

# **Management and Modernization of the Cadastral Infrastructure in Colombia**

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## **Key words:**

## **ABSTRACT**

Throughout sixty-five years, Colombian Cadastre has stopped being a “tax” to become into the main development information source where parcels are described as well as their characteristics and their relation with the people and the zone in which they are located. This is why the cadastral reform is currently being carried out, whose objective is to bring up the cadastral management to date and as its product, converting cadastre into a Land Information System (LIS) whose fundamental is to provide information to support sustainable development.

The cadastral management updating in Colombia expects to make a reality the creation of a modern cadastral framework that will facilitate cadastral processes and guarantee a better access to information, contributing with better resources for vital processes for the country such as stratification, issue land titles, or the territorial ordering.

## **RESUMEN**

A lo largo de sesenta y cinco años, el catastro Colombiano ha pasado de ser un impuesto a un Sistema de Información en el que se describen los predios, sus características y su relación con las personas y la zona en que se encuentran. Para ello se lleva a cabo la reforma catastral que tiene como objetivo modernizar la gestión catastral y como producto de ella, el convertir el catastro en un Sistema de Información de Tierras (SIT) con base en el predio que tenga como fundamento el proveer información para soportar el desarrollo sostenible.

En Colombia la modernización de la gestión catastral, pretende hacer realidad la creación de una infraestructura catastral moderna que facilite los procesos catastrales y garantice un mejor acceso a la información, aportando mejores recursos para procesos vitales para el país como son la estratificación, la titulación de tierras o el ordenamiento territorial.

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## 1. INTRODUCTION

The Geographic Institute Agustín Codazzi was founded in 1935 as a branch of the government, assigned to the Armed Forces, with the name of Military Geographical Institute. Colombian cadastre came into being in an incipient form at the end of the first decade in the 19th Century, but it was nationally formalized around 1940 with the consolidation of the *Instituto Geográfico Militar y Catastral (Military and Cadastral Geographical Institute)*; in 1957 became into the *Instituto Geográfico Agustín Codazzi (IGAC)*, that is standing as the only civil geographical institute in South America.

The institute includes activities in mapping, agrology, cadastre, geography and research and teaching; in accordance to the political constitution, the country must produce and update the official map and as a governmental entity, it must develop the policies and carry out the plans of the national government with regards to cartography, agrology, cadastre and geography through the production, analysis and publication of cadastral and georeferenced environmental information.

## 2. CADASTRAL ORGANIZATION IN COLOMBIA

During its history of over sixty-five years, the Colombian cadastre has evolved from being a support for the Internal Revenue Service, to being the fundamental information source for the development of territorial entities and of the country in general.

The cadastral information is produced based on the detailed cartography and soil quality studies: this is the inventory of the physical, economic, legal and fiscal attributes of both state and private property.

As a result of the census of both rural and urban properties, the Institute owns a valuable systematized information bank which contains physical, legal and economic characteristics of about seven million parcel.

The country's need in relation to spatial information, the development of technologies and tools used in the cadastral process to cover both public and private users' requirements, have been the drive that marked the sep for the cadastre to become first into a multi-purpose and into the parcel based Land Information System secondly.

- In its first stage, the main product of cadastral work in Colombia was a listing with properties and parcels, that worked as a support to define and collect parcel tax by the municipalities; in this way, cadastre was constituted as the main income source for local administrations.

- The second stage in cadastral development was given when it passed from producing data that guaranteed collecting taxes to support municipalities, to cadastral organizations that capture, manipulate, and offer solid and varied information about the parcel, the setting where it is located and its owners. With this conception, the so called “Multi-purpose cadastre” were brought about, that constituted the main information source for planning and all those activities concerning land resource as basic data.

### 3. THE CADASTRAL REFORM

In order to get to a modern cadastre management<sup>1</sup> within the parameters that will allow the entity to produce and offer better quality information and in a more dynamic manner, currently the so called Cadastre Management Reform Project is being developed. The main **objectives are to improve efficiency in the cadastre processes to provide users with data and information in a much faster and more efficient manner, updating procedures, using new tools and facilitating access to information.**

Three fundamental aspects are pursued with the cadastre management updating:

- Update methodologies and technologies used in the cadastral process.
- Produce efficient information according to users’ requirements.
- Guarantee a fast access to information.

Activities to be carried out for this project are being developed within an internal and external context that will benefit both the cadastre as the users.

#### 3.1 Internal

- Consolidate the National Cadastral Data Base to guarantee:
  - High quality data
  - Better positional accuracy
  - Access Facility
- Application design to convert the L.I.S into an Expert System that will guarantee:
  - Automatic appraisal settlement.
  - Line maintenance
  - Automatic plane certificate production
  - Cadastre chart’s automatic production
  - Digital parcel index card.

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<sup>1</sup> *Set of technical and administrative operations required for the formation, updating and cadastre preservation and of the drive for the appropriate use of cadastral information.*

- Historical database that will allow retrieving geometrical and alphanumerical information of any parcel.
- Use of ortho-photos produced by digital restitution and use de G.P.S.

### **3.2 External**

- Offer updated digital information to municipalities and other users.
- Provide consultancy to use information to different municipal entities
- Implement information system to users.
- Accomplish interrelation through electronic media between the Cadastre's database and the Register.
- Guarantee that cadastral information is a permanent item in the Colombian Spatial Data Infrastructure (ICDE).

The impact of the reform on the organization is not only to modernize the production line processes but also to shift the emphasis to greater awareness of the need for new products and a marketing strategy to better meet the users requirements. In accordance to this, training is also an important aspect and a continuous professional and technical development program has been organized in the Human Resource Department of IGAC to ensure that personnel can remain up to date technically and professionally.

## **4. THE LAND INFORMATION SYSTEM**

Due to its nature, the cadastre is an information system where the information describing parcels and their relation with the scenery and owners is stored, processes and filed. As from the cadastre's specific conditions and the type of manipulation generally effected in cadastral activities, a data model suitable for the local cadastre conditions was designed:

- Neighboring relationships not only physically in the land (spatial) but also legally.
- Changes that occur in cadastre (mutations), have to be stored in a historical database due to the legal value contains.
- Both land and construction have an economic value that has to be kept.
- There is a fundamental relation between the parcel and the owner.

Due to the fact that the IGAC produces basic cartographic, agrologic and cadastral data, in order to implement the Integrated Geographic Information System, the SIGAC Data Model was created, that represents the total scenery manipulated by the Institute and that is being implemented at national level. Within the SIGAC, cadastral elements are grouped in the Cadastre theme as it is shown in Figure 1.

As a major provider of spatial data in Colombia, IGAC is involved in the development of Meta data and Standards for spatial information within the Colombian Spatial Data Infrastructure (ICDE); as a product of that, the organization has seven and half million parcels with metadata according with the Colombian norm (NTC-4611). Access to data is a

fundamental prerequisite for the establishment an effective Land Information System and ICDE is the solution for that.

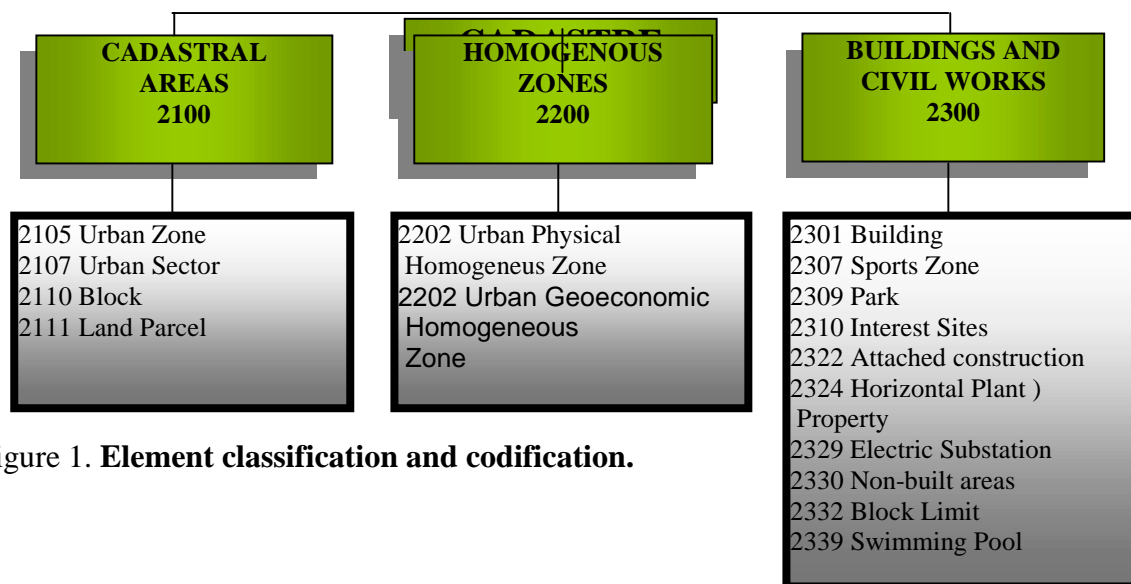


Figure 1. **Element classification and codification.**

At this moment, the cadastral department has two million and half parcels in digital form within the LIS; the digital data are currently sold at a highly subsidised price, this is due the service-oriented policy of the IGAC and its inclination to improve the use and development of geographical information.

By combining the cadastral information with the digital cartography and soil data, the IGAC is the principal source of spatial information in Colombia.

## 5. THE NATIONAL CADASTRAL DATA BASE (BNDC)

The demand for information relating to cadastre and land data is increasing in all the country, several public and private companies are involved in a lot of project related to parcels and ownership. The National Cadastral Data Base in Colombia meets the urgent requirements of cadastral information for more than seven and half million parcels; the BNDC in turn has been identified as having an fundamental role in Colombian development as information resources for decision making at national and local level.

Obtaining and maintaining national homogeneous, standardized and updated data allows to add and consolidate information and knowledge at national level, enabling to define coherent global or sector policies, as from guaranteeing convenient equality levels in the parcel taxation up to determining methodologies that may develop stratification processes, the designing or implementing of the territorial ordering plans at municipal or regional level and contributing with fundamental information to carry out land title projects that will result in ending with the informality in land possession in Colombia.

A national database will render users a faster and easier access to information about any parcel in the country and to obtain a certification about physical, economic, or legal

characteristics. This transcendental aspects for the nation's development, is highlighted in the Bathurst Statement (1999) as one of the essential recommendations:

“...Whilst access to data, its collection, custody and updating shall be facilitated at a local level, the overall land information infrastructure should be recognized as belonging to a national uniform service to promote sharing within and between nations.”

Colombia has the only existing national cadastral database (Figure 2) in South America that includes over seven and a half million parcels.

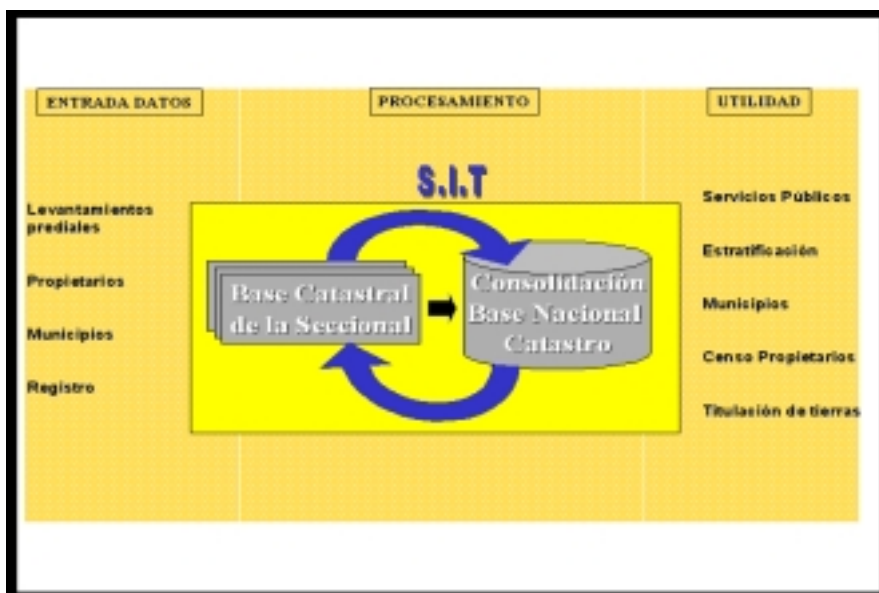


Figure 2. National Cadastral Database Structure.

## 6. THE CADASTRAL VISION: CADASTRE 2005

The task for the Colombian cadastre, is to fulfill most of the demands concerning information about parcel and its characteristics, ownership and the relation between parcels and zones in which they are located; due the increasing requirements for cadastral information, IGAC is modernizing the cadastrals activities.

The IGAC as completion of the cadastral management-updating project, expects to provide the country and the users in general with information that will allow to set forth any activity that has the land resource as basis. Precisely, the United Nations and the FIG (Federation Internationale Des Geometres) defined the Cadastral View as “**develop modern cadastral infrastructures that facilitate efficient land and property markets, protect the land rights of all, and support long term sustainable development and land management.**” (UN, 1996.Bogor).

As minimum, this framework shall guarantee:

- Total union between graphic information and attributes.
- All the information will be computerized.
- Totally display the parcels' legal situation including public rights and use restrictions.
- Hard and soft copy of Cadastral Parcel Certificate via electronic way.
- A significant portion of the costs will be recuperated.

## 7. CADASTRAL INFORMATION: FUNDAMENTAL TOOL FOR THE NATIONAL DEVELOPMENT

As it must be constantly updated, cadastral information is constituted as an essential base to aid several processes related to land management and planning such as:

**Land ownership titling:** In Colombia there are about two and half million parcels without title, a Land titling project has been set forth, project whose objective is to solve the legal situation of millions of parcels and families that exploit them without being owners.

As a result of the cadastral management reform, the IGAC is contributing with the new **Cadastral Parcel Certificate (Figure 3)** that eliminates the limit literal description in the new public deeds and that will have binding compliance as from the year 2005.



Figure 3. Cadastral Parcel Certificate

**Social Economic Stratification:** the methodology generated by the National Planning Department (DNP) to determine the rural stratification has the geo-economic homogeneous zones as a mandatory input that is one of the product of the cadastral process.

**Utilities:** One of the main users of the urban digital cadastral map are the utilities companies that has it as a mandatory requirement to set for their activities.

**Territorial Ordering:** As a territorial planning and administration tool, the cadastral information contains aspects relevant to the use of soil and property of useful land in order to learn what there is, who possesses it, where is it located and who it is.

## 7. CONCLUSIONS

- With the management and modernization of the cadastral infrastructure, the cadastral information will be accomplished as the information supplier for the territorial ordering and planning, contributing with a significant effort for the country's development.
- The Land Information System is a great significance tool for the sustainable development, the territorial ordering, urban and regional planning, since these processes require a clear and actual knowledge of the information about the land resource.
- The land information system, consolidated to the cadastre as a *science* for land management, providing information that enable:
  - Ownership titles to the persons that are settled in marginal zones by the governments.
  - Planning of urban spaces, as mechanisms to organize the cultural and social scenery of the population.
  - Set policies to control urban space's disorganized growth.
  - Secure land possession and its rights by the owners.

## REFERENCES

Bathurst's Declaration about cadastral frameworks and sustainable development, United Nations -FIG; Bathurst, Australia, 1999.

Bogor's Declaration, United Nations, - FIG, 1996

Congress Proceedings, XXI International Congress. FIG, Brighton, U.K., 1998.

**Henssen, Johan L.G., 1990.** Cadastre, Indispensable for Development. Enschede, The International Institute for Aerospace Survey and Earth Sciences (ITC).

The FIG Statement on the Cadastre, International Federation of Surveyors, No. 11, 1995.

**Martínez M. Yovanny and Ubaque U. Nyrian (2000).** Cadastre a land information system for sustainable development. In *International Cadastre System Seminar*. Santafé de Bogotá, May 3-5.

**Martínez M. Yovanny and Ubaque U. Nyrian** The New Millennium Cadastre. In *Revista Cartográfica (Cartographic Magazine)*. Colombian Cartographic Society. Bogotá 2001. Publication in progress.



## **BIOGRAPHICAL NOTES**

**Yovanny A. Martínez Martínez** was born in Valledupar Colombia in 1953. He graduated from the Universidad Distrital Fco José de Caldas. He is a cadastral and geodetic engineer; he got postgraduate titles in remote sensing in Colombia and GIS for cadastral purpose in ITC (Netherlands). Actually he is Chief of Cadastre in Geographic Institute Agustín Codazzi.

**Nyrian Angélica Ubaque Ubaque** was born in Bogotá Colombia in 1971. She graduated from the Universidad Distrital as cadastral and geodetic engineer; she got postgraduate title in management and planning of the regional development, graduate from the Universidad de Los Andes. Actually she belong to the cadastral modernization team in IGAC.