

**SIG AS A TOOL FOR THE ANALYSIS AND CARTOGRAPHIC OF THE LANDSCAPE EVOLUTION;  
APPLICATION TO A SPECIFIC AREA: THE LOZOYA HIGH VALLEY.**

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**Abstract.**

The general aim of this paper is to present a cartographic study of changes happened during the thirty years on the Lozoya high valley. We will use the 1957 and 1987 occupation maps.

**1. Introduction.**

The Lozoya high valley is located to the northwestern part of Madrid Autonóm Community. It covers an area of 259 km<sup>2</sup> distributed unequally between four municipalities: Lozoya, Pinilla del Valle, Alameda del Valle and Rascafría.

From a natural view of point, the Lozoya constitutes a narrow and individualized valley. Its topography, typical of a graben, conjugate the almost plain terrain of the valley with the steep slopes which surround it, mainly on the west. For its singularity Peñalara, the highest point on the Guadarrama Sierra, surpass all of them. In respect to the vegetal cover, it is very conditioned by litology and topography and it arranged in horizontal layers by altitude.

**2. Methodology for landscape evolution analysis.**

*a) Justification.*

To analice the lanscape changes it has been chosen to map the land occupation at some specific dates, at the end of the 50's and 80's (1957 and 1987 with 30 years span). The landscape occupation has been chose because it shows the natural ecosystems, the rural economy and the traditional use of forest. Man action has modify through history the natural ecosystems by the introduction of diferent ways of terrain exploitation, agricultural and livestock use, followed, at the end, by a large pine-tree afforestation.

The traditional agricultural exploitation was the cause of forest clearing, by cutting and burning the original oak forest to be used for the pasture or agriculture. In rocky or higher lands the oaks and other original forest remained. The wood was used mainly to make charcoal. Years after pine-trees and other species were introduced in these areas as been its use more profitable.

The traditional method of agricultural exploitation came into crisis after the 60's rural exodus. The gradual abandonment of numerous practices gave a new impromptu to these landscapes: the values of some resources change and the abandonment generalices allowing the start of very different processes of vegetal recolonization.

At present time we must take into account another factor, the use of this area as amusement land for Madrid citizens; the attractive landscape and the ski tracks have increased its value as leisure sporting and contact with nature place for Madrid population.

*b) Technical specification.*

The escale election was determined by the comarcal character of the study and because was considered interestin the use of the cartography generated by the CORINE LAND-COVER proyect. The planning of that proyect already is dinamic, because pretends, by use of remote sensing, to obtain cartographyc cover of European Union members states every fifteen years. That also conditioned the date of the second map to compare.

The occupation map of 1957 was made by the interpretation in accordance with CORINE. of aerial photographs at about 1/33,000 scale of the so called "american flight", the first flight of national coberture made over Spain between the years 1956 and 1957.

Once the pictures were interpreted, they were georeferenzated and changing its scale to the 1/100,000 in accordance with the Army Geographical Service map, by means of a stereo transferer ( Zoom transfer Scope of Cambridge Instruments).

Once the map in no deformable paper at the CORINE scala, it was introduced by its digitalization in PC ARC/INFO , the same software used with the 1987 map.

After the cartography was firstly compared and because the sources and scales used were to much different, aerial photographs for the fist and Landsat imagery for the second, and the interpreters were also differents, it was aggregated into the CORINE these categories whose interpretation were possible in a different way, creating confusion and overvaluation of dinamic areas.

In the specific case of high Lozoya, that affected the thicket categories, with were grouped into one alone under that generic name, without type or density discrimination.

Once the covers were prepared in PC ARC/INFO format the information was transferer to SIG raster IDRISI for processing. The election of IDRISI was due to the easynes of the information crossing from a SIG raster in respect to a vectorial.

The program polygrid was used inside PC ARC/INFO for rasterization, generating a file in ERDAS format which can be imported by IDRISI by means of the ERDIDRIS module. Taken into account the scale and the minimum unit cartographiable, the 50 x 50 meters pixel size was stablised for a coberture of 493 rows and 419 columns.

The authomatic superposition by means of crossed tables and intersection inside SIG allow us to detect dinamic and stable occupation areas. In that sense it possible to establish a gain and loss matrix and to obtain a serie of maps which value the transformation.

There are different methods to measure the spatial change, depending if the variables are quantitative or nominative. If they are nominative, as in our study, the spacial change to determinate is referred to the nature of the observed fenomeenum in both times (1957-1987) and not to its numerical quantity, although some stadistics can be obtained but they will be only indicatives.

The greater part of the area considered has suffer changes in more or less degree. The more stable type of occupation is the pine-tree mass located to the southwest of the area and the thickets. Categories as pastures and thicker mantain more or less the same extension but not its locate. Respect the others, dry farming and prairies with farming was dissaperars. In the other hand, Caducous trees and pine trees have an expectacular increasr.

New ways of occupation, oriented toward the present social-economical orientation of the area as leisure areas, mainly ski tracks and some other related infrastructures have appear. They usethe old high altitude pasture lands.

The valley is used to collect water for Madrid, the Pinilla dam is an example, it has flooded pasture and farming lands.

The category of forestal systems occupy a large area in 1987 but is scarce in 1957. That was because for the map of 1957 only were cartographed as that some areas resembling pasture lands but CORINE map of 1987 has included pasture and praires separated by trees.

### 3. Conclusion

- Using a 1/100.000 scale map to study an area shows the use of terrain evolution, and from that the evolution of landscape, which is related with terrain occupation.

- In comparing maps made from different sources its legends have to be homogenized, losing some categories in order not to commit errors at the time when territorial changes are estimated.

- SIG is an useful tool for analysis of phenomena with spatial influence.

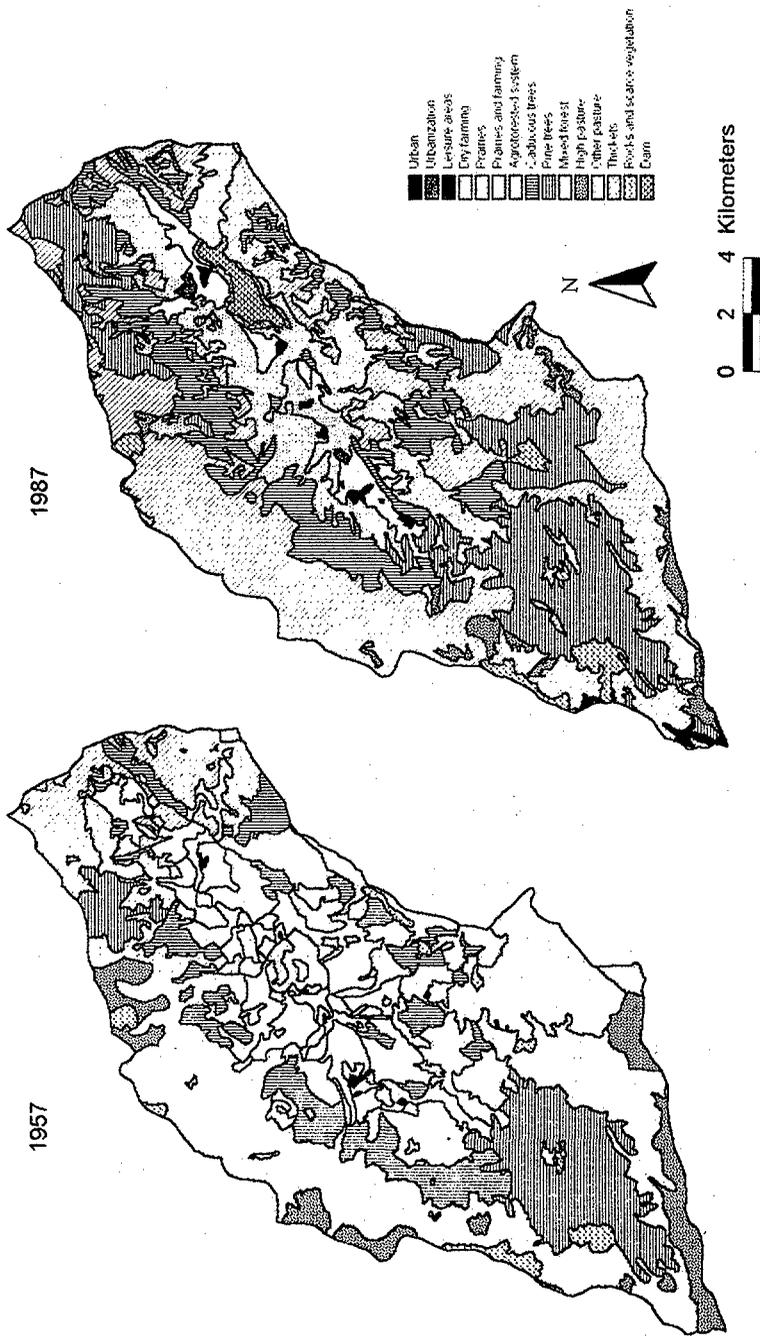
- SIG is a fast and economic way to elaborate and up to date the thematic cartography of an area.

Maps obtained are included.

### References

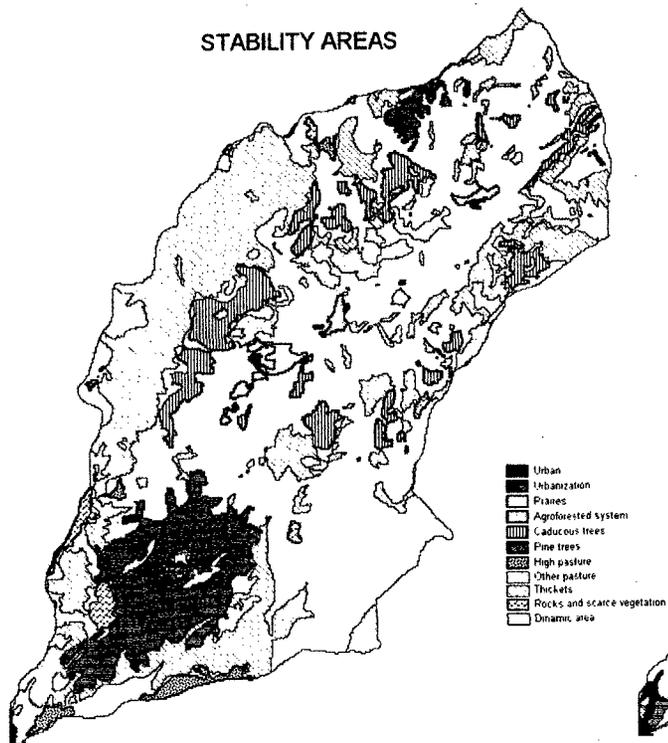
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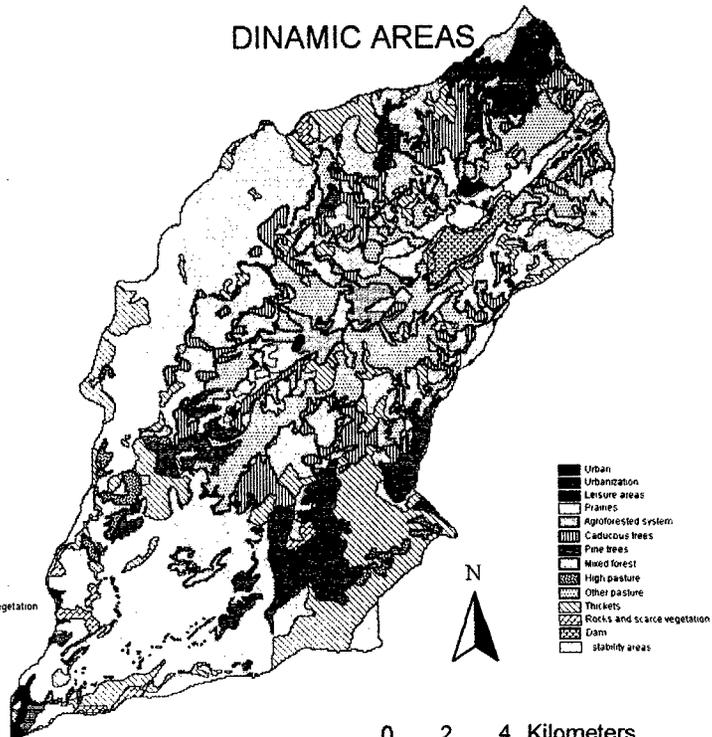


## LAND COVER IN THE LOZOYA HIGH VALLEY

STABILITY AREAS



DINAMIC AREAS



0 2 4 Kilometers

