

# **CARTOGRAPHIC INFORMATION MANAGEMENT IN COLOMBIA**

## **...REACH A LEVEL OF PERFECTION**

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### **ABSTRACT**

Key words: management, geo-referenced information, yields, production methodology, implementation.

Within the processes of urban and regional planning of land-related activities involving the handling of road information, utilities, cadastral and environmental data, among others, requires the implementation and support of a robust infrastructure of databases that allows storing, processing and obtaining timely and updated geo-data as the situation demands.

Today, we produce physical, logical and operation models to maintain information consistent with the current reality, produced and generated by modern production technologies, related to the scientific advancements that remote sensing, digital photogrammetry and telecommunications have undergone.

However, a properly designed infrastructure would be meaningless if there is no adequate administrative management of georeferenced data that is supported, generally, by a strong Geographic Information System (GIS) and Management System, the latter (Management) emerging as a new requirement addressed to GIS.

### **1. Introduction**

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The ambitious but concrete, practical and realistic work of the Agustín Codazzi Geographic Institute aims to show the way to reach a post (rigid)GIS phase and arrive at its own management System, in other words involving activities such as: control and permanent updating of said system, based on the premises of: opportunity, agility, reliability and data use in real-time, thus supporting the needs of users of geospatial information.

The territory is constantly evolving and changing, therefore static data systems and involutive production technologies must be modernized towards creating a gear system that enables the management of the data contained in said systems.

The process starts with the approach to a variety of needs by users and customers to obtain (purchase) information of the territory. Since centuries past (Babylon), humans have had the need for a means of locating themselves for their movements and especially for understanding and planning in the territory/space in which they travel. Through cosmographers, astronomers and mathematicians (Greeks, Romans, Arabs, etc ...) scientific work began in representing the earth surface through maps to be used by armies, traders, etc (Spatial Analysis Techniques Lic . Environmental Management - U. CAECE, 2004), which requires increasingly accurate and timely information, creating the need scientific and technological progress in the production of spatial data.

Here are the main components that enable the management of cartographic information in Colombia under the paradigm of achieving a level of perfection.

## 2. Information Management

The use of new technological tools that have improved production processes have managed to meet the needs of data acquisition in an efficient manner, as seen in the development that the mapping production in Colombia has had.

The next step, inescapable and modern, is to capture the elements of the earth's surface from photogrammetric surveys and remote sensing. Initially topographic surveys are ruled out since these would be useful to update basic information already existing.

Obtaining information by digital photogrammetric means allows maintaining databases of the different layers of basic information, complying with the principles of standardization / normalization of information such as the Colombian Spatial Data Infrastructure-ICDE. With a modern production facility with fully digital workstations and 74 years of experience in map generation of the country at national, regional and local levels progress is achieved in obtaining integrated map databases.

Remote sensors remain an innovative alternative tool for capturing the spatial elements in the earth's surface. Satellite inputs used in Colombia for cartographic production are

optical and radar images provided by United States and Europe. This information is stored in an image management system at the national level, which allows the management of existing information for the country from the previously mentioned sensors. This initiative has been named the National Image Bank, which seeks to avoid duplication of efforts and resources in the acquisition of said images in the country. It is available on IGAC's website, for the various user inquiries. (www.igac.gov.co), the link is Colombia maps / applications / Image bank.



Image No. 1. National Image Bank

Currently, the sensor used by IGAC is a Digital Airborne Camera System, which allows the capture of images at the panchromatic, multispectral and near infrared level.



Image No. 2. Digital Camare UltraCam D

But the production of spatial data is not an isolated work, it follows planning and integration of processes, which is obtained through data management that is consolidated through the planning needs of the users in the Production Programs and is organized through a flow that allows control of entries (inputs) and outputs (intermediate and final products) in the mapping process. In this way, maintaining the databases by information level as well as by intermediate and final process.

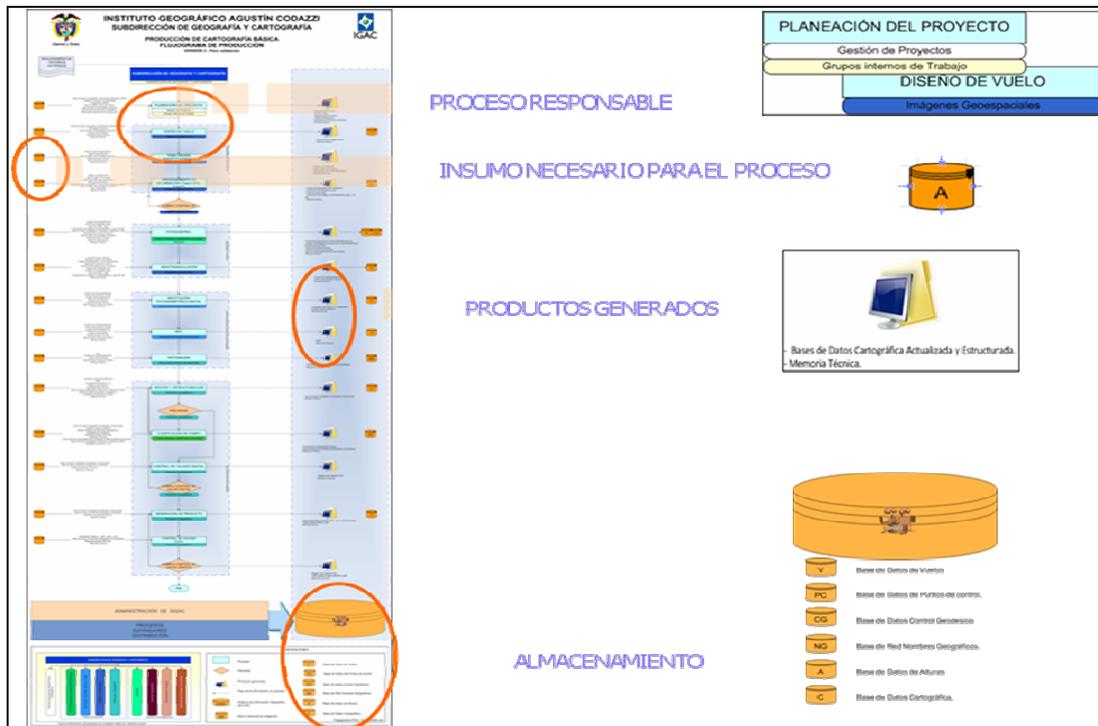


Figure No. 1. Production Flow Chart

Similarly, continuing the process of data management, information is standardized through a multiscale data model that determines the element type, coding and representation, according to the scale of work, in this way standardizing the levels of information representing the area.

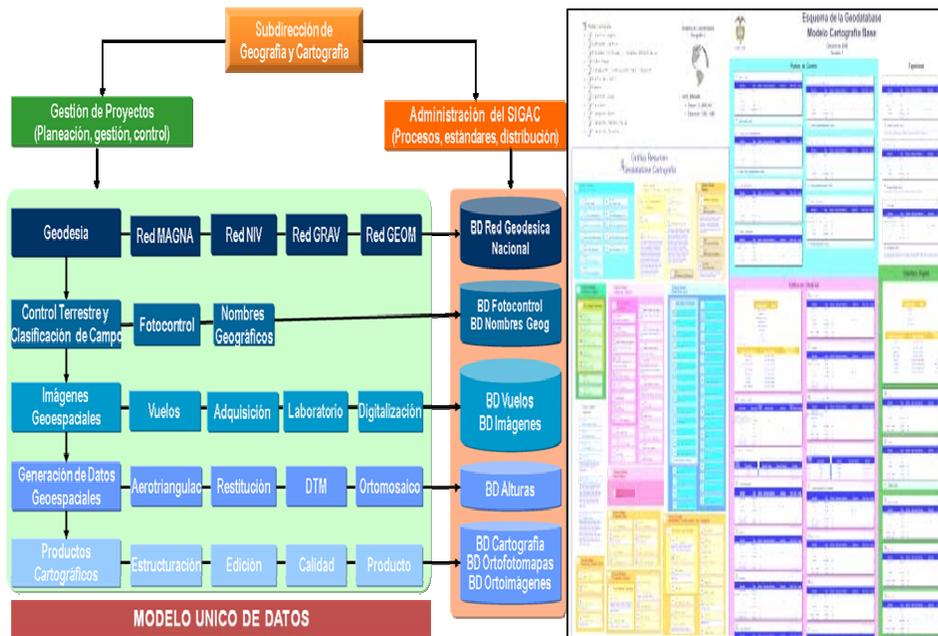


Figure No. 2 Multiscale data model

But Management is not achieved unless there is an Information System focused on the administration of geographic data, which reflects the needs of internal and external users and the requirements of the platform being used preferably to serve / provide information in real time. Therefore, we have implemented a Cartographic Information System, comprising the modules key to the mapping process:

- Image Module: for planning, imaging/collection and image processing;
- Geodetic Control Module: photo databases;
- Field Classification Module: database of geographical names;
- Mapping Product Module: databases of finished products.,

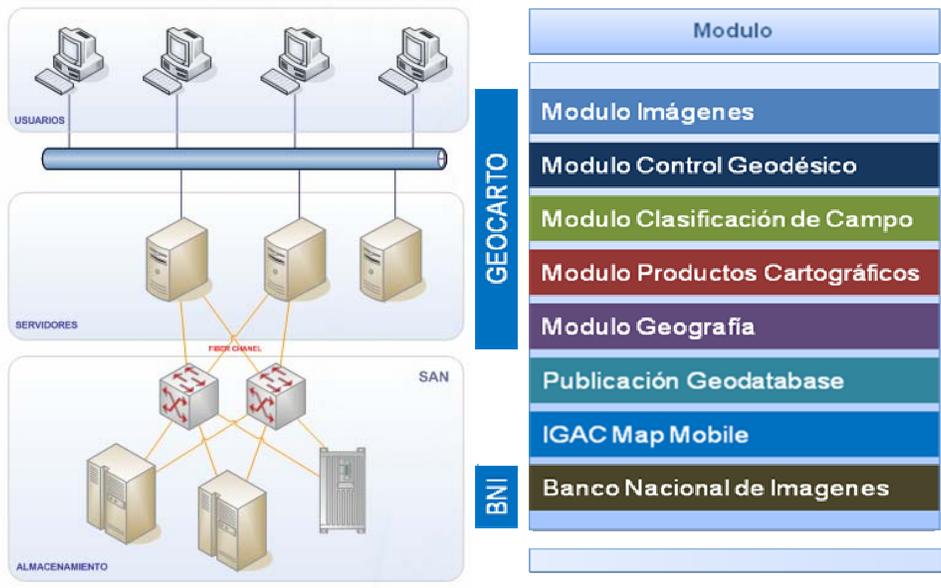


Figure No. 3 Cartographic information System

It should be taken into account that there are a number of elements across the territory that frame and enable the development of thematic projects. These elements are divided into natural and manmade. Among the natural there are water bodies, vegetation, landscape; and among the manmade there are utility networks, bridges, roads, buildings, etc.

Once the territory is mapped out, various thematic projects arise that interact with the spatial elements: population studies, economics, planning, environmental, agricultural, cadastral, etc..

It is important that any local political organization, regional or national obtain base spatial data with different levels of detail and content, in this way familiarizing itself and planning for the territory starting with the dynamic maintenance and update of its Geographic Information System organized and controlled from its own administrative office.

What is administered? Technical and human resources, methodologies are given according to existing documentation, a quality standard is established and production is controlled from yields precisely calculated and controlled by the management indicators.

It begins with the planning of projects corresponding to mapping production plans, with user requirements and their feasibility.



Figure No. 4 Module Project Planning

It continues with the control of production in terms of meeting the targets according to the quality and specifications set up, monitoring performance of software / hardware and human resources. This interaction brings production efficiency by the optimization of resources.

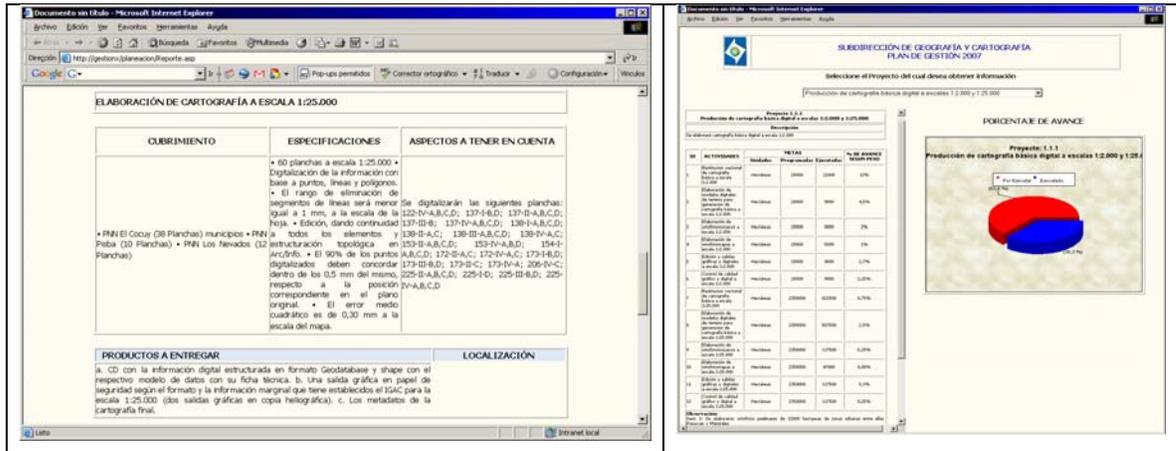


Figure No. 5 Module Project Control



**SISTEMA DE CONTROL**



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Usuario :	
Password :	
<input type="button" value="Ingresar"/>	

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Yeisy Vargas Sánchez

AREA:	Unidad de Imágenes	
PROYECTO:	Ninguno	
SUBPROYECTO:	Ninguno	
PROCESO:	Ninguno	
FECHA:	12/09/2007	
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AVANCE:	<input type="text"/>	Cantidad <input type="text"/> Unidad de medida <input type="text"/>
OBSERVACIÓN:	<input type="text"/>	

Figure No. 6 Module Project Control - Form

Environmental and climatic factors in our countries are hostile and complicated, so the synergy of different technologies of production and images allow the generation of alternative products that do not necessarily reflect orthodox georeferenced data.

Boundaries have been crossed; the slow production of data has been transformed into a dynamic system that allows managing a factory producing according to the demand as required. The products are no longer the same, they have changed and have been transformed.

Because of this, managing information is so important, this allows an efficient way to have data in a dynamic simple way over a base layer; at present it is the technology that provides the tools to develop national production plans of spatial data ( orthophotos and mapping), where a complete survey in Colombia has been generated with updating

processes where needed in the territory/terrain, to obtain continuous cartographic information bases reducing costs and efforts in data acquisition.

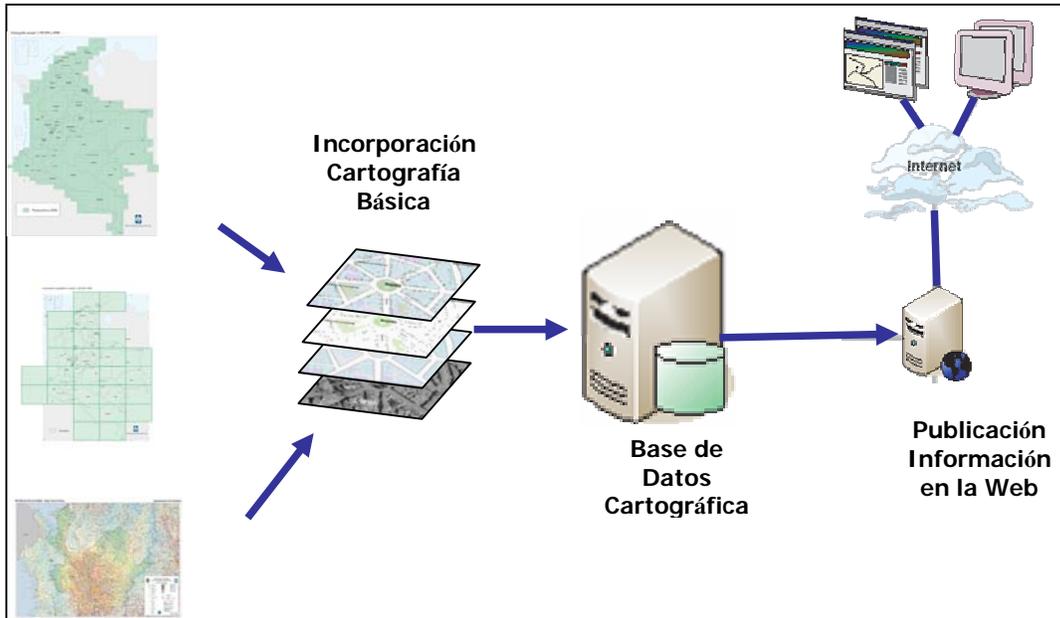


Figure No. 7 Cartographic database update

### 3. Conclusions

Technological advances have enabled databases to continually serve the country, through IGAC, which are the official geospatial products to support planning in Colombia.

Standardizing processes has succeeded in optimizing the production of geospatial data and in reducing administrative, financial and technical efforts.

IGAC consolidates its role as the entity for generating and supporting the production of geospatial data in the country.

The Agustín Codazzi Geographic Institute, by providing users with geospatial information, has enabled the country to reduce its efforts in data acquisition and to invest in areas which do not have basic information.

The implementation of spatial data infrastructure has enabled IGAC's competitiveness in Colombia and in the region.