THE ENVIRONMENT AND THE DISTRICT DEVELOPMENT PLAN OF GALICIA: THE MAP OF THE ENVIRONMENT

Juan F. Loureiro Grandal and Alba M. Arias López
Gabinete de Planificación y Desarrollo Territorial. Xunta de Galicia.
A Barcia-Ctra. Santiago-Noia, Km. 3
E-15896 Santiago de Compostela

Abstract

The map of the environment constitutes one of the primary aspects of the Land Information System of Galicia (SITGA), since it contains a great deal of both graphic and alphanumeric information on every aspect related to the environment of the Galician districts. This cartography aims to show both impact areas such as those of environmental interest, focusing on the positive factors, natural resources available or advantages and on possible negative impacts.

1. The District Development Plan

The District Development Plan of Galicia was created as a model for endogenous development within which environmental studies abandoned their traditional descriptive or introductory role in order to become a document which would allow the evaluation of potential land resources and to help achieve a balance between their own exploitation and that of the environment.

2. The Cartographic Development of the Map of the Environment

In the context of the Xunta de Galicia (autonomous government) The Land Information System of Galicia (SITGA) began as the technical support for this development model. Included is the environmental area, which is responsible for a complex cartographic process directed towards obtaining thematic maps called "Map of the Environment" and "Map of Resources", both obtained from derived cartography.

This thematic cartography is not only a graphic document, but also part of an extensive bibliographic series focusing on different socioeconomic and geobiophysical aspects such as climate, lithology, hydrology, mineral deposits, edafology, suitability for waste dumping. bioclimatology, flora, fauna, environmental hazards and other aspects relating to the environment.

The development of resource and environmental maps consists of several intermediate stages from which other maps may be derived as well. In order to produce this, the stored information is linked in the Database along with cartography of diverse nature depending on the expectations and necessities of the intended task.

2.1. *The Geological Map*

The first step in the process consists of the digitization of the geological map of the MAGNA at a scale of 1:50.000. The different units are assessed and contrasted with the support of the cartography at a scale of 1:200.000, using aerial photography with LANDSAT and SPOT images, as well as field work.

By means of a computerized system, each unit is related to the database via a code, that is, it contains graphic and alphanumeric information. Several tables are linked to this code: one tells us

the type of rocks, their age, the geological category to which they belong, dominion, unit, etc. and other tables on their chemical composition, mineralogy, grade and type of permeability, pollution risk assessment of aquifers, changeability, geomechanical properties, etc. Both are essential for obtaining the thematic cartography (Figure 1).

2.2. Digital Terrain Model (DTM)

It consists in the simplified representation of a digital format of the slopy 3D surface of the land. It is made using a regular grid of points with a resolution of 50 m on X and 50 m on Y.

2.3. Land-Use

The objective of this map is to describe the type of land cover and utilization which exist at present in the territory. Its creation is approached by interrelating the available cartographic base, the georeferenced information contained in the SITGA, submitted by aerial photographs, LANDSAT and SPOT images, and provided by other sources such as the CORINE project, the Map of the Forest Areas of Galicia (1:50.000 and 1:10.000) the Map of Agricultural Land-Use and Potential (1:50.000) and other complementary studies. In the legend, given the enormous variety of different land use existing in Galicia, many different types are obtained (around 40) which are grouped into larger categories.

2.4. Derived Cartography

Once this information has been stored in the SITGA and the Database, through different computer processes, derived (intermediate) maps are drawn-out that are useful for obtaining thematic (final) maps.

Starting from the geological base (geology and edafology) and incorporating into it data from known research projects, climatic observations (precipitation) of hydrographic basins (hydrology, dams, slopes, overland flow, etc.) the Hydrogeological map is obtained with the following legend:

- permeable materials.
- low permeability materials
- materials with very low or no permeability.

The development of this map is only an intermediate although significant stage, given the absence of this type of cartography in the Galician autonomy, for it constitutes the base of the Map of Feasibility for Waste Dumping: In this case, the terrain is distributed according to the following classification

- materials apt for waste dumping
- materials which in certain cases may be vulnerable to pollution. Areas requiring complementary studies.
- materials especially vulnerable to contamination. Areas not apt for waste dumping.

2.5 *The Map of the Environment*

Using the Map of Feasibility for Waste Dumping, and including the data necessary for the Database, we obtain the Map of the Environment (Map 1). Its objective is to compile all the factors

which have a negative influence on the environment, that is, of the impacts present, among which the following are included:

- Pollution risk assessment by Purina: of outstanding importance in Galicia, which supports a strong load of livestock breeding and in which a widespread pollution from Purina is at times elevated.
- Localization of sewerage waste, both urban and industrial.
- Interesting infrastructures already in existence or proposed (e.g. treatment plants)
- Condition of bathing waters and rivers.
- Location, when information is sufficient, of controlled and uncontrolled waste dumps.
- Areas with a special risk of erosion.
- Quarries and mines, active or abandoned.
- Rubbish dumps.
- Areas with a high density of forest fires.
- Other impacts.

Information relating to population settlements, industries and communications networks (roads, railways, ports and airports) may be overlaid on this map; in other words, what we have generically considered the Socioeconomic Environment. Thus we may obtain a first rough estimate from which to determine, for instance, what areas are apt for the localization of waste dumping points so that neither the population's health nor the environment may be damaged.

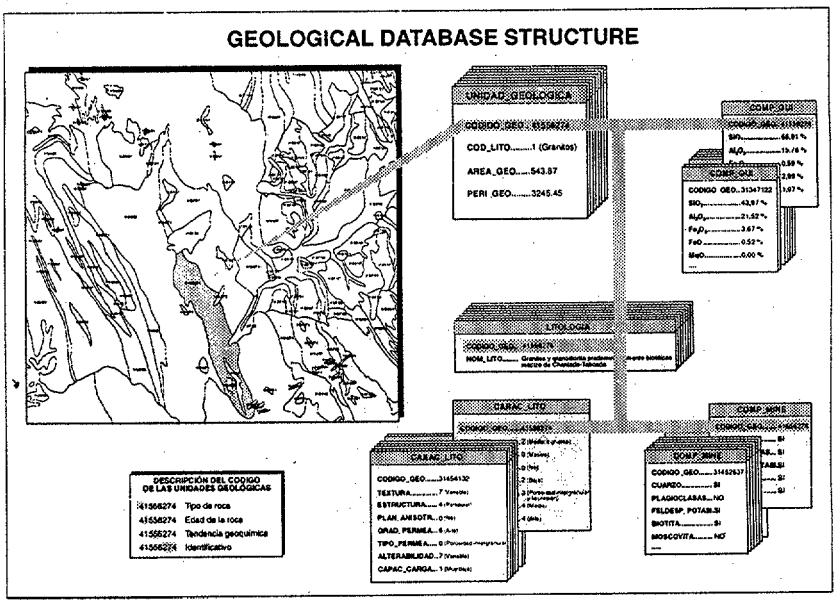
The whole makes up the Map of the Environment, on a scale of 1:100.000, that tries to display the infrastructures, facilities, natural areas of interest, impact areas, etc. with the aim of locating and correcting those impacts, improving the urban and natural environment of each district.

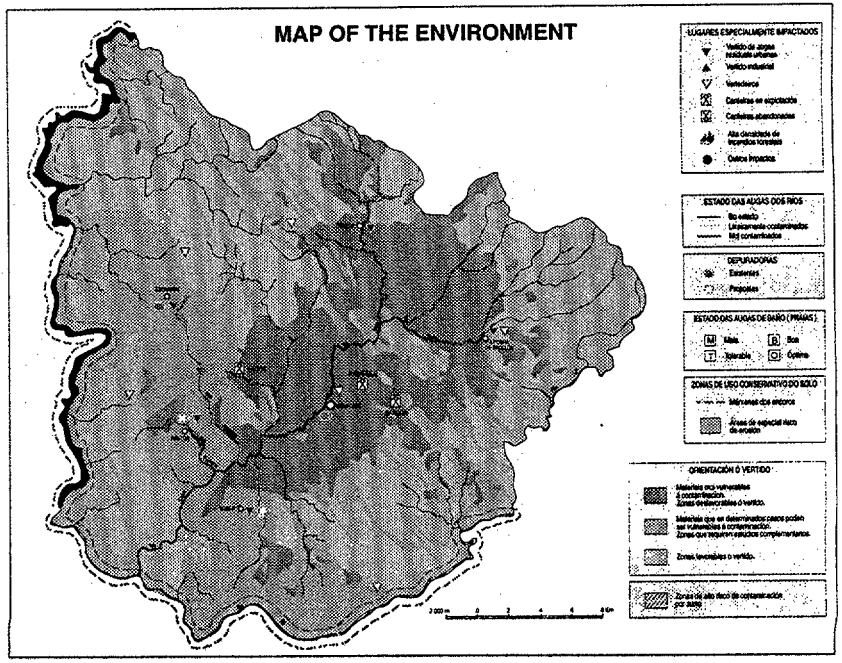
2.6. The Map of Natural Resources

Is the second thematic map obtained from the graphic and alphanumeric information contained in maps of Land-Use, natural areas of interest, Game and Fishing Preserves and other additional information. It tries to give a general outline of the situation of the territory's natural resources, their availability, the ideal locations for them or routes of environmental importance, etc. contributing information on:

- Natural Areas protected or registered (Natural Parks, Game Preserves)
- Unregistered (proposed) natural areas of special interest.
- Potential land-use (conservational and/or productive forest land, farmland, prairies, etc.)
- Game preserves (major and/or minor) and Fishing preserves
- Suitability for marine life: Salmonidae and Cyprinidae (category of the permits)
- Areas of environmental or recreational interest: viewpoints, recreational areas, shelters, lectures on nature, spas, blue-flag beaches.
- Hiking routes.
- Infrastructures of interest (renewable energy resources, etc.)

As in the preceding map, this one also admits overlayed socioeconomic information (e.g.: principle population centers, infrastructures, etc.) as an aid when making proposals of environmental interest.


GEOLOGICAL DATABASE STRUCTURE
UNIDAD_GEOLOGICA
COD_LITO.....1 (Granitos)
AREA_GEO.....543.87
PERI_GEO.....3245.45
COMP_QUI
LITO_GEOL
CARAC_LITO
COMP_MINE
DESCRIPCIÓN DEL CODIGO DE LAS UNIDADES GEOLÓGICAS
41556274 Tipo de roca
41556274 Edad de la roca
41556274 Tendencia geoquímica
41556274 Identificativo


MAP OF THE ENVIRONMENT
LUGARES ESPECIALMENTE IMPACTADOS
ESTADO DAS AUGAS DOS RÍOS
DEPURADORAS
ESTADO DAS AUGAS DE BAÑO (PRAIAS)
ZONAS DE USO CONSERVATIVO DO SOLO
ORIENTACIÓN O VERTIDO