

The Geopark in Sardinia: a fuzzy spatial analysis for assessing the development tendency

G.Manca, L. Pireddu

Geoparco s.c.a.r.l.
Via Brusco Onnis, n° 25, 09123 Cagliari, IT.
Telephone: +39 70 253343
Email: germana.manca@tiscali.it

Abstract

The Sardinian Mineraary Geopark (Fig.1), established during “The General Conference of Unesco”, held in Paris on 1997, represents the first example of Geosites/Geoparks in the world. On the July 2000, the Italian government passed a bill, concerning the institution of the “Geopark”. Two of the proposed definitions of UNESCO Geopark will be considered in this poster, like “a territory encompassing one or more sites of scientific importance, not only for geological reasons but also by virtue of its archaeological, ecological or cultural value” and “will have a management plan designed to foster socio-economic development that is a sustainable (most likely based on geotourism)”. Based on these assumptions, the mixed economy of tourism and agriculture is presented as one of the main development potentials of weak areas, such as those of the Geopark. Consequently the spatial analysis is performed in order to point out the tendency of the development to the tourist sector as a catalyst for local economy. Given the nature of the economic situation of several activities that are characterized by a mixed economy rough set analysis is applied to show different kinds and levels of the shift from a pure agricultural to a tourist economy. Through geoinformation and modelling approach, the fuzzy spatial analysis enhances evaluation ability and the usability potential resulting products. Any environmental and social factors can be jointly analysed both visually and by quantitative means, moreover, once the system is correctly integrated in the organization, updating and development of the new products implies relatively limited investments.

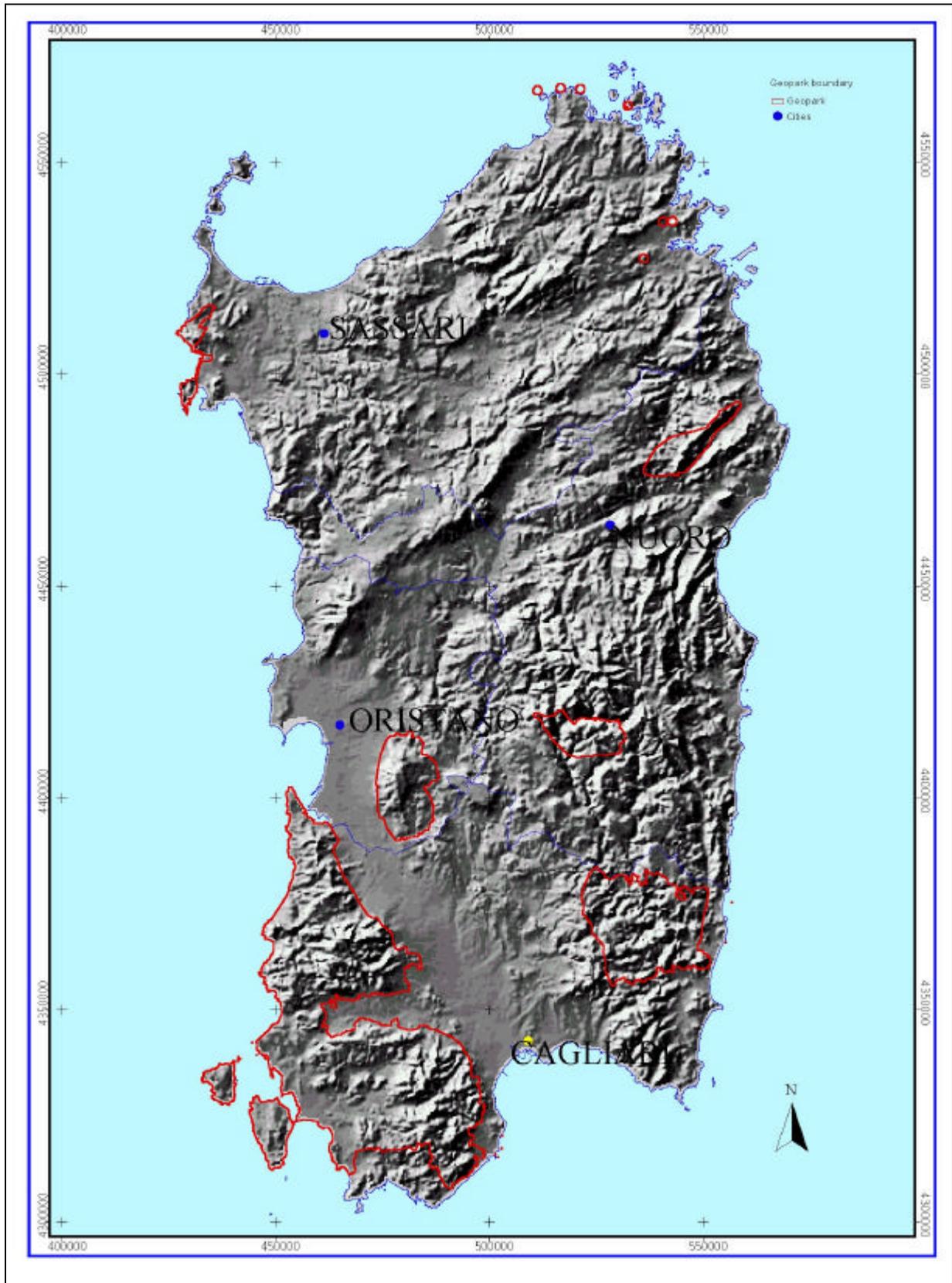


Figure 1. The Mining Geopark

1. Introduction

The Mining Geopark covers an area of 3.771 kmq and for the rich deposits of lead, zinc, copper, tin, silver and iron it has been acknowledged as one of the most important metal districts of Western Europe. Today all that remains of those areas is a rich heritage of mining archaeology as part of the Sardinian culture and past life.

The present economy of the Geopark reflects the economy of Sardinia, that is characterized by a weak structure; the sector of tourism represents a strategy for this economy, if it were possible to activate efficient linkages with the other economic sectors. Sardinian tourist supply can be ranked in medium-high range. This characteristic is peculiar with respect to many other Italian regions. Natural beauties and favourable weather are well known features of Sardinia and one of the main reasons why many wealthy tourists wish to visit. Regional policies aim to boost the development of tourism with a high standard of the tourist service be maintained, in order to promote the image of an exclusive vacation on land. It follows that the area of the Geopark is one of the most suitable for this kind of development. As a matter of fact the former buildings of the coal mines (Fig.2 and Fig.3), most of them located in the forestal-agricultural production area, close to coast, should be converted in a new type of tourist supply, which is expected to become a key part of the receptive apparatus. It is based on the concept of diffused hotel system and agritouristic activities. This seems to be linked to main issues, like the diffused-hotel system creates a network, to connect the interior areas to the coastal zone, and revenues from agriculture and forest activities are poor. Consequently the sector may be associated to other activities, like tourism. In this way the two activities support each other and expand production and revenues.

The geotourism, defined as a new opportunity of local economy, is the natural user of the Geopark. The evaluation's tool regarding the tendency of the geotourism is the use of fuzzy logic, in connection with geoinformation.

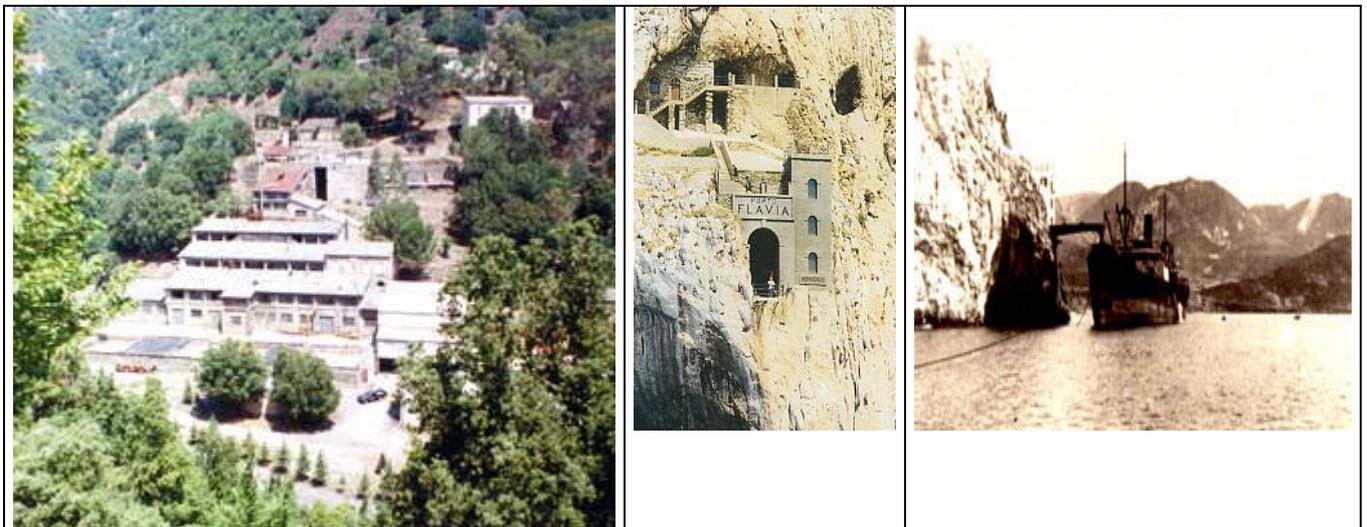


Figure 2. Former buildings

Fig.3 Porto Flavia and old ships loading coal

2. Methodology

It studies the influence of coastal tourism on the agricultural activities and farming holidays of the area. Through the use of the geoinformation, as the input of the Geographical Information System, the right combinations of synthesized information for landscape, regional planning and fuzzy logic, it is possible to analyse the changes that have taken place

in traditional agricultural farms. An environmentally homogeneous area has been chosen, containing farms, which are either zootechnic, or used for holiday purposes. These areas are characterised by different economic, social and environmental features. By means of criteria-indicators and their organisation, we can define the agricultural context. The use of these indicators, in conjunction with the real situation, shows a shaded reality. This kind of picture does not match with the traditional tools of territorial assessment. In actual fact, all the indicators have been analysed by means of fuzzy logic cluster analysis. The results will be discussed and compared with the 2080/92 and 2078/92 CEE regulations. This regulation helps to convert the agricultural area, devoted to crops, towards forest area. This further check shows the grade of penetration of the law for the conversion of traditional agricultural activities. Thank to spatial and fuzzy analysis, we have shown that there is a link between the influence of coastal tourism and farm holidays. The depiction of the “fuzzy area” allows to confine the buildings of the former coal mine to restore. The GIS depicts the boundaries of a homogeneous area, through the following geoinformation:

- Slope
- Landuse
- River network
- Soil
- Vegetation

The natural resources have been processed using GIS. In particular, the following geographical analysis, such as surface hydrologic analysis, terrain models analysis, simple overlay analysis were carried out. With defined limits, the areas seem to be quite homogeneous for environmental characteristics.

Inside these areas are the farms. The farms represent the input for the fuzzy c-means. Taking into account the environmental and economic indicators, it is possible to build an initial matrix for the fuzzy analysis. In the columns of the matrix there are the fuzzy area, and in the rows there are the following indicators:

groups related to economic field:

- Workmen of the farm holiday farms
- Workmen of the zootechnic farms
- Revenues of both

groups related to physical criteria:

- Distance from the coast area

groups related to social field:

- 2080/92 regulamentation
- 2078/92 regulamentation

groups related to geopark field:

- former mine’s building (called industrial buildings)
- architectural forms and particular constructive techniques
- technical infrastructure.

An example of small area it has been show in a Fig.4 below.

3. Results

The results obtained from the analysis show how the FCM approach, applied to territorial planning, is interesting in the interpretation of phenomena. A cluster’s logic overcomes the yes/no dichotomy, and the phenomena that do not have clear boundaries, because of a variable’s complexity, are well represented in a fuzzy environment. The wide amount of information, especially environmental information, together with the difficulty of computing

real events, does not allow the use of a rigid mathematical tool. The link between real events and a way of measuring them suggests that applying a flexible mathematical tool such as cluster analysis is a more profitable strategy. Such a technique must be capable of capturing the differences arising from the territorial criteria. Fuzzy logic application connects linguistic concepts to real events, leading to a new overview of the vitality of the land. A fuzzy area shows the way of development; this in turn helps the actors of Geopark policy undertake actions in order to modify or improve the development. The Geopark should orient the activities, inside the fuzzy areas, in a geotourism development, through the restore, of the former coal mine buildings, improving a network of diffusive hotels, and the underground tunnels. This is the way we are moving on.

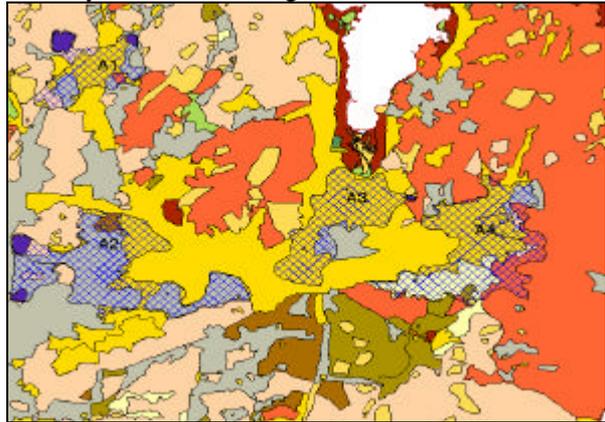


Figure 4. The local fuzzy areas

4. References

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