The Role of the LADM in the transactional flow of Land Administration. Case: Colombia

Daniel CASALPRIM, Spain and Golgi ALVAREZ, Honduras

Key words: Land administration workflow, information management, Colombia Cadaster, LADM and transactions.

SUMMARY

Current efforts for automation include the consideration of the entire value chain of industrial processes. To achieve this, Integrated Management Systems focus on the inclusion of the main processes: information management and operation management.

In the Land Administration case, the standardization has prioritized largely on the LADM adoption to facilitate massive data acquisition processes, modeling, Cadastre - Registry integration, and its interoperability through exposition mechanisms. The LADM plays an important role for the standardization of the domain model, including the data core elements: BA_Unit, Spatial_Unit, Source, RRR relations, and Party; however, the focus on the current LADM version is information modeling

An important challenge is the adoption of the LADM in the workflows where the end user (the citizen) intervenes, through the standardization of the operation. Beyond modeling the ultimate state of the information, and for simplification purposes, it is necessary to model the transitional steps between final states; i.e. the transaction. For this, it is necessary to consider the integration of the stakeholders that participate in the transactional chain, including intermediaries, that can be different depending on the legal framework of each country.

The Land Administration modernization process in Colombia is currently being implemented through a joint vision of many government entities and stakeholders, focusing on the data integrity and processes simplification through the development of a management model where external all the stakeholders involved in the land will be integrated in a single flow, in a single file and a unique identification of the territorial objects modeled over the LADM standard, before recording changes in the Cadastral Registry

The utility of modeling the “out-of-registry” transactional process has potentialities beyond the operation which takes place through legal channels, as is the case with formally registered properties. If this standardization is applied to non-formal processes, it is possible to make the complete reality of the territory coexist in a single model without entering conflicts of competence between the "facts" registered by Cadastre and the "rights" recognized by the Registry.

Consequently, the integration of the LADM into the transactional flows brings significant value to initiatives that simplifies processes and procedures; especially when the objective is the decentralization of data update, data certification and data query information procedures.

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1. MANAGING THE INFORMATION IS NO LONGER ENOUGH

For a long time, the scope of the automation process has been focused on data management. For business environments, such as assisted design (CAD) and geographic schemes (GIS), it was enough to achieve data interoperability between different offices responsible the acquisition, analysis and provision of information.

Current market demands have led to higher expectations in information management, especially for other phases of the business cycle: temporary versions (4D), its relation to the economic value (5D) and even its control in the complete life cycle in a file from its conception until its inactivation (6D). The BIM higher levels and the Digital Twin concepts are examples of this standardization trends.

Land Administration is not an isolated case in this trend to standardization, where the territorial object can be a property, a public good or a special regime zone, all of them subject to changes. The LADM has become an important tool to facilitate semantics and interoperability for institutions whose main role is to manage and maintain data records:

- Capture existing data in physical reality
- Maintain the relationship between stakeholders and their documentary source up to date
- Advertise this data through formal mechanisms.

However, the greatest utility of this standardization is the latest version of the data, and sometimes, it is also the relationship with its antecedent, what solves the most important needing of the institutions, but not necessarily the end user (the citizen) requirements. Current efforts for automation include the entire value chain of industrial processes, and not only the latest version of the data. To achieve this, Integrated Management Systems focus on the inclusion of the two main extremes of the process: information management and operation management.

Figure 1. From Information Management to Operation Management

2. MANAGING THE OPERATION IMPLIES INTEGRATING THE PROCESS

One of the challenges of the information management is how we control the channels of citizen actions through transactions such as sales, mortgages, tax payments or license

management. Depending on the country institutional environment and its limitations to speed up simplification, these procedures involve multiple public and private stakeholders through which the citizen must go by filling out forms, submitting requirements, doing payments and investing considerable efforts (time and cost).

The following graph is a sequence diagram of a sale that includes a parcel split; in addition to the buyer and seller, there are eight more stakeholders and 24 actions are taken, starting at the willing and finishing at the record registration; if it only happened once.

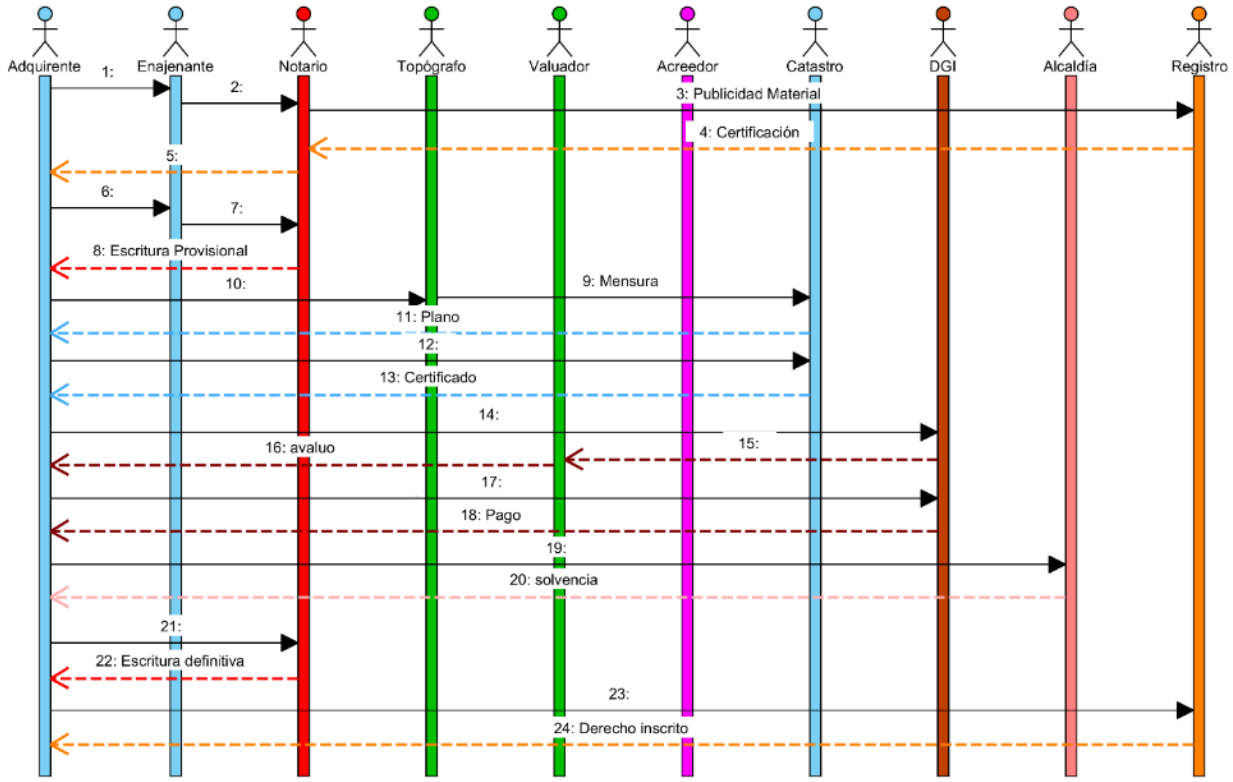

Figure 2. Concatenated flow of a sale: Multidimensional Cadastre - Registry Diagnostic - in Nicaragua[7]

For modernized processes the previous flow might seems illogical, however, it is the result of a recent study (2016) where the user:

- Due to lack of access to the registered information he must request a certificate,
- He must visit a cadaster office that authorizes his physical reality, another cadaster office for his economic appraisal and a municipal cadaster office to ask for a tax solvency certificate
- According this study, in the best case, this process would take from 38 to 105 days.

The negative impact of the intermediaries needed of this chain is one of the indicators that Doing Business qualifies as incentives for competitiveness and investment for a country. http://www.doingbusiness.org/en/rankings.

In addition to the time and cost issues, the traceability issue gets worse in the absence of a semantics in the sensitive data, the existence of multiple quote numbers, reception, and certification, and having a great impact on the efficiency of the services required by the citizen.

If this reality is not modeled, mainly the interactions between stakeholders who take actions in the process, the challenge of simplifying processes and procedures will not be evident, even if the Cadastre – Registry integration process have been standardized and automated.

3. THE INTEGRATION OF TRANSACTION IN THE COLOMBIA LAND ADMINISTRATION MODEL

Figure 3. Colombia in South America

Colombia is going through an important moment in the alignment of initiatives focused on the Land Administration modernization. Among the most important milestones in the modernization process, it can be found the LADM Colombian profile definition as a semantics standard which had been included in the public policy standard definition. It can also be found a high-level alignment in the government entities and the selection of methodologies for the provision / formalization of data applying the land administration standard.

Implementing modernization processes does not work by copying and pasting from other experiences, particularly in Colombia which has institutional, legislative, social and historical complexities that prevents the adoption of immediate transformations. Among the particularities in this country, we can find:

- Excessively ambitious goals for updating the Cadastre and land titling, due to the recent peace agreement of the conflict that lasted more than four decades.

- Inequalities of modernization conditions between rural municipalities and big metropolis with large urban centers; example: Bogotá +7 million habitants, Cali +2.5 million, Medellín +2.5 million.
- Existence of a Cadastre with a legal / fiscal approach implemented throughout the country, but with a high level of outdating.
- Centralization of cadastral actions in a single state entity, with limitations to cover the demand.
- Multiple institutional actions regarding property, data collection, updating, titling, conflict resolution, tax burdens and rights registration, without effective coordination.
- Manifest intention in public policy for the ISO-19152 standard adoption and the philosophical principles of Cadastre 2014/2034.

These types of conditions create an ideal scenario for the adoption of standards such as LADM as a common semantic for property data management where the interoperability within the institutions can have effective results. But the pressure for results, with very ambitious targets and high citizen expectation, together with the limitation of not having new property legislation needed for this complex institutional environment, makes its implementation highly complex.

As a result of this context, the Colombian LADM model profile, beyond providing valuable results in terms of standardization in the management of the operation, will also be provide lessons learnt in how to implement the mechanisms for the incorporation of the LADM standard in the traceability of the procedures.

3.1 The Joint Vision of Land Administration of Colombia

The process of modernization of the Land Administration in Colombia includes a commitment to create better interoperability conditions within the institutions and to simplify the procedures that citizens need to perform for several purposes: update information, land titling, getting licenses.

From the Information management side (see Figure 4)

- As a next step for the inclusion of the ISO 19152 standard in public policy planning documents stated in Colombia CONPES[2], a Colombian profile called LADM-COL[4] was built. This includes the elements of the standard according to the actions of the institutions which capture, update, do land titling and land registration.
- In the phase of acquiring the property rights data in a massive way under a multipurpose cadastre approach, a reduced version of the LADM-COL model is used for field operation.
- In the phase of officialization and data linking (from those obtained in a massive way, to the the existing data in the current registers), there is a validation process based on the model, using the INTERLIS as an exchange language on a model-based architecture[3] (MDA).

- Finally, this data reaches a phase of exposition to be visible only by the institutions that may require data access (using the concept of master data management) through the publication of the core data included in the LADM as a single point of truth.

From the Operation management side (see Figure 4)

- This single point of truth will be available as a service for the multiple stakeholders related to the transaction process (surveyors, notaries, licensing authorities, municipalities, etc.).
- Once this data is arranged through a single integrated window, the procedure will move through the different stakeholders who do the qualification, authorization or updating actions, in a transparent way to the citizen, through a single point of processing and traceability of its progress.

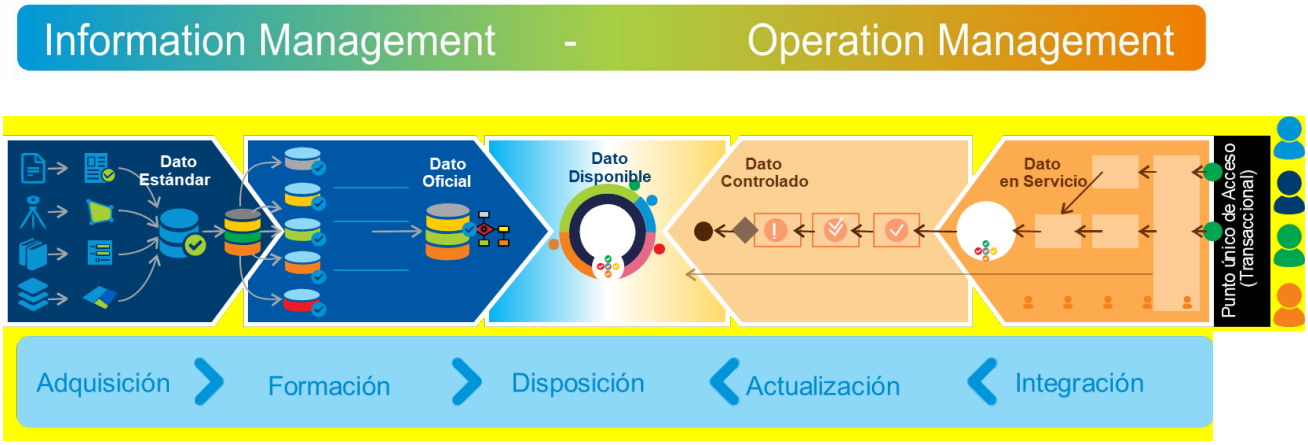

Figure 4. From Information Management to Operation Management

Obviously, in this conceptual model, the disposition point is crucial for the consultation and traceability of the information.

3.2 The mechanisms for linking the LADM with the procedures

The conceptual approach explained on the previous paragraph (3.1) includes mechanisms that facilitate its materialization by the institutions individually and by a National Land System in which all collaborate in a complementary manner. The conception of these mechanisms, even if they are under construction, has already been socialized and adopted by the Government and included in the National Development Plan 2018-2022[6]; which suggests, more than a political decision, a guide for its gradual implementation.

3.2.1 Gradual integration of institutional processes within the framework of a National Land System.

Adopting this vision by institutions will not be easy in the current context that, as mentioned above, includes the pressure for immediate results in a highly complex environment. For this reason, the institutions are working on the processes modelling under a complete trace vision:

on the left side, the temporary processes, such as the massive property surveying and the regularization by massive offer (Information management); on the right side, the permanent processes that are the demand based for information updating (Operation management).(See Figure 4)

These processes were modeled under a joint vision. It is easy to understand the role played by a single point of truth and its relationship with data inputs and outputs. The Figure 5 reflects an example of how data coming from the massive surveying and the data coming from demand process are involved in the general data flow.

It includes the role of the main systems: National Cadastre (and partners), Land Records Registry, Title Agency and Spatial Data Infrastructure.

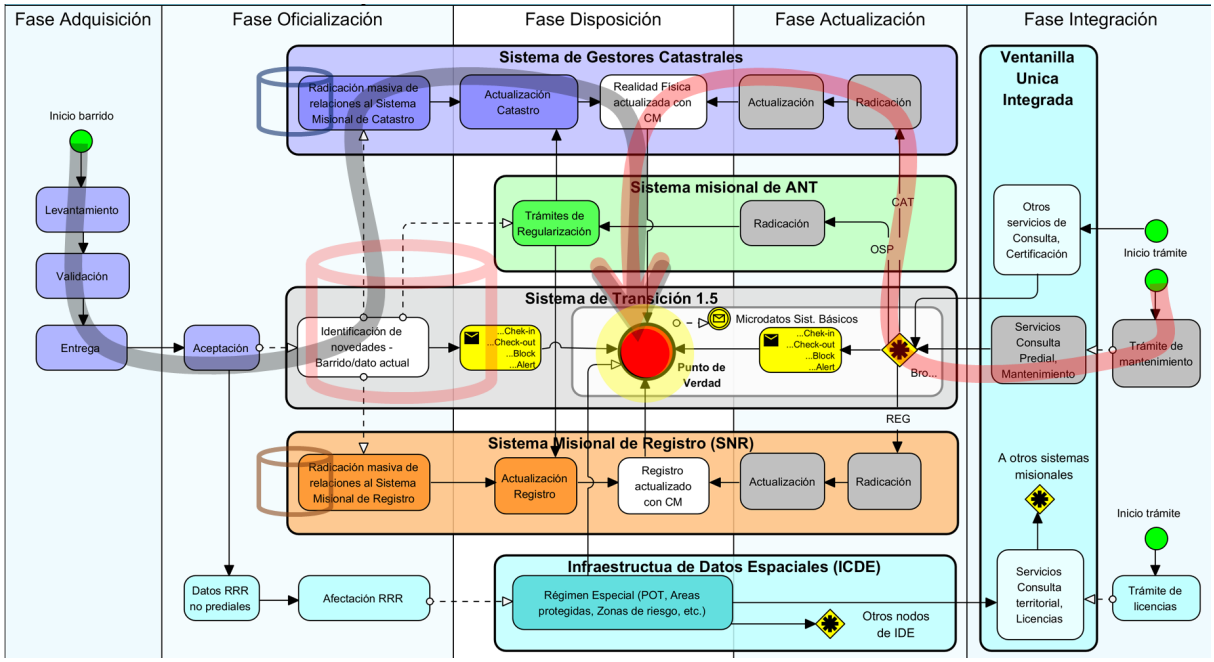

Figure 5. From Data Acquisition to Data Maintenance

This high-level modeling allows each institutional system to be reflected in simple roles with a view on the complete trace, allowing the understanding between the object (property) and its separation from the process that is carried out on it. So, the owner of the object should not be the institutional system, but a unique truth core, while the institution is the owner of the procedure qualification of rights, restrictions and responsibilities over the territorial object.

3.2.2 Information Management: The only real point based on the LADM model.

With the logic of Master Data Management, the Colombian model raises a point of truth based on roles, where the citizen, notary, surveyor, registrar, etc. have access to information from the authorities managing it. This point of truth is the LADM-COL[2] core, with a unique national identifier and transaction alerts.

The basic applications of the Master Data Management could be Check-in / Check-out controls, but additionally can be extended to alerts like integrity and versioning. And specially to create a master database of those information which in the legacy systems could be different like area, identifier, address, party, etc.

- **Section 1. Basic data of the Property (BA_Unit).** Includes physical, legal and administrative realities.

- **Section 2. Integrity Alerts.** Alerts coming from inconsistencies between the physical and the legal information.

- **Section 3. Spatial Unit.** This includes map, coordinates, surveying and boundaries in a spatial viewer.

- **Section 4. Check out/in alerts.** Alert services for transactions in process or in qualification status.

- **Section 5. Rights and Source (RR + Source).** Summarized at the tabular level, including both the formally registered right and informality.

- **Section 6. Restrictions / Responsibilities (R).** It comes from the spatial cross check of thematic information, through extended models[5] that affect the use, domain, occupation and disposition of the land, based on territorial objects that support the planning.

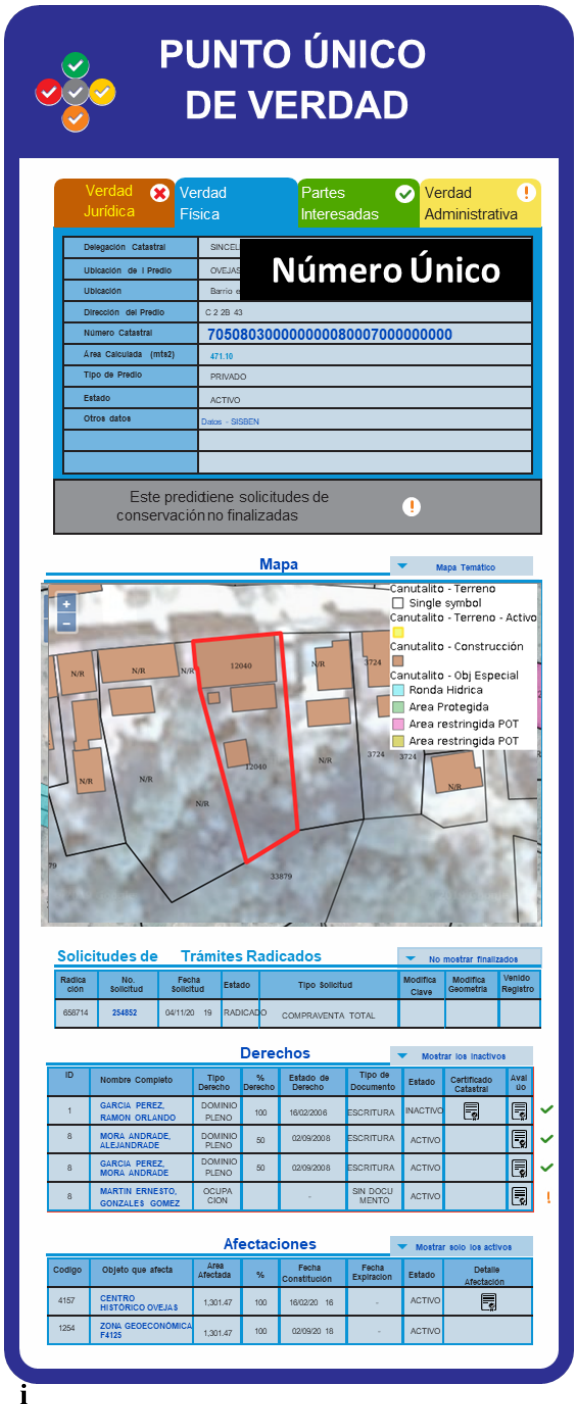

Figure 6. Point of truth

3.2.3 Operation Management Modeling and in process alerts standardization.

The Colombian model is committed to the approval and mechanization of all types of procedures under an unified approach. Rather than obeying a technological approach, this is an industrial engineering discipline, as one of its peculiarities is that it has a similar behavior no matter how many interveners are involved:

The user

1. Check information, steps or requirements
2. Submits a request

The Receiver

3. Receives the request **(Check-in control)**
4. Allows requirements correction
5. Assigns request to who will perform the qualification

The Register

6. Qualifies according to his discipline
7. Approves, deny provisionally or definitively (**Check-out Control**)

The user

8. Receives the result, being able to return it.

Although within the steps listed above, for each stakeholder or institution it may be different stages and subprocedures, that can be very complex and difficult to standardize in the short term. To ensure traceability, only the entry and exit control points are of interest (Check-in / Check-out). Very basic attributes like Data, Iteration number, Owner are needed. In this context, no major modifications to the systems are necessary to be implemented, except in the alert services of entry and exit of the procedure and its disposition on a single point.

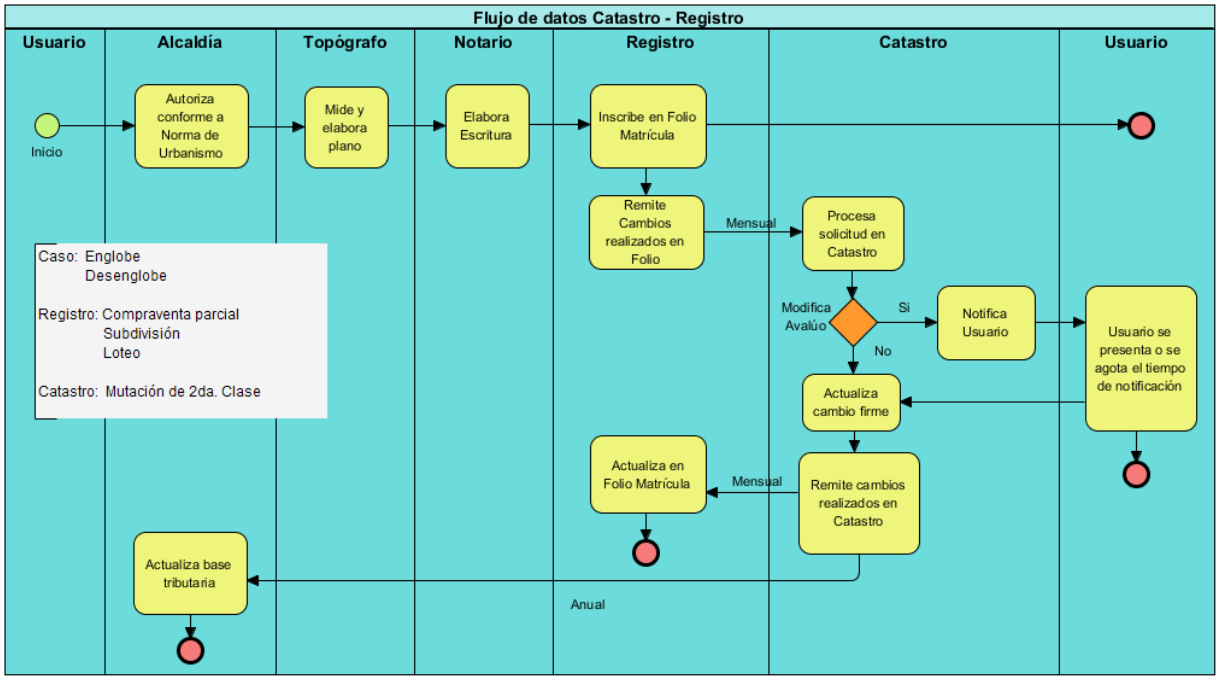

Figure 7. Wrokflow Cadastre - Registry

The Figure 7 shows the different interactions in a parcel split and sale process currently in Colombia, where the user needs to deal with:

- The municipality or an authorized stakeholder to approve the subdivision,
- The surveyor to perform the measurement,

- The notary to prepare the public instrument,
- The cadastral authority to update the information in their missional system,
- The registration authority to register the act in its mission system.

All of them, need to access to the single point of truth, but they are also interested in knowing if the property they are qualifying is being affected by any other proccess that may have an impact on the transaction.

The Figure 8 shows how the actions feed data, alerts requests and resolutions on the single point of truth, where the core information is consolidated.

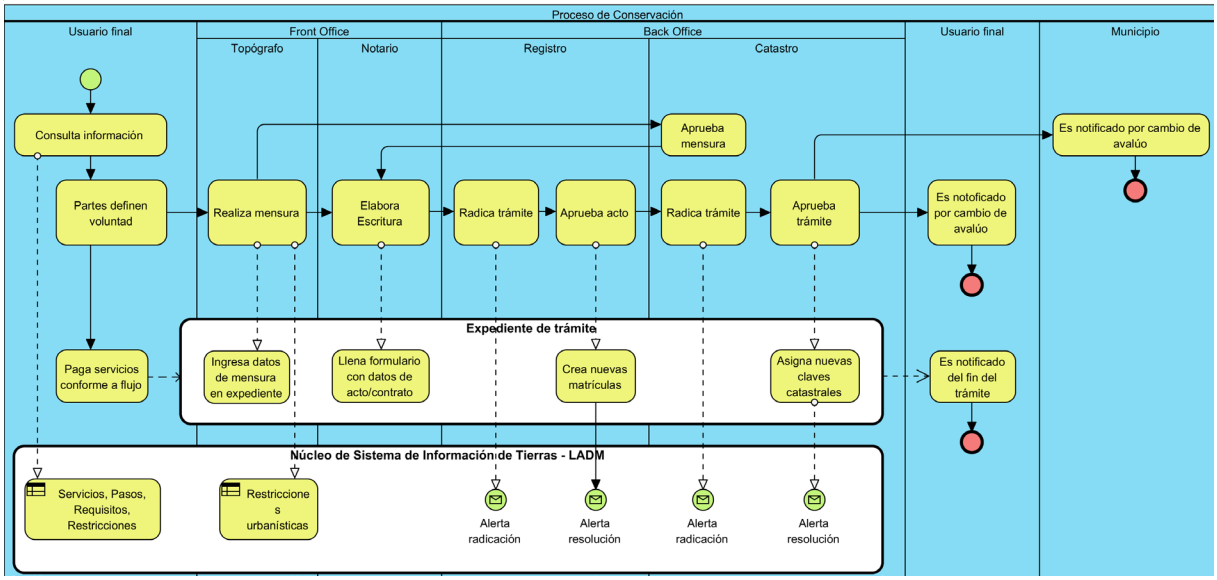

Figure 8. Maintenance process

The potential of this scheme is that the same property can reflect everything that is happening in real time from different processes, both formal and informal. As an example:

- The identification of the interested parties in a property, without a recognized right,
- The application for titling or regularization requests,
- The management of licenses or permits for construction or business operations,
- The affectation of a property through restrictions or responsibilities.

Of course, with a unique file case, the user just submits the required documents once and those are shared to be used in the different steps in the workflow. Additionally, the data is filled just one time, avoiding mistakes, duplicities and omissions.

Under the previous considerations, the commitment with the next version of the ISO-19152 standard is imperative, where the need to model the actions of known stakeholders that participate in land administration transactions is raised. Since this will be the case in any country, at a smaller or larger scale, the modeling of real time processes becomes an unavoidable requirement.

3.2.4 Ideal Scenario of the Land Administration System in Colombia.

The new processes that are being developed in Colombia include institutional transformations in terms of roles, such as the deconcentrating cadastral actions through cadastral managers. Although the detail of this flow is under construction, the role of the "Point of Truth" has been widely accepted. The way on how it interacts with all the entities is currently under analysis.

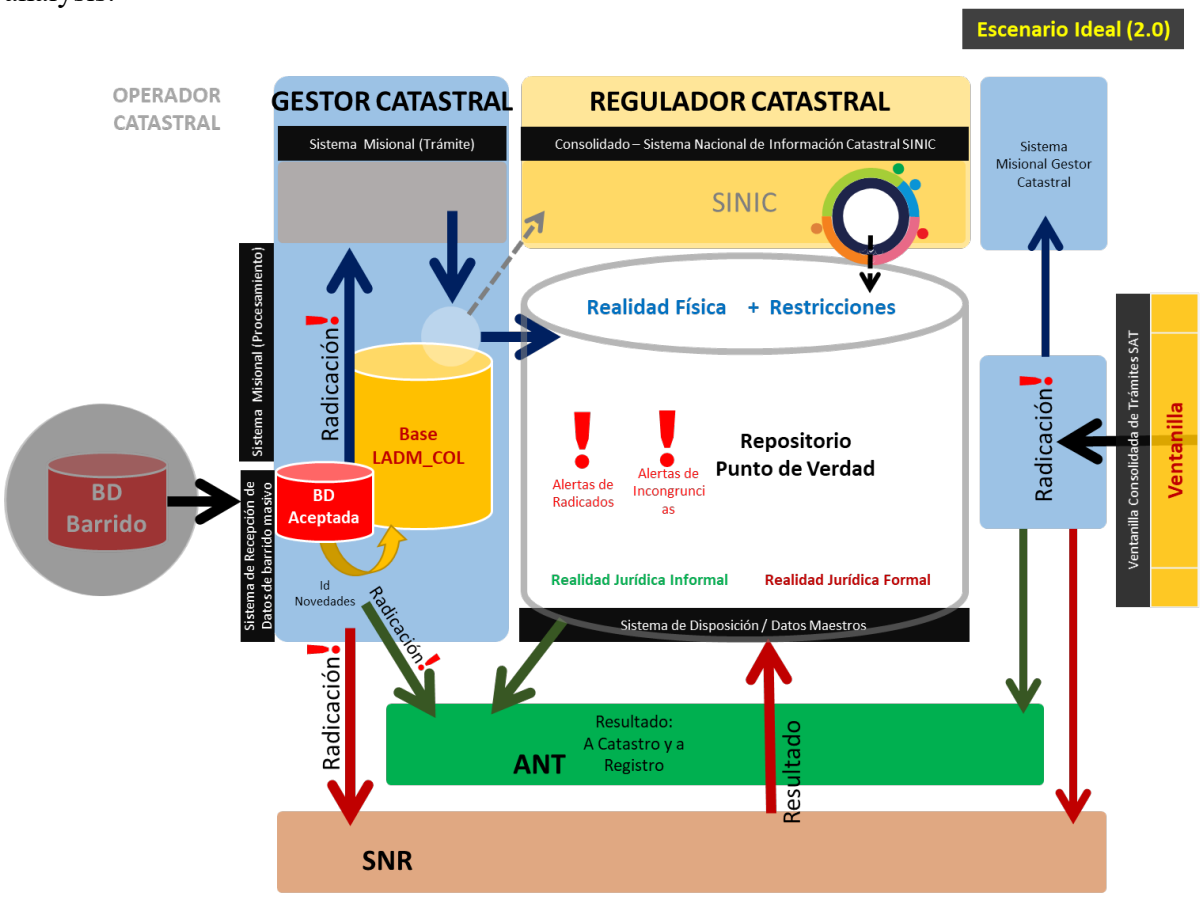

Figure 9. Land Administration System – Cadastral Case

From the perspective of the massive data acquisition (left side):

- The data goes into the system and becomes the official source of information, related to historical information.
- Institutions related to regularization, such as the National Land Agency or Municipalities act against the same data core.
- Each procedure/transaction that takes place in a property record is displayed as an alert flag, or as a final result.

From the perspective of real estate transactions or updates (right side):

- Every stakeholder in the pre-registration process chain has access to the unique point of truth,

- The stakeholder can be integrated in the window through the standardized procedure

This ideal scenario will not be achieved immediately, so the Colombian model has considered a transition phase based on gradual scenarios that will allow the sustainable integration of the new model, considering technological, regulatory framework and institutional constraints.

4. CONCLUSIONS AND RECOMMENDATIONS

The adoption of the LADM standard in public policy instruments facilitates decision-making at the intermediate levels of the institutions. Thanks to this, the transitory processes have allowed the continuity and breadth of the LADM design according to the reality of the country in Colombia, instead of abandoning government efforts to apply changes.

There is an evident need to make visible the central role of the citizen in the modernization processes of Land Administration. The success of this transformation will depend on the consideration of time, steps and requirements on the transformation of the transaction processes. This implies considering the transaction as an element to standardize.

It is feasible to use the LADM as an element of traceability of Land Administration transactions. Beyond the historical control of the versioning contained in the Source, the states of Check-in and Check-out are very useful for the real-time control of what happens to the properties.

The processes of modernization of Land Administration, needs to be seen from the perspective of the operation, rather than standardize information management, as it will allow the inclusion of indicators that will focus on time, cost, traceability and transparency of the operations. Including these elements in the design stages of processes, tools and policies will undoubtedly lead to simplification as an obligatory step.

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BIOGRAPHICAL NOTES

Daniel Casalprim.
Specialist in Project Management of Map Production, Land Tenure and Property Rights projects, he has leaded Technical Teams and the implementation of innovative production structures in these areas during more than 15 years in Latin America, Africa and Europe, with different funding agencies. He has managed map production projects for governmental agencies in South America, leaded a fiscal cadaster project in Cameroon and a land delimitation project in Ecuador (Programa Sigtierras). He has also been involved in the LIFT project in Ethiopia (DAI) through the evaluation of the Rural Land Administration System, funded by DFID. Currently he is leading the technical team involved in the Proyecto de Modernizacion de la Administración de Tierras in Colombia, funded by SECO (Swiss Cooperation).

Golgi Alvarez.
Social Development Professional, with more than 15 years of experience in projects to modernize the territory processes in different Latin American countries. Among the projects that have actively participated is the adoption of the Core Cadastre Domain Model (CCDM) in the Unified Registry System of Honduras in 2004, the Joint municipalities Cadastre Management Model in Honduras and the Integrated Cadastre – Registry Management Model in Nicaragua. He is currently part of the SwissPhoto-Incige team of specialists, which with support from the Swiss Cooperation has been supporting the adoption of the LADM for the modernization of the Land Administration in Colombia

CONTACTS

Daniel CASALPRIM
Agencia de Implementación Proyecto Modernización de Administración de Tierras en Colombia - BSF Swissphoto AG
Av el Dorado No. 69 - 63, Edificio Torre 26, Oficina 406, Bogotá DC
COLOMBIA
Tel. +57 7040687
Email: daniel.casalprim@bsf-swissphoto.com
Website: https://www.proadmintierra.info

Golgi ALVAREZ
Agencia de Implementación Proyecto Modernización de Administración de Tierras en Colombia - BSF Swissphoto AG
Av el Dorado No. 69 - 63, Edificio Torre 26, Oficina 406, Bogotá DC
COLOMBIA
Tel. +57 7040687
Email: galvarez@proadmintierra.info
Website: https://www.proadmintierra.info