

## THE SITGA, A GIS DIRECTED TOWARDS LOCAL LAND PLANNING AND MANAGEMENT.

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**Summary:** The Land Information System of Galicia (SITGA) is the result of gathering, in a comprehensive tool aimed at land planning and management, socioeconomic and environmental information compiled at different levels. The outcome is a dynamic GIS -which is being frequently updated- capable of giving a quick response to the needs of a myriad of users in the fields of cartography, resource inventories and for the land analyses and planning.

### The SITGA as a Basic Tool in the Genesis of the District Development Plan of Galicia (PDC).

The Regional Government of Galicia -through the Cabinet for Land Planning and Development- initiated in 1990 a District Development Plan, which was conceived as a strategic instrument aimed at achieving full coordination of all land programmes and projects of the Administrations operating in Galicia. This plan, far from representing the top-down approach to local and district development, was based on a voluntary model of integrated planning, aimed at stimulating local development resources. The purpose of the Plan is to define -based on the previous diagnosis of the comparative advantages, the endogenous potential and the resource bottlenecks in every Galician district- a series of objectives and to determine top priority actions to be undertaken.

As a consequence, the establishment of an integrated District Development Plan (PDC) for the whole of Galicia required the setting-up of a system with precise and detail land information covering the fields of cartography, statistical data, aerial photographs, satellite images, environmental studies, etc. Combining all these elements, a GIS adapted to the main objectives of the PDC was created, that is, a GIS directed towards land planning and land management. The development of this type of GIS could improve tasks like keeping alphanumeric and graphic data up to date; solve cartographical problems, and help to cope in a speedy way with demands of data for the different District Plans. It would also facilitate the making of studies and analysis, and their updating in short intervals of time.

The result of the efforts to set up a GIS aimed at land planning and management is the SITGA, which has been developed since 1992 with financial aid from the EC.

### The Structure of the System.

The SITGA is made up of a set of alphanumeric databases, a series of cartographical databases, and different applications which interrelate these two groups of information. Its main objective is to facilitate the evaluation, planning and management of natural and socioeconomic resources, as well as to protect the environment, with the help of a powerful and modern technology.

The SITGA allows for the compilation, storage and management of data from different categories and sources. This information comes from data generating agencies (National Statistical Institute, National Geographic Institute, the Geographical Service of the Army, and different departments of the Galician regional government) and, thus, with diverse formats and output mediums. Within the SITGA data is not only stored; several procedures are applied in order to purge, select and transform the data. Data is

then standardised and saved in the same format and structure, so that it can be accessed in a comfortable and speedy way. Another way to insert data is to generate it through the combination of different datasets and maps already in the system.

Besides introducing data, one of the most important tasks for the effectiveness of the system is to update and correct stored data. This process is performed in such a way, that it allows an easy alteration of digital data. The structure of the SITGA includes the following field areas:

- **The Socioeconomic Database (BDM)**, which entails socioeconomic and demographic data, as well as information on the residential and working populations, economy, housing, education and training, culture and recreation, health and social security, indicators of well-being and the standard of living, in each Galician municipality. This is alphanumerical information and has different origins. A significant percentage of this data comes from the reworking of original statistical sources, and from periodical field controls of the accuracy of data. Data is inserted in a progressive way, depending on the needs of the Development Plans of each District.

In some cases, in order to preserve the effectiveness in land planning and management of the database and given the extreme fragmentation of the Galician landscape and the extraordinary dispersion of settlements, data is inserted in the system on a submunicipal basis. As a consequence, the BDM is being enlarged with socioeconomic data at a parish level, a fact which will make the BDM a powerful tool for the analysis of the development processes and potential of the whole of Galicia.

The socioeconomic database also includes Spanish and European data at a provincial and regional level, as a source for comparative studies.

- **The Infrastructural Database** contains data stemming from the Provincial Survey on Local Infrastructure and Equipment and from detailed Infrastructural maps. This database stores up-to-date information on the state of infrastructure, the supply systems and equipment all over Galicia. It is, therefore, a basic tool for land planning and management, with important applications like urban maps, and isochrone maps around different facilities.
- **The Environmental Database (BIAM)**, which consists of thematic data on natural resources and the environment. Most information in this database can be transformed into thematic maps. In order to achieve a sufficient level of efficiency, the BIAM stores a considerable amount of physical data, generated from basic surveys, which act as foundations for all derived information.

The basic surveys furnish data on:

- 1.- **Geology and geomorphology:** Rocks and land units, mineral ore and deposits and rocks of industrial interest.
- 2.- **Physiography:** Elevation above sea level.
- 3.- **Hydrology:** River basins, flow and quality of river waters, and dumping points.
- 4.- **Climatology:** Rainfall, temperatures, and evapotranspiration.
- 5.- **Edafology:** Texture, porosity, permeability, nutrient content, upwellings, etc.
- 6.- **Land use and settlement system.**
- 7.- **Agricultural typologies.**

8.- *Environment*: Natural areas, protected areas, pollution, rubbish and other types of dumps, areas affected by serious environmental impacts, etc.

9.- *Basic cartographical information*: Infrastructure and settlements, administrative borders, and river system.

Once this basic information is available, the different physical variables are interrelated in order to obtain data which could be easily used for planning and for determining the main environmental problems. In this way it is possible to determine the endogenous potential of every space, to re-orient land use, to search for alternatives, to develop new resources, and to achieve a greater spatial equilibrium. Some of the basic maps derived from the analysis are:

- 1.- *Geomorphology and geology*: Main land forms and morphodynamics, geotechnical interpretation and geological risks, hydrogeology and tolerance for dumping.
- 2.- *Vegetation*: Map of potential vegetation.
- 3.- *Physiography*: Hypsometry, slopes, and insolation.
- 4.- *Climatology*: Risk of frost, climatic classification, and indexes of agrarian and forest productivity.
- 5.- *Edafology*: Soils, productive capacity of soils.

In this way, through the integration of different thematic datasets in one system, we achieve a similar format and structure; we avoid duplicating cartographical environments; we take advantage of the enormous capacity of analysis of the system, and we promote the interrelationship between variables from different thematic datasets. This represents an important advantage with respect to completely autonomous systems, since it implies significant savings in time and cost.

The compatibility between the different thematic areas within the SITGA does not limit the capacity to use in an autonomous manner each of the thematic databases. Each one, prior to their incorporation to the system, has been organized, structured and updated independently, and they remain powerful devices for thematic analysis. The reasoning behind this structure is to establish common organizational principles which allow for a maximum adaptability and flexibility in the processes of the treatment of territorial data and for their use in land planning and management.

### Work Scales

The work scale used in the storage of graphical information is 1:100.000, which is the one employed by other European projects of land planning at a district level. This scale allows at the same time to embrace the whole regional territory and to administer in an adequate way all the information, given the equipment and programs that we now possess. The insertion of data is not necessarily done at this scale, but generally in larger scales, which are later transformed -via a process of generalization- to 1:100.000.

In several fields the SITGA works with scales of greater detail: the geological map is being digitalized at a 1:50.000 scale; the road map at 1:25.000, and the map of population settlements at a 1:10.000 scale. In the near future, we envisage to use scales of 1:5.000 and 1:10.000 for urban and metropolitan planning purposes.

## **Applications of the SITGA**

The SITGA attempts to promote a coordinated collection and compilation of spatial data throughout Galicia. This should avoid as far as possible parallel and inefficient efforts for data collection and administration, both within and outside of the regional administration.

The main use of the system is to produce basic and thematic cartography. Both types of cartographical representation can be combined, a feature which confers the system greater effectiveness for land planning. Among the chief applications of the SITGA, we could highlight the following thematic maps:

- 1.- Lithological map.*
- 2.- Geomorphological map.*
- 3.- Hydrogeological map.*
- 4.- Map of geological and geotechnical risks.*
- 5.- Map of land use.*
- 6.- Map of soils.*
- 7.- Map of agricultural capacities.*
- 8.- Map of Galician parishes.*
- 9.- Regional and District Atlas of Galicia.*

Another basic application is the making, in short intervals of time, of general and/or specific inventories of land uses. Moreover, the configuration of the system allows for the placing of optimal points for the location of specific activities, on the basis of the analysis of the physical and time distance or of economic costs.

Furthermore, the SITGA permits the monitoring of forest fires, the analysis of changes in land uses, the estimation of environmental quality and environmental impact, the evaluation of the capacity of soils and for the establishment of cartographical models of natural risks, risks for building activities and dumping.

All these uses of the SITGA constitute the base to determine the potential strategic resources in every space. Thus, they become the basis for specialized diagnoses in the field of land planning and management, as well as for other types of studies and projects.

## **Conclusions**

The SITGA is a system of small thematically specialized GIS. The databases which make up the SITGA are fully compatible and user-friendly, and offer great possibilities for data exchanges. This alternative was considered more flexible and adaptable to planning than that of the more expensive and rigid solution of a single GIS, directed towards basic cartography. Moreover, this system also provides us with the possibility of data processing and analysis according to the specific needs of users, advisory services for spatial data users giving support for their own analyses and projects.

However, the main objective of the system is to coordinate land information by means of gathering, processing and evaluation data which describes the territory. In this way a large geographical database at the service of the regional administration and of any other possible user is generated.

Hence, the SITGA represents a versatile and multifaceted GIS, aimed not only at the production of cartography, but mainly to land planning and management. The main customer of this system has been the District Development Plan of Galicia. In the near future it will also function as a base for all types of land planning and programming in Galicia. In this sense, the thematic division in the SITGA fosters its use by different Departments within the Galician Regional Government.

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