

STANDARDS AND GEOGRAPHICAL INFORMATION SYSTEMS GIS IN THE ESTABLISHMENT OF A SPATIAL DATA INFRASTRUCTURE IN CHILE

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INTRODUCTION.-

In lately years, the countries have seen the utility that provide the Geographic Information Systems GIS and the Spatial Data Infrastructures SDI, for the rationalization of resources and management of the geographic information. Its implementation requires considering in an integrated form political, technological, normative and institutional aspects. Considering the different aspects involved, such as data production, accessibility, update and standardization. The definition and implementation of a reference frame, standards, and organization of the geospatial data is fundamental. The “Sistema Nacional de Coordinación de Información Territorial SNIT (National Coordination System of Territorial Information) and its dependant groups have accomplished important progress in the conformation of a National Spatial Data Infrastructure. This work presents some aspects analyzed by the Standard Subgroup of the “Grupo de Información Territorial Básica GITB” (Basic Land Information Group) of the SNIT.

PROGRESS ON SPATIAL DATA INFRASTRUCTURE ESTABLISHMENT IN CHILE.

The Basic Land Information Group GITB of the National Coordination System of Territorial Information SNIT.-

One of the objectives that the “SNIT”, contemplated itself, is conducted to reduce the duplicity of expense that the State falls into in relation to the production of geographic data accomplished by the different public organisms. For which, focused its effort in order that each organization announced the different geographic data set that generate, use and distribute with the purpose of encouraging the cooperation and rational use of the State resources. For that, a metadata catalogue was developed with the purpose of documenting them properly and for their location via Internet.

On its part, the Standards Subgroup of the GITB of the SNIT, contributor of this initiative, visualized the necessity of establish a reference frame for the implementation of the National SDI. Therefore, different initiatives were studied, encountering that there were many thematic that required being approached, mainly with reference to the necessity in a central level of defining the kind of reference frame that required to be

implemented, whether to improve the data quality, the utilization of financial resources or to increase the use of geographic data.

For being composed by institutions guided to the production of Basic Land Information the standards subgroup directed its labor to seed the basis that allow to harmonize the data, in order to integrate and distribute them, although these arisen from various sources.

Institutional Cooperation.-

The cooperation among the institutions of the State is essential in the process of building a National Spatial Data Infrastructure, because presumes an effort and a contribution uninterested going after the integral development of the Nation.

The organisms that conform the GITB, under the coordination of the SNIT, have joined together for more than 5 years to contribute to the generation of the National SDI, the Servicio Aerofotogramétrico of the Chilean Air Force, the Instituto Geográfico Militar, the Army Hydrographic and Oceanographic Service and the Natural Resources Center, have established for the development of the Metadata Catalogue of the SNIT, the study and use of norms and standards of Geographic Information and the development of a Catalogue and Thesaurus of Cartographic Entities, definition of the Core Data and lately they've focused on the technological, methodological and conceptual aspects of the interoperability of Geographic Database and the feature catalogue. Contributions performed by a heterogeneous group of professionals on an equal form to the functions that execute in their respective institutions.

Spatial Data Infrastructure.-

The concept of Spatial Data Infrastructure has fluctuated strongly since John McLaughlin used it for the first time in 1991, as well as, the amount of initiatives of this kind have increased strongly since President Bill Clinton signed the Executive Order 12906.

The technology and especially the information, has played an important role in the improvement of the SDI, but it was the development of the World Wide Web, the fact that modified forever the way how the Data is transmitted to users. The first effort to create a National SDI was framed on the necessity of coordinating the different producers and users of Geographic Information, focusing especially on products. This early conception of the SDI has evolved to another even more concerned on the processes models, where the users obtain greater participation and where Local Infrastructures connected to International and National Spatial Data Infrastructures appear.

Spatial Data Infrastructure and Geographic Information Systems.-

The Spatial Data Infrastructure SDI, is the platform that eases the access to the Spatial Information, it is composed by a set of resources (catalogues, servers, programs, data, applications, web pages, etc.) dedicated to manage the Geographic Information. Data, Services and Metadata are the spinal column that supports the SDI. On its part, the field of the Geographic Information Systems (GIS) is related to the description, understanding and prediction of patterns and processes of the elements that have a Geographic Dimension.

Both the Spatial Data Infrastructure and the Geographic Information Systems are providing a new media for the understanding of the territory and the established relationships among the different elements that compose it. This information plays a critical role in making decisions for all the social characters; governmental organisms, academic entities, private enterprises, etc., whose purpose is to distinguish a territorial unit and reproduce potential future behaviors in order to optimize the use of resources and produce a sustainable growth.

This interdependence looks itself increased by the fast and constant technological change, especially in the field of geospatial, where is possible to count on a greater number of seizing instruments and geographic data processing, transforming each time our society richer in information. But this is not always translated in better and greater capacities. In most cases, great geographic data volumes distributed in different institutions, format and scale diversities, varied qualities are available, in many cases poorly documented and with access difficulties due to technological problems or ignoring where they are located.

Geographic Information Models.-

Currently, Geographic Information Systems and Spatial Data Infrastructures are a set of geographic data coming from various sources and arranged in forms of layers. Making evident different structures, mainly as product of a lack of consensus, economic support, proper policies and the slightly severity in the production of geographic information, which generates difficulties for its search and use.

The employment of geographic information has evolved from a use with purposes purely descriptive, where the only functionality required was the data storage and recovery, for a use with forecasting purposes, for which the required functionality is considerably more complex and is based on sophisticated structures of organization and search.

To achieve these purposes in many cases data organization systems are established by means of catalogues and metadata, but on their own they don't solve completely the problem and substantiate with evidence the necessity of molding the geographic information by means of unique codes that determine unequivocally the geographic elements whether their attributes or geometry.

Catalogues and Thesaurus.-

The SDI and GIS used in a beginning as simple data stores require being structured to turn into real implements of territorial management, for that, catalogues and thesaurus play an important role.

The feature catalogue is a list or inventory tidied from geospatial elements that contains definitions and descriptions about the kind of elements, attributes of the elements and relations among the elements, being essential for the transformation of data into usable information.

The thesaurus, on its part, is a commanded dictionary of terms with the purpose of giving importance to the relations among the elements, allowing reducing the ambiguities in the use of terms and their relations.

Both are conducted to ease the search, processing and use of geographic data increasing their reliability and maximizing their use through the GIS and SDI. For that, the GITB considered important to develop a catalogue and thesaurus of Cartographic Entities for the Chilean Common Cartography, in order to be transmitted by the SNIT, being this the first attempt to focus on geographic data as primary element of the SDI and GIS.

Geographic Database.-

The Information Systems, considered as a set of geographic data, evolution through the Spatial Database Systems in the 70's, when storage techniques and medias, manipulation, record and recovery of more efficient spatial data that allowed molding and performing complex forecasting analysis, were developed. Providing a simple way of relate data, considering its entities and attributes, having special care in maintaining its integrity.

The study performed by the members of the standards subgroup allowed boosting the adoption of a geodatabase, within the producer organizations of Basic Land Information, with the purpose of serving as motor for the interoperability.

Metadata.-

As a result of the expansion in the production and use of the digital geographic information combined with technology development, brought as consequence the necessity of documenting the geographic products. The use of Internet and search protocols required the establishment of a structure to detail the digital geographic information. The metadata are defined as "data of the data" as they describe the data content and characteristics for search, selection, location and access to the information, becoming the linking point between the users and producers of data. The Technical Committee 211 of the International Standard Organization (ISO) generated a series of definitions and procedures to describe geographic data, within is contrasted the ISO 19115 *Geographic Information Metadata*. The metadata are today a fundamental pre requirement for the implementation of a Spatial Data Infrastructure and the tools required to catalogue and describe the data set, as well as recovering the information that circulates on Internet, being this way the more diffused standard due to its applicability. For that, the members of the GITB Took part of the technical group of the SNIT, that allowed to establish the conceptual basis to develop by means of a software company, the Metadata Catalogue of the SNIT, that has allowed to know the geographic data that are generated and used, establishing a greater interrelation and cooperation of the public organisms.

Web Services.-

As marked, the Web Services constitute one of the fundamental columns of the SDI, because they enable to publish and have access to data through the Web. For turning SDI into a useful and living instrument is crucial to reach the interoperability of the database, which carries out by means of standardized Web services where are detached the Web Map Service (WMS) that produces maps in a dynamic form, based on vectorial geographic information or raster, introducing the information as digital images liable to be visualized on the screen, the Web Feature Service (WFS) that allow to recover and modify (consult, insert, update and delete) spatial data in vectorial format encoded in Geography Markup Language GML. Every service can handle one or more kinds of phenomena, each one from which has associated a XML Schema that describes its structure. The industry has leaded the development and standardization of Web services,

therefore their implementation in the SDI are performed as different technological progresses are inserted.

Geographic Objects Catalogue.-

The last component of the SDI and that is being the object under study of the standards subgroup of the GITB, that is focused on the necessity of adopting a unique code that describes and identifies the geographic elements in a univocal way. This allows the real Geographic Database Interoperability. Despite the importance of this aspect is the less approached to the conformation of the SDIs, mainly because it requires in many cases to restructure the database, developing or adopting complex encoding systems, and due to the technological industry is not focused with the strength that performs it in the case of the metadata, database, the GIS or Web services.

The geographic feature catalogues are the first approach to an abstract and simplified representation of reality in a structure that organizes the types of spatial objects, their definitions and characteristics (attributes, relations and operations). At the same time, they are the base of other particular representations of greater level of abstraction. They allow the cartographic molding and are defined by:

- Objects: Sort of reality phenomena that have common properties (points, lines, polygons).
- Objects Attributes: Basic characteristics of the object.
- Associations among the objects: Hierarchical structure for connecting the different objects, relational tables cardinality.
- Operations among the objects: Connectivity and closeness.

Once a geographic features (objects) catalogue is established, the institutions of the GITB, like producers of Basic Land Information, will adopt it and propagate with the purpose that it turns into a product that allows interoperating geographic data among the different members of the SNIT.

CONCLUSIONS.-

The SNIT, has made a big effort to create a Spatial Data Infrastructure SDI, according to the necessities and characteristics of Chile. In this task a great importance has been given to the establishment of an Institutional Frame that intensify the agreements between producers and users of the geographic information, as well as the establishment of policies and legal basis in which sustain this initiative. Equally, it has concerned about technological aspects, among which the implementation of a Metadata Catalogue is underlined.

Within this initiative, the GITB and the standards subgroup have performed important contributions, focusing on the methodological and technical aspects, that will allow to establish a conceptual model in which founding the National SDI.

For which, it has focused on standardization, spatial data transmission and harmonization aspects, so can be incorporated in the Geographic Information Systems that each organism of the State uses, and this way, propitiate the rational use of the resources and reinforce the integration and interoperability of the geographic data.

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