Interaction of Land Objects from LADM Models to Improve Citizen Services

Golgi ALVAREZ, Honduras, Leidy BERNAL, Jonathan ALBARRACIN Colombia

Key words: Land Administration Domain Model, LADM, Land-Use Planning, Land Administration, Land Standards

SUMMARY

Colombia is going through an interesting stage of modernizing land administration processes because of the peace agreement. One of the transformation strategies is to adopt the LADM standard (ISO 19152), which involves modeling cadastral information and other legal land objects with a set of rights, restrictions, and responsibilities. This improvement in information management is expected to also impact the processes and procedures positively through which citizens access public services.

The design framework guided by Colombian models involves creating extended models for the different sectors of territory governance (environment, risks, planning, mining, and energy, etc.). The Land Use Plan is one of these models; it is needed for the issuance of most of the licenses related to land use by municipalities, such as construction permits, urban development, business operations, and natural resource exploitation. This model has been designed to be compatible with the LADM-COL core, applying the concept of a legal land object to each of the 10 types of planning units resulting from the formulation of the plan approved by each municipality.

The standardization process required the proposal of minimums for the administrative units and spatial units, applied by the 1,123 municipalities under the current regulations. An inter-institutional committee was formed that includes territorial regulatory entities, such as the Ministry of Agriculture, the Agustín Codazzi Institute, the Ministry of Housing, and the National Planning Department, among others. Once a consensus on these objects was reached, data mining was carried out on more than 100 management plans in force to obtain approximate domains, given the dispersion from a lack of minimum standardization. Finally, a regulation was approved with a margin for gradual adoption that allows guidelines to be created while supporting the first municipalities to implement it; a migration of the plans still in force was also approved.

When applied to three of the ten objects in the land use plan, this standardization resulted in simplified procedures, which positively impacted citizens. Thus, one of the most requested certificates (Land Use Certificate) has been made available on the Internet to be generated

automatically by the citizen, rather than the traditional procedure of needing to request it from the municipal authorities. In addition, the Ministry of Trade and Industry has approved the official validity of this certificate, meaning its use is authorized for all procedures.

This article presents the process that has led Colombia to adopt the LADM standard for land use planning and related regulations. In addition, if the method of cross-referencing land use planning objects with land registry properties to automatically generate licenses and certificates is also adopted for the other objects in the Spatial Data Infrastructure (SDI), it would simplify procedures, thus meeting citizens' requests.

RESUMEN

Colombia pasa una etapa interesante de modernización de la administración de tierras como una de las consecuencias del acuerdo de paz. Una de las estrategias de transformación es la adopción del estándar LADM (ISO 19152) que conlleva la modelación de la información catastral y los demás objetos territoriales legales que tienen una relación de derechos, restricciones y responsabilidades. Una de las expectativas es que esta mejora de la gestión de la información impacte también en la mejora de la operación de procesos, procedimientos y trámites por medio de los cuales el ciudadano accede a los servicios públicos.

El esquema de arquitectura orientada por modelos de Colombia implica la creación de modelos extendidos para los diferentes sectores de la gobernanza territorial (Ambiente, riesgos, planeación, minero-energético, etc.). El Plan de Ordenamiento Territorial es uno de estos modelos; necesario para la emisión de la mayor parte de licencias relacionadas con el uso del suelo por parte de los municipios, como los permisos de construcción, desarrollo urbanístico, operación de negocios y explotación de recursos naturales. Este modelo ha sido definido en compatibilidad con el núcleo LADM-COL, aplicando el concepto de objeto territorial legal a cada uno de los 10 tipos de unidades de ordenamiento que se generan tras la formulación del plan aprobado por los municipios, dentro de su autonomía.

El proceso de estandarización requirió la propuesta de mínimos para las unidades administrativas y unidades espaciales que aplican los 1,123 municipios bajo la normativa vigente. Se conformó una mesa interinstitucional involucrando las entidades que norman sobre el territorio como el Ministerio de Agricultura, Instituto Agustín Codazzi, Ministerio de Vivienda, Departamento Nacional de Planeación, entre otros. Una vez obtenido el consenso de estos objetos, se ha realizado pilotaje de datos en más de 100 planes de ordenamiento vigentes para obtener una aproximación de los dominios, en vista de la dispersión a falta de una estandarización de mínimos. Finalmente se aprobó una normativa de adopción con un margen de gradualidad que permita la creación de guías a partir del acompañamiento a los

primeros municipios que lo implementen, y también un ejercicio de migración de los planes que aún tienen vigencia.

Como consecuencia de esta estandarización, al aplicarlo a tres de los diez objetos del plan de ordenamiento territorial demostró la simplificación de trámites con un impacto al ciudadano. De modo que uno de los certificados más demandados (Certificado de uso de suelos) ha sido dispuesto en internet para generarse de forma automática por parte del ciudadano, contrario a los mecanismos tradicionales de solicitud en el municipio. Adicionalmente, el Ministerio de Industria y Comercio ha aprobado que dicho certificado tenga una validez oficial, pudiéndose utilizar para todos los trámites que lo requieren.

Este artículo presenta el proceso que ha llevado Colombia la adopción del estándar LADM para el ordenamiento territorial y su adopción normativa. Adicionalmente, el resultado del cruce de los objetos del ordenamiento territorial con los predios del catastro para la generación de licencias y certificados de forma automatizada; método que de adoptarse a los demás objetos de la Infraestructura de Datos Espaciales (IDE) permitiría la simplificación de trámites que demanda el ciudadano.

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As a result of the peace agreements, Colombia is going through an interesting modernization period in terms of land administration (IGAC, 2021). In order to recover balance and social stability after many years of conflict with armed groups, one of the priorities was to update the cadastral information throughout Colombia, including its integration with the Property Registry, in order to promote a massive regularization and land titling process for both urban and rural land.

Colombia's transformation in terms of land administration is substantial and inevitably involves prioritizing land use planning. This includes:

- Modernizing the Spatial Data Infrastructure (SDI),
- Implementing a Land Administration System (LAS) policy with an integrated systemic vision, which includes realigning decision-making about land and improving citizen services,

- Massive land titling based on massive supply and not traditional individual demand,
- Devising a single window to facilitate traceability,
- Simplifying processes and procedures for citizens,
- Adopting interoperability mechanisms and standards,
- Decentralizing cadastral management to managers and operators in the regions under a public-private partnership scheme,

The Figure 1 summarizes the Colombian context, where 80% of the municipalities are estimated to have outdated land use plans. Partly due to using the outdated Cadastre as a basic information source, some of the methods used in many plans are not comparable in terms of continuity or adoption of regional criteria.

Figure 1. Colombia Context

Country: Colombia **Area**: 1,141,748 Km2 **Population**: 52.1 million inhabitants **Municipalities:** 123 **Departments:** 32 **Bogotá Population**: 7.9 million inhabitants **Poverty line**: 27.8% **Gini Index**: 53.0		

Source: Wikipedia

The first interesting aspect of this modernization included adopting the ISO-19152 Land Administration Domain Model (LADM) standard, which is considered for the interoperability of property information as well as other land objects, leading to decisions that create rights, restrictions, and responsibilities (ISO, 2012). This concept stems from the Cadastre 2014 statements promoted by FIG in 1998 and updated in 2014 in what is referred to as “Cadastre 2014 and Beyond.” (Steudler, 2014).

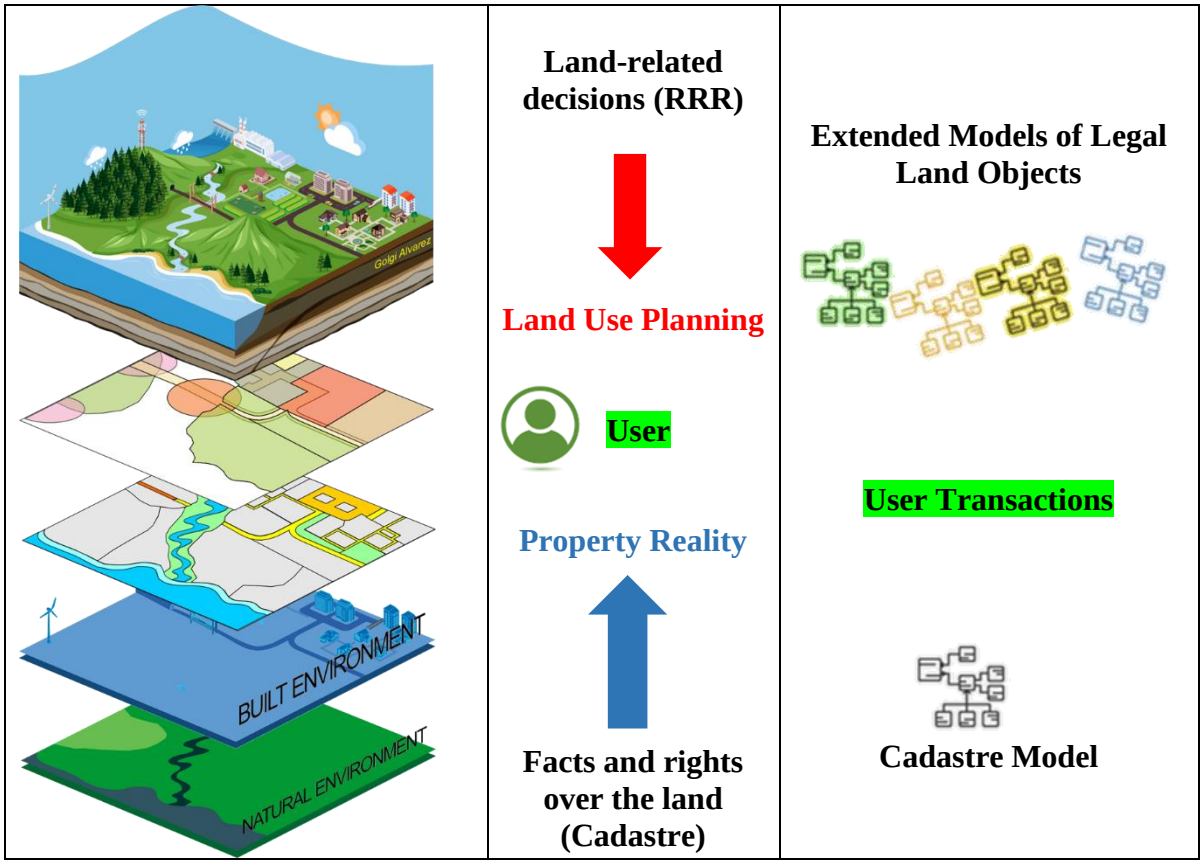
The second interesting aspect to highlight is the adoption of model-driven architecture (MDA). Based on a property-focused core model, the other extended models have specialized thematic characteristics, and the application models adjust to the particular realities of the systems they operate in (SwissTierras, Gestión de Modelos de Datos LADM-COL Catastro - Registro, 2021). Under this concept, an ecosystem of models is formed, representing the complete reality of the land. These concepts are also supported by the Cadastre 2014 statements.

Finally, the third important aspect is the focus on improving processes and services for citizens. This entails not only improving the information available, but also positively

affecting citizens with the digitalization of procedures that take less time, involve less intermediation, and create better quality conditions in the registry infrastructure.

These three aspects are addressed in this document, using the LADM standard adoption for land use plans as an example. These are instruments approved by the municipalities that reflect both the higher-order determinants and local decisions to the extent their autonomy allows.

Figure 2. General Model Outline



Source: Created by SwissTierras

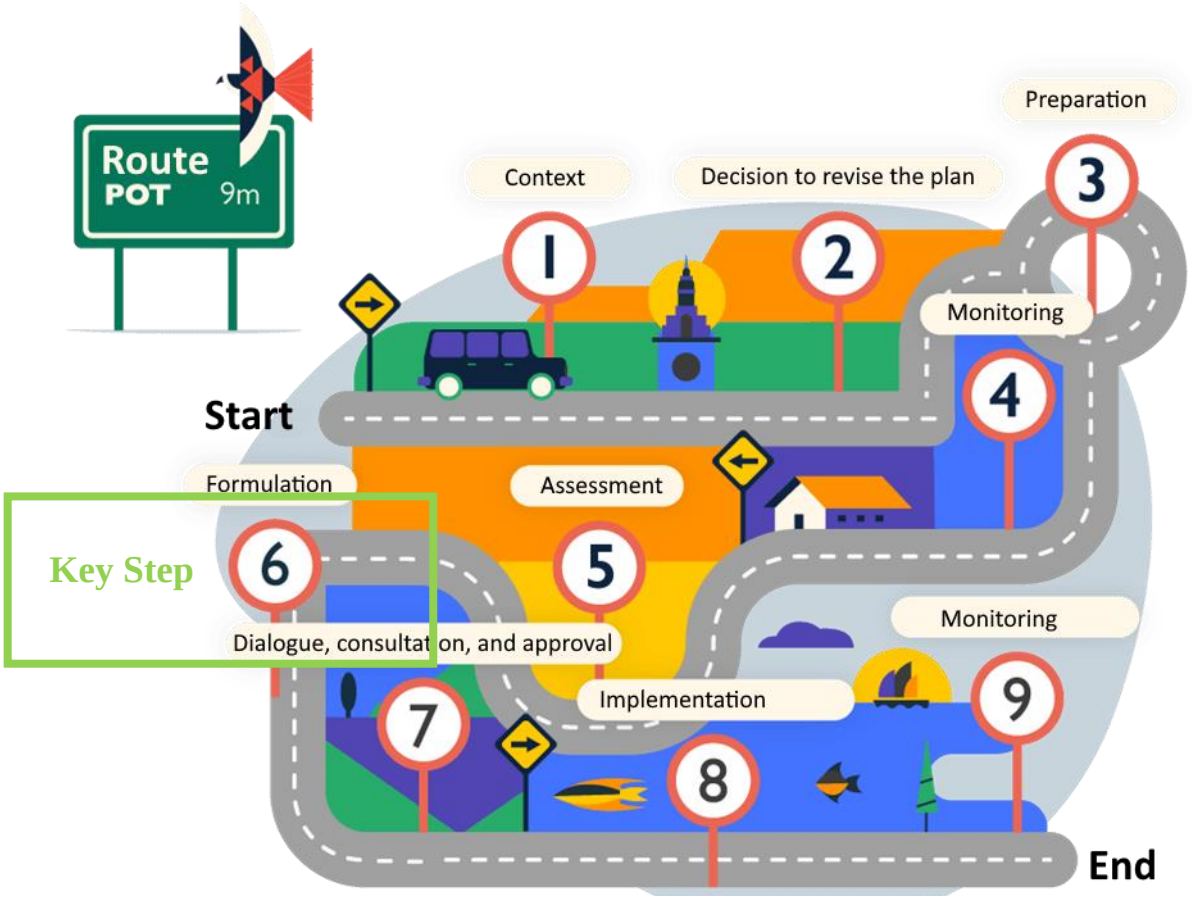
The Figure 2 summarizes part of this outline in which the reality of the land has been modeled in two large sets of information: Legal decisions by means of "extended models of legal land objects" and property continuity by means of a "cadastre model." In between these two is the end user — which may be a citizen, a municipal government, or a private institution — who needs to deal with procedures related to tenure, use, value, or development within what is permitted by rights, restrictions, or responsibilities (RRR).

1. WHY STANDARDIZE THE INFORMATION IN LAND USE PLANS?

For years, municipalities have been developing their land use plans, taking nationally adopted regulations and guidelines into consideration, as well as a widely applied methodology that includes structuring and adoption stages. Law 388 of 1997, issued by the Ministry of Housing, City, and Territory, and the regulatory decrees compiled in Law 1077 outline stages for diagnosis, formulation, implementation, adoption, monitoring, and evaluation.

Once this instrument is approved, local and regional governments must approve new urban developments, grant building permits, business operation licenses, and natural resource exploitation licenses, as well as other procedures.

Figure 3. Steps for Land Use Plan (POT Route) Implementation - Source: Colombia OT IGAC



Source: Colombia OT IGAC (IGAC, 2023)

1.1 The Process of Creating a Land Use Plan

The Figure 3 shows the nine logical steps followed to develop a municipal land use plan. While not all these steps are mandatory, they are necessary in practice, summarized as follows:

1.1.1 **Context.** In this first step, local administrators, headed by the Mayor and the Municipal Planning Secretariat, learn about the context and status of their land use plan, identify the main conflicts and opportunities, and come to a general conclusion on whether the plan needs to be revised or modified. Additionally, at this stage, the type of planning instrument required by the municipality is reviewed in accordance with the country's regulations, which could include a Land Use Plan (POT as per its acronym in Spanish), Basic Land Use Plan (PBOT as per its acronym in Spanish), or a Land Use Scheme (EOT as per its acronym in Spanish).

1.1.2 **Decision to develop or revise the plan.** This is done after reviewing the status of the current POT, taking technical and political willingness to revise the POT into account. The availability of resources to start the revision and modification process must also be analyzed. This is necessary because there are various sources of funding for this process.

1.1.3 **Preparation.** This stage includes the preparation of a technical, institutional, and financial feasibility analysis, as well as an analysis of the participatory processes required to prepare the plan. It also includes the identification of resources and activities needed to prepare the plan, the definition of the strategic and priority areas for spatial planning based on the municipality or district's vocation in accordance with the social and economic policies defined in the Municipal Development Plan, and the formulation of the strategy to ensure coordination between the development plan and other sectoral plans.

1.1.4 **Monitoring.** This stage involves a set of actions to evaluate and monitor the current POT to support policy assessment and definition, as well as the formulation of plans, programs, and projects for spatial planning at the different regional, municipal, and district levels.

1.1.5 **Assessment**. This stage aims to determine the current state of municipal land to compare it with the end goal, in order to appropriately formulate the general development aims for the municipality or district in terms of spatial planning. This assessment includes the analysis of the urban-regional vision of the municipality or district. It also incorporates the various aspects of rural and urban land development, with a focus on environmental, economic, social, cultural, and institutional aspects. It will also incorporate land attributes or structural elements.

1.1.6 **Formulation**. This stage includes the decision-making process for land use planning, which translates into components and contents, as well as dialogue, consultation, approval, and adoption of the regulations stipulated by law.

1.1.7 Dialogue, consultation, and approval. This includes dialogues with the Regional Autonomous Corporation (CAR) on environmental matters and the presentation to the Land Use Planning Council. During this stage, there is technical and legal support provided for POT modifications, considering comments received in the various stages.

1.1.8 Implementation. This includes the actions needed to make the Land Use Plan a reality in terms of financing, institutional capacity, technical development, and capacity to come together and discuss the issue.

- This stage aims to define a procedure to ensure a feasible implementation of land financing mechanisms relative to taxes that are approved by the Municipal Council based on the principle of tax representation. Since the land management and planning mechanisms derived from land use planning are directly part of the land use plan and can be regulated by the Mayor's regulations or directly developed in the land use plans, they are set by the implementation program in coordination with the development plan.
- For the implementation phase, a set of best practices needs to be compiled for the related entities to strategically achieve the following:
    - Reconfigure and outline new ways to exercise control in terms of planning, development, and monitoring,
    - Achieve institutional and organizational change to develop new action logics,
    - Reinforce the information system.
    - Ensure coordination between the development plans and land use plan.
    - Align the land use plan management strategy and the regulatory decrees of the selected instruments,
    - Measure the impact of implementing the different management and financing mechanisms.

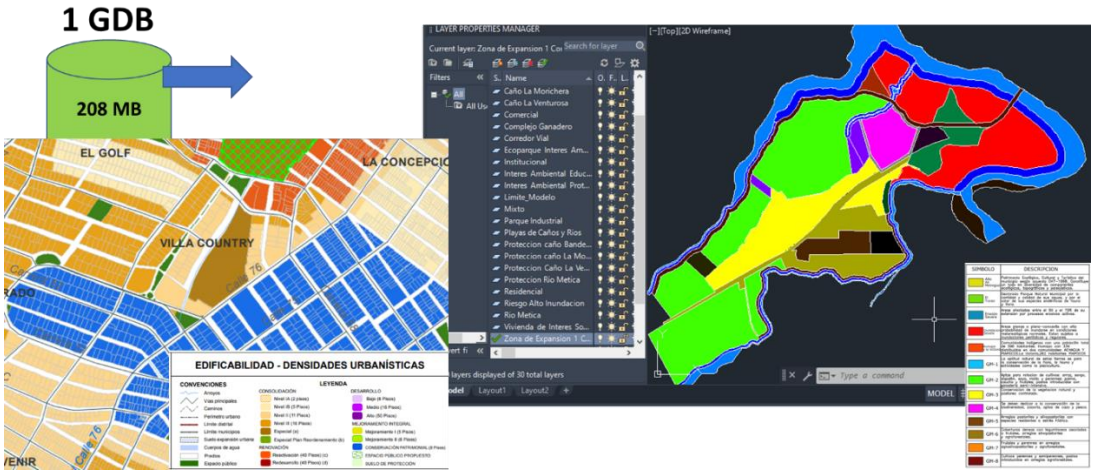
1.1.9 Monitoring. As part of the proposed spatial planning processes (POT, PBOT, EOT), a stage is established for specifying objectives, programs, and planning projects, and implementing the proposed occupancy model. To this end, the management and financing mechanisms that support a land use planning management model (MGOT) are applied.

The mechanisms are not applied separately or independently from the land use planning instruments. Instead, the mechanisms to be used for this region are incorporated into the land use plan, to ensure the conditions needed for their implementation as well as for institutional support.

1.2 Existing Results of Land Use Plan Implementation

Despite the complexity of the planning instruments that must be considered in the creation process for the municipal land use plans, in general, most of the municipalities have and use this instrument. Evidently, the outdated figures suggest the need to simplify the process and, above all, make the results available by using mechanisms that provide an overall view of the results.

Figure 4. Example of CAD - GIS File Types in Land Use Plans



Source: Prepared by SwissTierras

And although the land use plans are put together considering all the suggested methodologies — including guidelines such as higher-order determinants in aspects such as environment, infrastructure, or heritage—when reviewing land use plans from different neighboring municipalities with the aim of sharing them on a national publication platform, the following problems are identified:

- Continuity across municipalities is difficult to interpret due to the diversity of criteria, nomenclature, and formats used for its representation,
- The available geographic information is in different modeling formats, from spatial databases to CAD files, separated from tabular data, PDF files, and even images,
- Information in vector formats has topology problems, internally or with neighboring municipalities,
- The complete land use planning dossier usually contains a combination of information that was part of the inputs for the assessment and information that impacted decision making,
- A large majority of plans do not have spatial information in a format compatible with a GIS program.

1.3 The Decision to Standardize Step 6. Formulation

Considering the focus on land objects that create rights, restrictions, and responsibilities, standardizing decisions called “formulation” were prioritized (Step 6. in the previous figure). This implied standardizing the minimum requirements defined by the regulations and what the municipalities are building. This modeling was to be done using the LADM standardization that Colombia has adopted as a policy where specific relationships are defined between administrative units, spatial units, stakeholders. and documentary sources.

2. STANDARDIZATION OF LAND USE PLANNING

One of the crucial decisions involved in structuring the LADM land use planning model was the identification of land objects. The main confusion has always been related to which objects represent a finding from the assessment or an input file, and which ones represent the decisions made based on that finding (See figure 5).

To this end, an inter-institutional roundtable was held to determine the different decision objects required by the regulations, as well as the higher-order guidelines that must be considered. This led to the finding that only 10 of the 140+ pieces of information in a spatial database for land use planning were land objects.

The following entities actively participated in this inter-institutional roundtable:

- Ministry of Housing, City and Territory,
- Ministry of Agriculture and Rural Development,
- Agustín Codazzi Geographic Institute,
- National Planning Department.

Figure 5. Schematic Diagram of Land-Related Decisions Included in a Land Use Plan

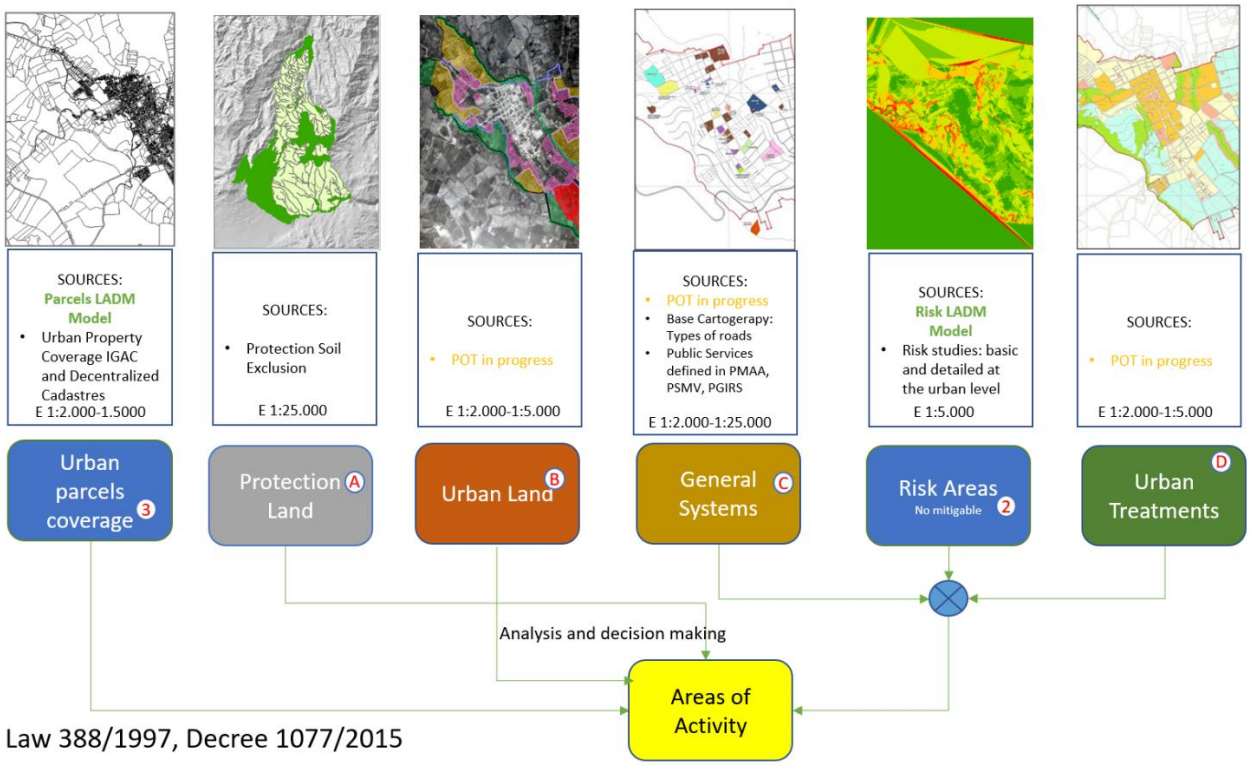
Source: Prepared by SwissTierras

2.1 The relationship Between Land Objects and External Models

As shown in the Figure 6, part of the work was to determine the relationship between POT land objects and objects from other models, such as a protected areas that the municipality determines to be a compatible use area. This activity was also important because, in addition

to the Land Use Plan model, models are being built in parallel and sequentially for other topics such as the environmental sector, the mining-energy sector, and even models to represent the interests of diverse populations, such as indigenous peoples and Afro-descendant communities.

Figure 6. Example of a Land Object and How It Is Related to Input Mapping



Source: Planning National Department

2.2 Unified Markup Language

One difficulty encountered was that the ISO 19152 Standard establishes that land objects must be modeled in a Unified Markup Language -UML (UML.org, s.f.), a skill that is not always mastered by subject matter experts. This implied that the SwissTierras project, financed by Swiss Secretariat for Economic Affairs (SECO), supported the process both for conceptual training and international best practices, as well as for the structuring of the UML model as decisions were made, as shown in the Figure 7.

Figure 7. LADM-POT Model Approved in 2022

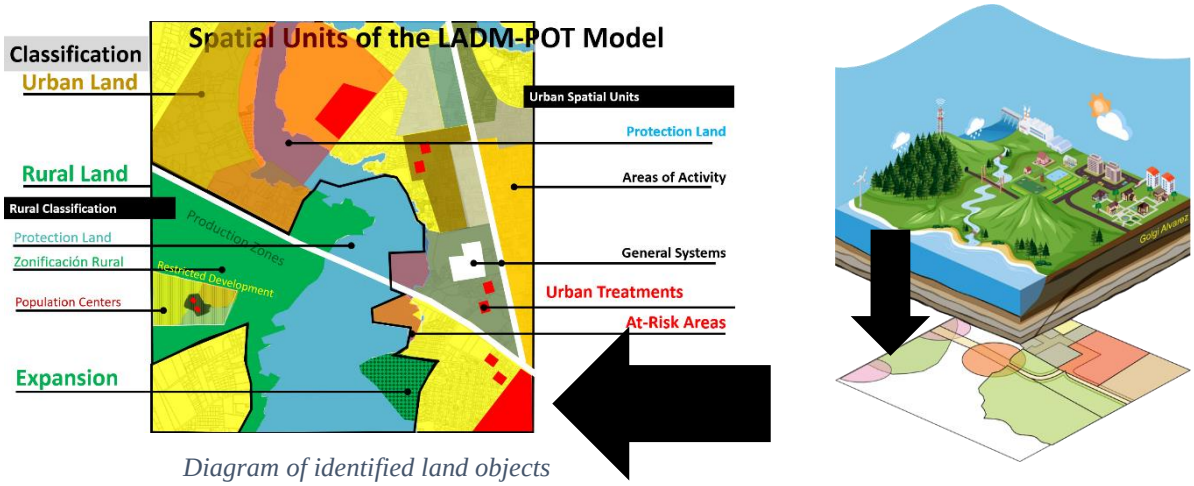
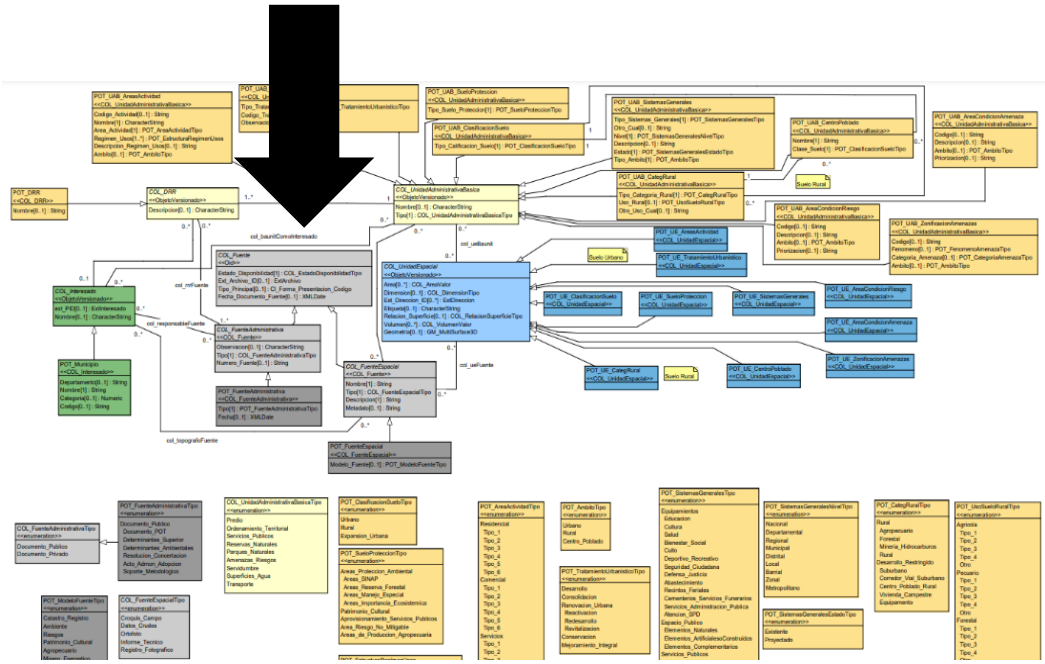


Diagram of identified land objects



Source: Prepared by SwissTierras

2.3 The LADM-POT Model's 10 Land Objects

The result (See Figure 8) of the model led to the following spatially represented land objects:

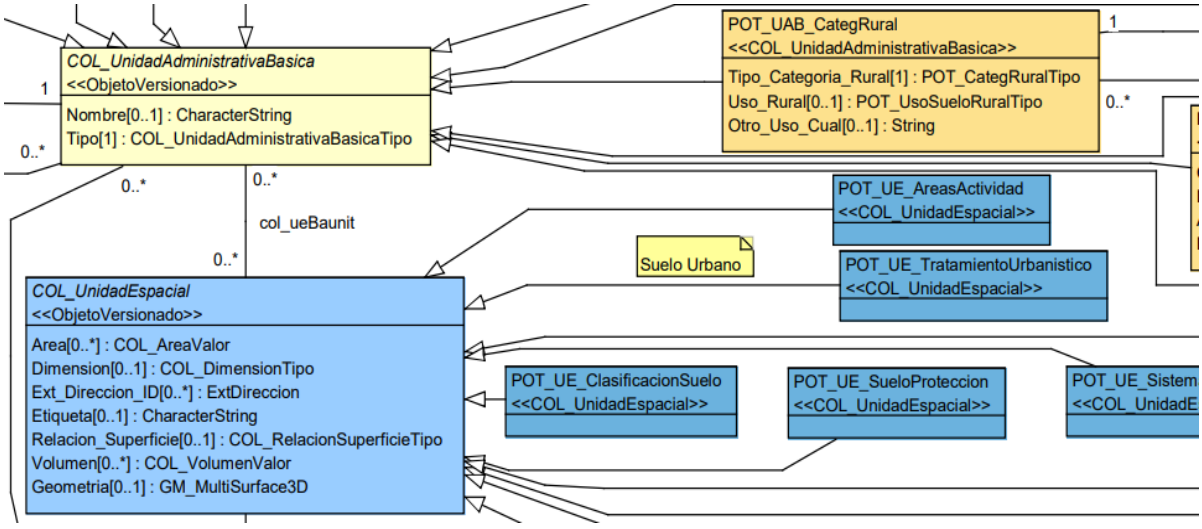
2.3.1 Land Classification: Structural urban development standard that defines rural and urban land, as well as land for urban expansion, with the following classification:

- **Land for Urban Expansion**
  The portion of the municipal land allocated to urban expansion, which will be enabled for urban use during the term of the land use plan. In the case of Colombia, this type of land continues to be rural until the land use plan incorporates it as part of urban land to supply land needed for housing, public space, and public facilities.

- **Urban Land**
  Areas allocated for urban use, with road infrastructure and primary power, water, and sewage networks. This type of land is a structural norm and may not be modified during the term of the POT. For its development, densification and balanced occupancy policies must be applied, guaranteeing the provision of public utilities.

- **Rural Land**
  Rural land consists of land used for agriculture, livestock, forestry, natural resource exploitation, and similar activities.

Figure 8. Example of UML Modeling of LADM-POT



Source: Prepared by SwissTierras

2.3.2 Protected Land

It consists of the zones and areas of land located within any of the land types (urban, rural, expansion), in accordance with the following conditions:

- Because it has geographical, scenic, or environmental characteristics,

- Because it is part of the public space with infrastructure for the provision of residential public utilities,
- Because it is an area with hazards and risks that cannot be mitigated, and where there are activities and uses that entail occupancy risk.

2.3.3 Areas of Activity

Applicable to the urban land type and where land use regimes are established according to the urban structure defined by the land occupancy model. These are areas with residential, commercial, service, industrial, institutional, community, and mixed activities.

2.3.4 Urban Treatments

Applicable to the urban land types determined by the POT, which, in accordance with each area's physical characteristics and the proposed occupancy model in homogeneous units, establishes the urban development standards for a differentiated management system for the different urban land and urban expansion sectors. This spatial unit defines the strategic intention of the municipal administration over a particular area, which can be: development, urban renewal, consolidation, overall improvement, or conservation.

2.3.5 Rural Land

Corresponds to land classified as rural, meaning areas with characteristics such as: rural population centers, suburban land, roads for different activities, rural housing, excluding land protected for environmental reasons or agricultural or productive areas that are protected for food security reasons (agricultural types I, II, III according to Colombian regulations).

2.3.6 Population Centers

Applicable for rural land types. These are small groups of attached or neighboring houses that have certain dynamics and requirements for public utilities and associated infrastructure, which is why property lines are marked to prevent uncontrolled growth and ensure adequate provisioning.

2.3.7 General Systems

Corresponds to elements of physical infrastructure that complement urban activities and uses, i.e., road infrastructure, public space, and urban facilities that provide residential, commercial, industrial, and institutional areas. These elements may influence the definition of the urban planning standard.

2.3.8 Hazardous Area

This is the definition of areas threatened by landslides, floods, torrents of water (flows), and forest fires. These areas are marked in rural areas, urban areas, and in population centers.

2.3.9 Threatened Areas

This corresponds to marking zones or areas defined as areas with high and medium threats in the municipality, classifying them as urban, urban expansion, rural or suburban land, or as population centers, as established in the new POT to enable their development, aiming to avoid creating at-risk areas.

2.3.10 At-Risk Areas

This spatial unit corresponds to marked zones or areas in the municipality that are classified as high threat areas that coincide with exposed elements such as: urbanized, occupied, or built-up areas, as well as where elements of the road system, public facilities (health, education, among others), and public utilities infrastructure are located.

2.4 The Pilot Process for Standard Approval

Once a consensus was reached on the land objects, their attributes, and a set of domains, a pilot study was carried out on existing information from current land use plans.

On the one hand, the Ministry of Housing conducted a comprehensive review of existing legal frameworks, seeking support for each of the attributes and domains established in the model, resulting in new discussions or decisive arguments regarding why they were considered or disregarded. In this regard, a comparative data pilot was carried out using the management plans for two municipalities as a reference.

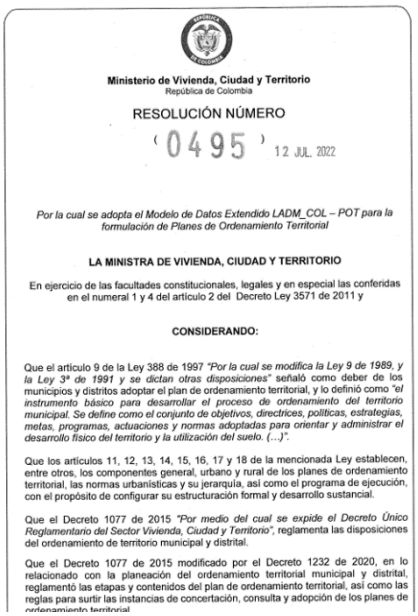
The Agustín Codazzi Geographic Institute (IGAC) compared the model to 120 land use plans received from the municipalities as part of a Geographic Information System for Land Use Planning initiative that aims to consolidate this information and make it available through a geo-portal.

On behalf of the SwissTierras project, a technical document explaining the model was prepared to facilitate its understanding. We also worked on the model adjustments and made adaptations for compatibility with the LADM-COL core model. Conversion functionalities from the UML model were transferred to the database with INTERLIS language, using the tool adapted by SwissTierras called *iliSuite* (SwissTierras, 2023).

2.5 Regulations for Adoption

Figure 9 Resolution 0495 on Adoption.

Once the adjustments were made after the pilot, a release candidate (See Figure 9) was defined for publication with binding regulations in accordance not only with Colombia's regulatory context but also with the limitations that this type of implementation may represent. The following strategic decisions were made as best practices:



Ministerio de Vivienda, Ciudad y Territorio
República de Colombia

RESOLUCIÓN NÚMERO

0495 12 JUL. 2022

Por la cual se adopta el Modelo de Datos Extendido LADM_COL – POT para la formulación de Planes de Ordenamiento Territorial

LA MINISTRA DE VIVIENDA, CIUDAD Y TERRITORIO

En ejercicio de las facultades constitucionales, legales y en especial las conferidas en el numeral 1 y 4 del artículo 2 del Decreto Ley 3571 de 2011 y

CONSIDERANDO:

Que el artículo 9 de la Ley 388 de 1997 *"Por la cual se modifica la Ley 9 de 1989, y la Ley 3ª de 1991 y se dictan otras disposiciones"* señaló como deber de los municipios y distritos adoptar el plan de ordenamiento territorial, y lo definió como *"el instrumento básico para desarrollar el proceso de ordenamiento del territorio municipal. Se define como el conjunto de objetivos, directrices, políticas, estrategias, metas, programas, actuaciones y normas adoptadas para orientar y administrar el desarrollo físico del territorio y la utilización del suelo. (...)"*.

Que los artículos 11, 12, 13, 14, 15, 16, 17 y 18 de la mencionada Ley establecen, entre otros, los componentes general, urbano y rural de los planes de ordenamiento territorial, las normas urbanísticas y su jerarquía, así como el programa de ejecución, con el propósito de configurar su estructuración formal y desarrollo sustancial.

Que el Decreto 1077 de 2015 *"Por medio del cual se expide el Decreto Único Reglamentario del Sector Vivienda, Ciudad y Territorio"*, reglamenta las disposiciones del ordenamiento de territorio municipal y distrital.

Que el Decreto 1077 de 2015 modificado por el Decreto 1232 de 2020, en lo relacionado con la planeación del ordenamiento territorial municipal y distrital, reglamentó las etapas y contenidos del plan de ordenamiento territorial, así como las reglas para surtir las instancias de concertación, consulta y adopción de los planes de

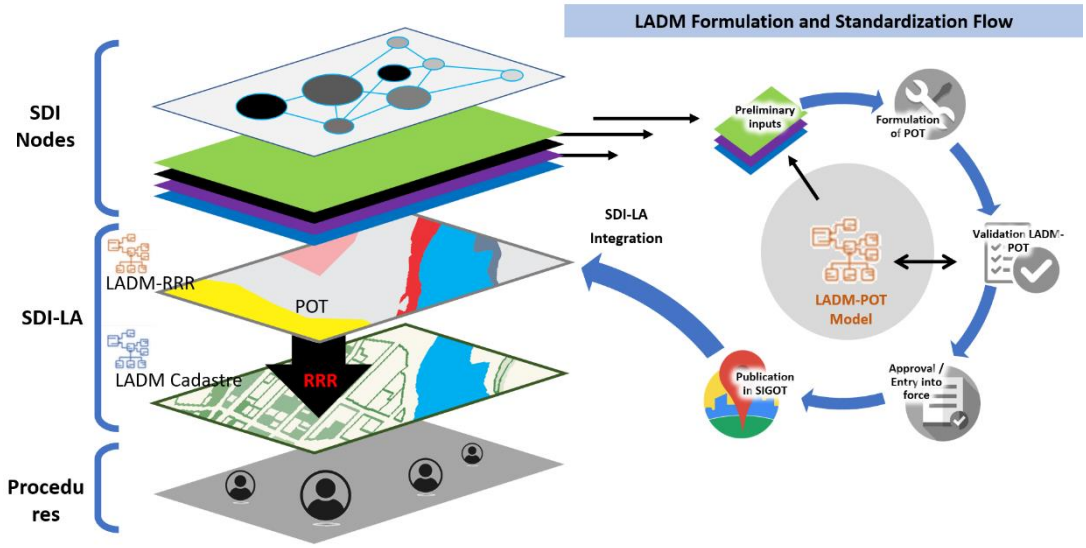
Source: Ministry of Housing, City and Territory of Colombia (MinVivienda, 2022)

- **Open for comments.** In accordance with Colombia's regulations, the proposed regulations and technical appendix were published, allowing time for comments to be made. As a result, new adjustments were made to the model and the publication standards.
- **Two years of transition.** This time frame was established to prevent potential conflict and opposition caused by the imposition of a change for which there is no immediate technical knowledge or tools. During this time, municipalities planning to update their POT can voluntarily adopt the regulations, while also conducting pilot exercises and documenting these good practices.
- **Implementation instructions**. During these two years of transition, easy-to-understand technical documents will be prepared so that once this period is over, the municipalities and private companies providing these services will have a set of best practices and methodologies for mandatory adoption at the national level. These instructions focus on the two immediate tasks: the migration of information from existing plans that are still valid for the next several years and working towards creating or adjusting land use plans in the coming years.
- **Demonstration of the advantages of adoption**. It was also planned that during this transition period, demonstrative exercises would be developed as early victories to show the advantages of adopting the regulations, including at the national level—by presenting unified information—at the regional level, in order to facilitate planning with thematic approaches (e.g., watershed approach), and at the local level, with results for citizens.
- **Freedom of technology**. The regulation does not limit municipalities to using a specific software to apply the standard, and they can submit the result in any geographic information format—ideally an INTERLIS XTF format, although this is not mandatory. What the regulations do limit is the use of CAD formats, which have been widely used in the past despite their topology and database integration limitations—which do not apply to GIS platforms.

3. OUTCOME OF THE INTERACTION OF LAND OBJECTS FROM LADM MODELS TO IMPROVE CITIZEN SERVICES

In summary, the implementation process involves the selection of ten land objects, either by migrating existing plans or implementing new plans, and modeling them according to the standard. The Figure 10 outlines the process.

Figure 10. LADM-POT Standardization Process



Source: Prepared by SwissTierras

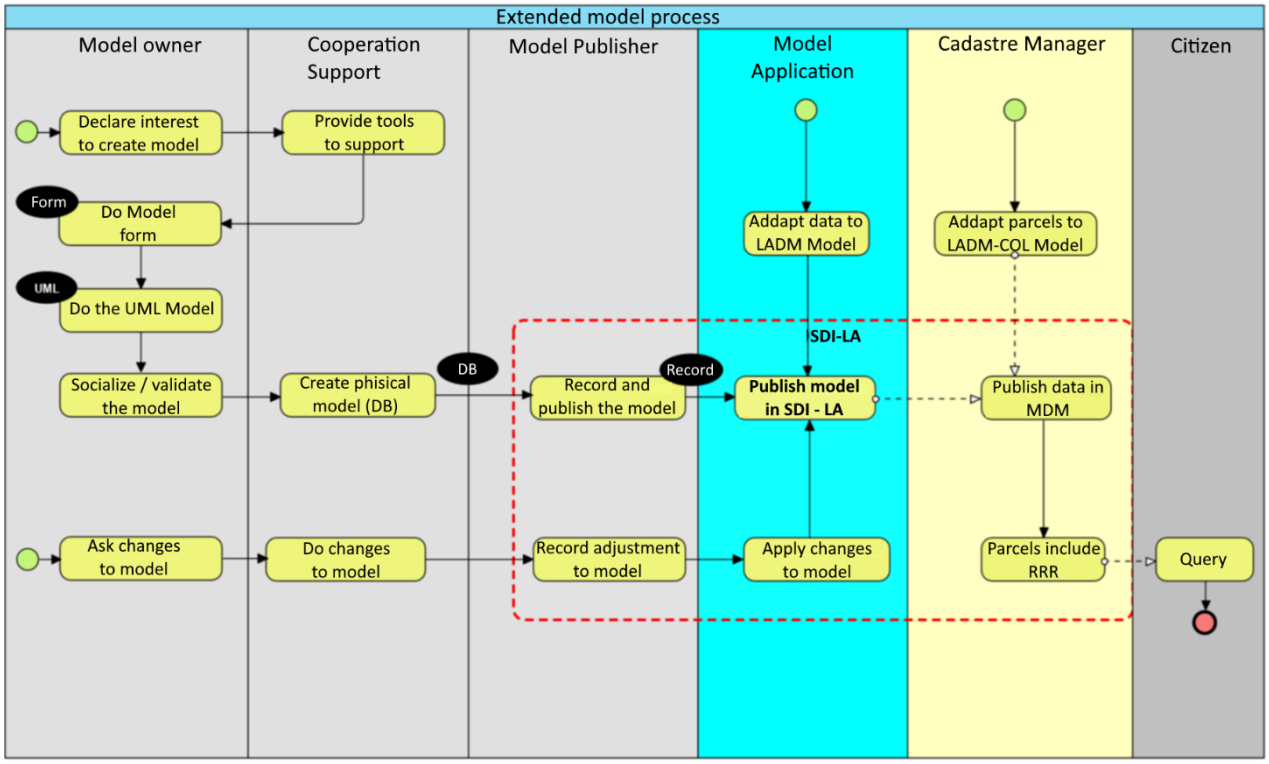
In an effort to modernize its spatial data infrastructure used for land use planning, the Agustín Codazzi Geographic Institute structured two platforms for data availability, aiming to comply with part of the expected flowchart in the Figure 11:

- **Colombia in Maps.** Consolidating all available geographic information.
- **Colombia in land use plans.** Micro-site that includes regulations, instruments, and inventory of land use plans that have been collected by the institution.

3.1 Automatic Certificates from the Online Land Use Plan

A pilot test was conducted in 17 municipalities, taking three of the ten land objects from the land use plan and cross-checking them with the properties to enable the automatic generation of the land use certificate. This is the most frequently requested certificate in the municipalities since it is a requirement for many land management procedures, such as building and operation permits, and also for the exploitation of natural resources.

Figure 11. Proposed Flowchart for Model Development and Implementation



Source: Prepared by SwissTierras

3.2 A Binding Certificate

An automatically generated certificate is not something new, it just requires technological development. However, the most key factor is that the automatically generated certificate is seen as an official, binding document, as shown in the Figure 12. **The certificate issued on the Colombia in Maps platform is officially recognized by the Ministry of Trade, Industry, and Tourism.**

Although the platform still needs to be improved to be more user-friendly, the potential of implementing the 10 land objects from the LADM-POT model is promising. In addition, the issue of land use planning is one of the new administration's top priorities, and any progress of this type will help strengthen and improve existing policies.

Figure 12. Land Use Query in Colombia Land Use Plan Application

Source: Colombia en Mapas IGAC (IGAC, 2023)

4. CONCLUSIONS AND FINDINGS REGARDING THE ADOPTION OF THE LADM-POT STANDARD IN COLOMBIA

- The existence of standards such as the ISO 19152 (LADM) and the philosophy put forward in Cadastre 2014 facilitate understanding among the various stakeholders that make decisions about land; this is also true for legal land objects, which allow the final decisions to be standardized.
- Since Colombia's multiple planning instruments still need to be reviewed in order to simplify and facilitate the process, the implementation of the "formulation" phase is a good next step to work towards the desired outcome.
- The support strategy adopted by the SwissTierras project is fitting, in the sense that it provides support at the technical and technological levels but leaves the regulatory decisions to the competent institutions. This facilitates appropriation and approval in line with the vision of short-term support, which the institution considers appropriate according to the context and its capacities—a lesson that international cooperation still needs to learn in Latin American countries.
- The strategy to adopt the new regulations over a two-year transition period is an interesting and positive decision for processes when changes cannot be applied immediately. Although the institution has all the power to order a change like this be implemented immediately, it is always necessary to consider the local capacities, academia's capacity to prepare appropriate training that aligns with the change, and above all, private companies that normally participate as service providers. If these stakeholders are not considered, they may become opponents of change.
- The LADM-POT model is just one of the extended models being developed in Colombia. After the property model, the land use planning model is the first to be approved, and surely this model's best practices will be replicated in the adoption and implementation of the other models.
- The focus on outcomes that positively impact citizens will always be a point in favor of implementing change. This has an added value—not only when the citizen sees the benefits, but also in the potential seen by the institutional framework, as well as the country's ability to manage its own resources or those of cooperation agencies, which will always see this approach in a positive light.
- The Colombian model has its complexities due to the country's dynamics around matters that could be simpler for others, but it's working.

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