A MIS-GIS APPLICATION FOR THE HISTORICAL CENTERS

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Abstract:

Our cities are continually transforming: their appearance is constantly changing over time, adapting to the needs of the community. Nevertheless, cities preserve certain essential characteristics that enable to recognize and maintain a sense of belonging of the inhabitants.

In the globalization era the historical city centres are recognized as human artefacts where the culture of the people that inhabit them is conserved and manifests itself. They are "adapted" for their purposes and needs for everyday life.

Important for those who administer them is the ability to take decisions aimed at maintaining this sense of belonging.

Our historical centers are, in every respect, "places of the memory", developing, at social level, a significant and refined identifying function. This implies the necessity, for local Administrations, associations and experts involved in the local transformation processes in act, to read the possible evolutions and identify effective intervention strategies. Moreover, the small historical centers of Calabria constitute an architectural historical and urban property which often melts with the natural and ambient values of regional and local belonging.

The developed application (still in continuous development) has as principal aim to support the processes of recovery of the Calabrian historical centers and the exploitation of local enterprises involved in extraction and production of the material necessary to the recovery. These processes have the last purpose to re-propose the typical solutions and the original typologies in order of an usable conservation and, so, "sustainable". From a structural point of view, the architecture of the application has organized in four levels, interconnected each other and scalable., These levels are the data base, the MIS component (Management Information System), the GIS (Geographic Information System) and lastly the multi-user interface (system manager, private and institutional stakeholders). This articulate application provides the necessary support to public administrations, planners, designer and companies.

1. INTRODUCTION

1.1 Historical city centres and experimentation

This note aims to illustrate some applied research activities connected with the recovery of historical city centres of the Calabria Region (ITALY), as the growth and implementation of the informatics component MIS/GIS (Management Information System/Geographic Information System). This experimentation, still in course, comes out from synergic collaboration between two laboratories of the University of Studies of Reggio Calabria: Laboreg, Faculty of Architecture, and the Geomatic Laboratory, Faculty of Engineering. The application MIS/GIS developed up to date actually represents a prototype of a more complex system that

will be able to manage and support the recovery of the Calabrian historical city centres (Figure 1). It aims, along with other parallel initiatives, the revitalization of economic areas associated with building recovery.

Figure 1: Access Interface of the MIS/GIS

In this paper, because of the complexity and the variegated discipline inherent in the subject of research, as well as the description of the technology and the models applied, the implemented functions developing applied informatics, it has given weight to the philosophy of general approach set at the foundation of the job. The first part of this paper outlines the frame of reference in which the applicative MIS/GIS is placed, describing traits that characterize historical city centres inside the territorial reality that is the subject of study and experimentation. The second part specifies and analyses purposes and aims, operational surroundings, implemented functions and methods of use. The last part analyses the results obtained and the possible research development.

1.2 Local context and reference framework

The historical city centres are, to all effects, "memory sites" and at a social level they carry out an identification function, which is more and more in demand. In the globalization era, which generates "no sites" as described by Marc Augé [1], historical city centres are recognized as human artefacts where the culture of the people that inhabit them is conserved and manifests itself and, last but not least, that are "adapted" for their purposes and needs for everyday life. This very last aspect implies a series of actions involving the artefacts, which commonly means to carry out various more or less invasive interventions as: maintenance, conservation, demolition, renovation, etc; conversely, as well as physical adaptation (the form of the building), we can see all those "adaptations" that could be called functional, which are part of those social and economic functions conveyed by that historical building. This process of "adaptation" often contrasts the necessity of conservation of the identification traits of the historical city centres. In Italy, more than any other country in Europe, this dichotomy is taken to the extreme, strongly stressing the contrast between conservation and transformation, even due to the fact that this nation has a conspicuous number of historical accounts. In fact, Italy, known as the "Country of the hundred Cities", has an incommensurable wealth of historical city centres, each of which has a singular history and a peculiar tradition of constructive traits (historical architecture and typological function). This cultural wealth has not been adequately brought out and protected, merit of excessive bureaucratic and legislative influence that imposes too much time and too tight obligations for "adaptation" interventions. This, and other problems of social and cultural nature, have fostered "unauthorised" interventions, taken place completely outside the law, with the result of an evident alteration of the nature of those places [3]. An emblematic case is without doubt that of the Calabria. This region is characterised by the presence of many historical city centres (Figure 2) that have a very

relevant architectural and urban patrimony, that often blends with the natural and environmental worth of its territory, but at the same time it is the region that has the highest number of "illegal buildings".

Figure 2: Historic centre of Tropea (Calabria)

1.3 Mining activity in Italy

The turnover moved by mining activity in Italy amounts to one billion and 735 million euro every year; in the coffers of the regions, however, does not even reach 53 million. Legambiente in a dossier analyzed the related data and reveals a paradox. In some regions, such as Valle d'Aosta, Basilicata, Calabria, Sicily and Sardinia, the extraction is free, but on average Italians pay just 4% of the selling price of the aggregates. The report quantifies in five hundred million euro, which prompted state and regional authorities to give up cash for more exposing the area to risk the illegality. Around extraction rotate the key areas of the Italian economy, as infrastructure and construction, ceramic and materials; but it is also extremely important with regard to the landscape and the management of that non-renewable resource which is the soil. In Italy active quarries are around six thousand, for a total of 142 million cubic meters of inerts extracted every year, mainly in Puglia, Basilicata and Lazio, which alone reaches 50% of extractions. It is astonishing that against such numbers, license fees paid to regional offices by those who quarry are insignificant to say the least, if not nonexistent. An absurd situation when you consider the weight that ecomafia have in managing the cycle of the cement, and control of the Southern quarries, but in part made possible by a regulation dating back to 1927 and a 1977 law that leaves to the regions the power to establish rules. The disinterest shown by regional institutions led to the ridiculous anomaly of revenue available to government agencies from the application of fees to cover the massive turnover in the sector. An examination of existing regulatory framework in the regions shows that the absence of Plans for quarries leads to the occurrence of a huge discretion in those who authorize the opening of new quarries, thereby reinforcing the lobbies of the quarry and ecomafia. In general, the need for a framework of national rules setting limits and criteria of the coal appears urgent in the light of regional laws that set limits very mild, as well as other plans, which often merely reflect the demands of quarrymen. So needs a timely intervention to redevelop the area and to ensure that mining activities are excluded from the organized crime and constitute an economic resource for local authorities. Recent proposals by environmental organizations as priorities indicate the reduction of the use of inert construction and quarry on the waste from construction, adjustment of the fees concession to the reality the European Union (the example to follow is the British) and the strengthening of planning and control activities in the territories. To these must be added the incentive for innovation in the Danish model, which are the same companies to manage the process of selective demolition and recycling instead of placing in a landfill. Because such an important resource must not have a regulatory regime dictated from mafias.

2. MIS/GIS APPLICATIVE

2.1 Aims and purposes

Presuming that the physical and functional "adaptations" are necessary for the survival of each human artefact, and even more in the case of the historical city centre species, it may be affirmed that it is also necessary not to scar the pre-existing state of the places through transformation processes completely not in line with the local historical and artistic characteristics; it follows that if on one side there is the necessity to

intervene in the respect of the prevalent morpho-typological adhesion, on the other side there is the necessity to respect and keep well in mind the importance of using local constructive materials. Very often, we are witnesses to adaptive interventions that alter the structure and form of those historical buildings using, among other things, construction materials that have little – or nothing – to do with the characteristics of that historical building. That is mainly caused by lack of information and a scant increase in value of local entrepreneurial realities, as well as an absent political and legislative directive able to qualify a real rebirth process in such a crucial sector as that linked to the recovery and conservation of historical testimonials.

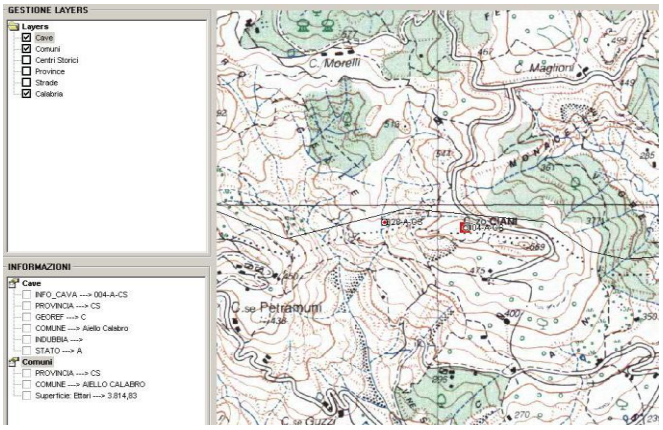

Figure 3: Identifying a quarry on IGM cartography

And that is why, the main aim of the MIS/GIS applicative is that to support both the processes of Calabrian historical city centres recovery and the increase in value of local entrepreneurs which can extract and produce those construction materials (Figure 3) necessary for recovery the ultimate purpose of presenting once again typical solutions and original typologies from the viewpoint of a usable conservation, and therefore "bearable". In other words, the attention has been focused on the theme of the re-appropriation of the "culture of materials" of the depopulated or almost depopulated ancient villages that are present in the Calabrian territory, offering recovery and conservation solutions, applying operations compatible with the endogenous architectural language. One of the fundamental tasks of the MIS/GIS applicative is precisely that of "interfacing" supply and demand of the construction materials present in the territory of the region, in a dynamic and quick way, so guaranteeing at the same time a volume of information able to support the analytical phase for a particular intervention and the sustaining the investment decisions [8].

2.2 Spatial analysis

The work was divided into several phases (which involved a number of human resources laborReg Department PAU, Faculty of Architecture, Mediterranean University of Reggio Calabria, ITALY): the first phase was directed to obtaining the basic data, with development of cognitive tabs of mining; the second was the creation of data base and its population; and the third phase concerned the structuring of geographic component. The completion of these phases led to the GIS. The retrieval of data on a regional scale is carried out mainly through visits with a patient reconnaissance activities at the offices of internalization and subsoil resources, and at the business department of the region Calabria, in the five Calabrian provinces. From this initial work has been structured sheets of the state of knowledge on mining activities falling open and closed in different provinces. Were surveyed 60 active quarries in the province of Reggio Calabria, 29 for the province of Vibo Valentia, 16 for the province of Crotone, 108 for the province of Cosenza and 64 for the province of Catanzaro, for a total of 274 active quarries in the region. It has also been possible to outline a survey of mining closed the last thirty years (or to exhaustion of ore or for reasons related to administrative-bureaucratic failures) that, throughout the region, are about 360. Based on the territory and its mineral resources, we developed a data base containing all information relating to mining Calabrian activities.

2.3 Constitutive phases and architecture of the applicative

Like any informative system, the consistency and quality of information are to be considered fundamental variables for a successful out come of the work [5]. It may be well understood how data retrieval has been planned in order to assure the physical and structural integrity and congruity of the data using specific

retrieval protocols with correlated intrinsic for each datum (metadata). The phases of data retrieval have permitted:

a. To localize and file information about historical city centres (morphology and typology of buildings, historical - evolutive and ambient notations);
a. To create a geographic database of sites of extraction of construction materials;
b. Assemble an registry database of the producers of raw construction materials;
c. Realize the land register of net of road link between the historical city centres and the zones of extraction's activities of the useful material to the recovery of the historical city centres.

This amount of information allowed the construction of a database and a related documental archives (various related documentation, photos, cadastral map extracts, etc). The heart of this database (DB SQL Server) is made up of "regional centre" tables and those of the "municipalities", which are connected between them in a classical entity/relational structure by about 60 tables. Information so composed allows to manage a series of specific characteristics like, as example: geological nature of the places, dimensional, qualitative and quantitative of extracted and extractable construction materials data, registry of firms and/or concessionary companies, exploitation period of a construction material site, methods of ambient restoration, phases of construction materials production, legislative regulations and constrictions, state of ownership etc. From a structural point of view, the architecture of the applicative is articulated on four levels (Figure 4), interconnected with themselves and climbable, such as the database, the MIS (Management Information System) component, the GIS (Geographic Information System) component and finally the multi-user interface (system administrator, operators, subject qualified private and institutional stakeholders).

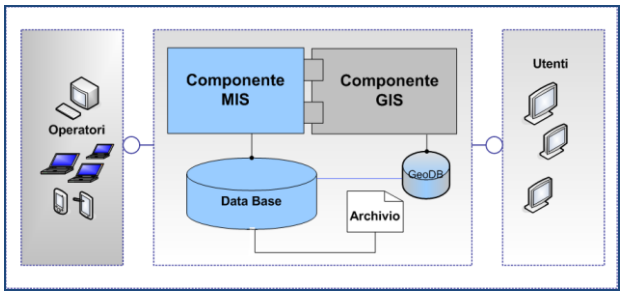

Figure 4: Architecture of the applicative

The MIS component (Figure 5), as well as consenting implementation the movement of new information and the related data update, constitutes a valid informative support for the documental and information system management of the firms operating in the extraction and/or production of raw materials field.

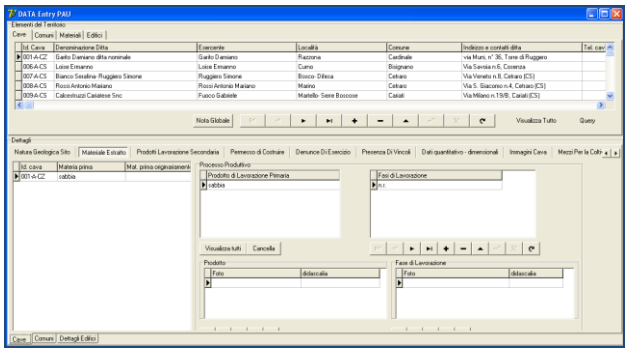

Figure 5: MIS interface component

The particular configuration of the system supplies in output data concerning the state of activities (extraction in course or not), quantities extracted and extractible, number of personnel, type of extraction site (typological characteristics of the site), state of permits and governmental grants etc. Different and more articulated is the spatial component. Using the now consolidated ESRI technology, the GIS applicative, developed at Visual Studio.NET (VB.NET) on ActiveX control MapObjects-Windows Edition, combined with appropriate ODBC connection strings use the data available in DBMS expressly created for the MIS applicative. So, made the informative spatial layers (shp) conveniently indexed in GEOBD mode, the GIS applicative consents the editing, analyzing and management of the spatial component of the data [4].

2.4 The theme tabs of data base

We can select a quarry on the map or from a list (Figure 6). By clicking on the selected quarry we will enter inside the cave management (Figure 7, Figure 8). In it there are fifteen "labels", which are issues that many boards have general information on exhibitors and / or its extraction and the quantitative and technical information relating to the quarries.

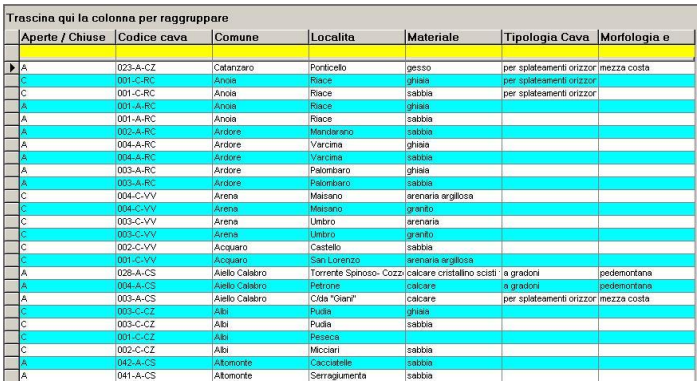

Figure 6: List of quarries

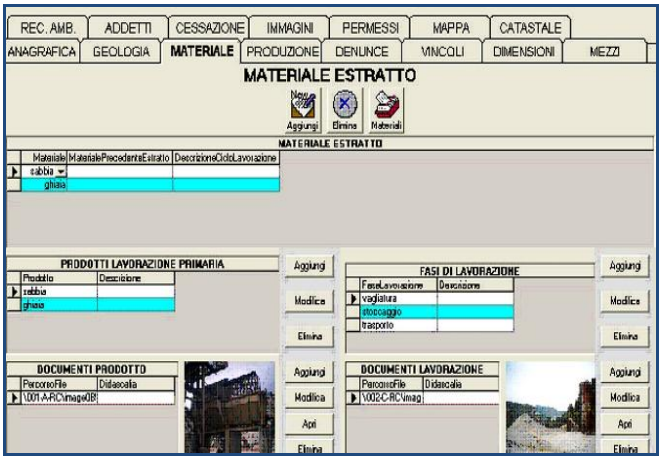

Figure 7: Layout tabs

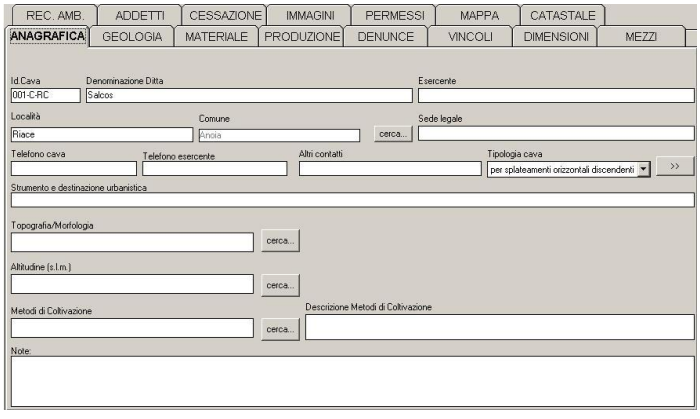

Figure 8: Tab of the single cave

2.5 Implemented functions of the GIS component

The spatial component is made up of four fundamental informatic layers in shp form: “administration limits”, “extraction sites”, “historical city centres”, “roads”. The “administration limits” layer, forms the geographical reference base as it defines the limits of the various township administrations present in the Calabrian region; in the “extraction site” layer the areas of construction materials extraction can be found, in the “historical city centres” layer historical city centres of great historical and artistic interest to be recovered

can be found, the "roads" layer includes, using a hierarchic method, the major road route links between the areas of construction materials extraction and the historical city centres.

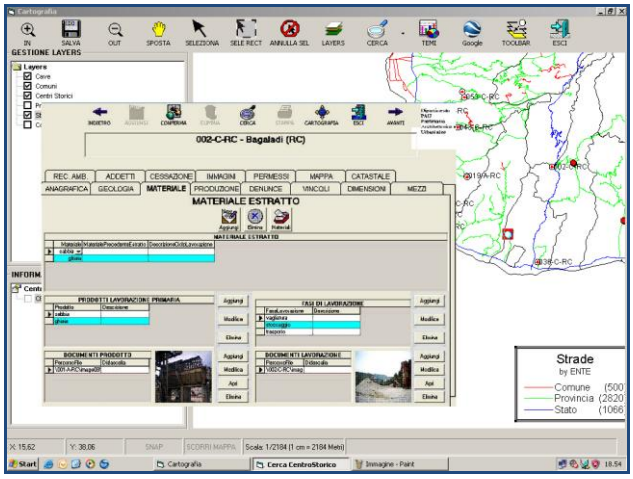

Figure 9: GIS component interface GIS. "Construction materials" layer's query

The GIS applicative as well as spatializing the information present in the DB with appropriate forms of data visualisation (Figure 9) consents to effect spatial queries in a variety of ways decided by the user, makes thematic maps, stamps statistic reports e cartographical excerptions. Along with the "traditional" basic functions, the authors have expressly created two specific tools: "calculate route" and "Google earth". The first tool consents, once chosen the historical city centre to be recovered, to find and visualize the "optimal" road link between the areas of construction materials' extraction and the wanted historical city centre, reproducing typology and partial distances, as well as indicating medium transport costs. The second tool allows (Figure 10), once chosen any informative layer, to visualize the real state, using a direct link to the famous Google utility that combines the powerful search function using satellite images, maps, reliefs and buildings in 3D (Google Earth); the tool demonstrates to be most useful (and economical) to verify the state of fact of the extraction areas of Calabria with data of qualitative and quantitative nature declared by the extraction companies.

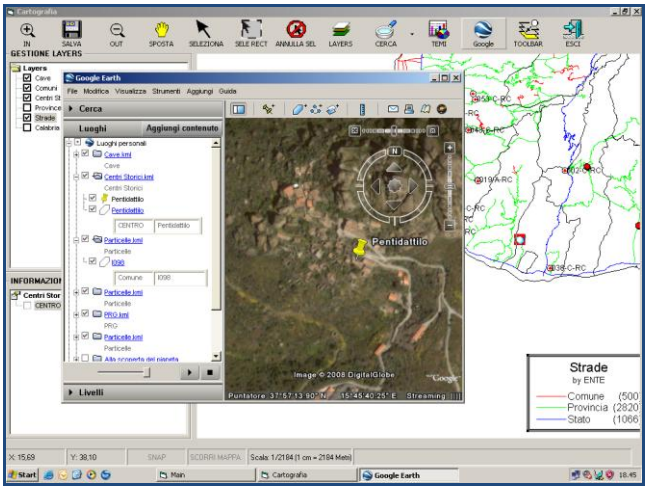

Figure 10: Tool link to Google earth

3. FUTURE DEVELOPMENTS

The research project of the two university's laboratories, as already stated, is still being completed. At the actual state there are two priority areas of study that will soon concern even direct implementations of the MIS/GIS applicative; the first area refers to the experimentation on a model able to determine, using appropriate algorithms of stochastic nature, the quantity and typology of the necessary raw material needed for the recovery of a core set of historical city centres particularly representative of the regional situation; the other, closely linked to the first, concerns the individuation of the compatibility between the technical - aesthetic characteristics of the construction materials (colour, resistance, density, etc) of the historical city

centre and the construction materials extracted in the Calabrian region sites. In other words, known the quantity and the technical and aesthetic characteristics, found the extraction area or area (the extraction site) that assures the maximum compatibility with the construction materials necessary for the recovery of the city centre, calculated the costs of transport, the system will be able to manage the entire "recovery chain". As well as a brief term development, there is being programmed implementations of a landscape and environmental nature, using remote sensed images so as to monitor the environmental conditions after the extraction activity [2].

4. CONCLUSIONS

The application supplies the necessary support to public administrations, planners, project managers, and sector companies. It will also be useful for recovery's plans of historical city centre, as well as planning to disburse community funds, developing the extraction industry and the production of raw materials. In fact, a basic element to keep in mind is that, thanks to research and informatic flow so created, it would be able to activate a policy to sustain all the extractive functions no longer active but still potentially productive that could assure more compatibility with the construction materials necessary for the recovery of historical city centres. Consequently, it favours the birth of new productive realities [6]. The combination is coherent with public and private processes ever more dynamic as they are today: in the era of "collaborative public management" public administration finds itself in a situation of a very complex management [7]. There is a major necessity to manage and most of all "organise" ever growing information, and it cannot be done effectively, efficiently and as quickly as possible without using those aids freely available with the advent of the modern information technologies, asy GIS technology.

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