) and web service oriented architectures. LADM serves as the common language enabling communication between systems when implemented as a physical schema.

Another implementation successfully implemented pilot projects to establish national land information systems in Uganda (2010- 2013) and Tanzania (2016-2019, ILMIS project) and is now in the final stages of implementing the roll-out of the National Land Information System (DESINLISI project) in Uganda (2015-2020). This paper and presentation will provide a detailed description of those projects implemented. A LADM-compliant data model, at the very early stage of the development was extended and customized according to the country-specific information content. Such adoption of the data model established a national land administration data model profile adhering to LADM standard. Base on the customized national profile data model were started incremental configuration of the working processes, transactions and related rules, forms, reports and specific operational dashboards.

Based on user studies and evaluation of existing tools, this paper presents a new design of a mobile data collector from Indonesia - enabling surveyors and para surveyors, residents help government surveyor in land registration program, to connect with national land databases. Data collection and verification on land boundaries and their corresponding status by para surveyors can be submitted to the national databases, pending for approval from local land offices. Here, the collected data are designed to align with LADM basic classes, known as parties, RRR, spatial units, surveying and mapping classes. Information on taxation, valuation and land use can be captured and linked with LADM external classes.