Enhancing strategies for cultural and natural heritage through the ALForLab Geographical Information System

Giuseppe Alì[1], Paola Cannavò[2], Pierfrancesco Celani[3], Erminia D'Alessandro[2], Manuela De Ruggiero[4], Roberta Falcone[2], Lorella Gabriele[1], Giovanni Mazzuca[2], Sara Parlato[2], Francesca Salvo[2], Sara Maria Serafini[4], Massimo Zupi[2]

[1]Physics Department, University of Calabria, Rende, Italy
`giuseppe.ali, lorella.gabriele@unical.it`

[2]Engineering for the Environment and Territory and Chemical Department, University of Calabria, Rende, Italy
`paola.cannavo, erminia.dalessandro@unical.it, ro.falcone@hotmail.it, giovanni.mazzuca.73@gmail.com, saraparlato@gmail.com, francesca.salvo@unical.it, massimo.zupi@unical.it,`

[3]Mechanical Energy and Management Engineering Department, University of Calabria, Rende, Italy
`Pierfrancesco.celani@unical.it`

[4]Civil Engineering Department, University of Calabria, Rende, Italy
`manueladeruggiero, saramariaserafini@gmail.com`

Abstract.
ALForLab' is a project co-funded by the National Operational Programme for Research and Competitiveness (2007–2013) that aims to the development and the integration of innovative technologies, improving the mobilization and utilization of forest resources, ecosystem services and the wood material of Calabria region, in Southern Italy. In this paper, we present the strategy applied to develop the ALforLab Geographical Information System Platform to exploit cultural and natural heritage from a touristic perspective, the methodology adopted to identify identity and perceptive paths of Calabria and the technological system and the devices settled along the touristic itinerary. In this case, exploiting technological devices, cultural and natural heritage sites can really innovate their communication methods and better enhance their fruition from a tourist perspective.

1   Introduction

Italy is universally recognized for its great cultural wealth, but the heritage is not only our past and present, it is also the future of the country, a resource that should be protected and enhanced, that makes it unique in the international scene (Serafini, 2015). Tourism is a key sector of our economy - 10% of Gross Domestic Product (GDP) - but beyond valuation of numbers and statements about our tangible and intangible heritage, the truth is that culture is not considered a priority in political choices for the development of our country.

In the last years, the interest that people show about heritage and cultural activities in general, is progressively increasing, thanks to a higher level of culture that has been improved considerably compared to the past, but also thanks to an instinctive attraction towards beauty (Serafini, 2015). These statements are demonstrated thanks to data provided by SISTAN (National Statistical System) and Statistical Office of the MIBACT (Ministry of Cultural Activities Tourism); from the analysis it is clear that, in the time series 1996-2012, the number of museum visitors (including in this category also monuments, archaeological and natural sites, etc. ...) is increasing continuously (Barbi et al., 2012).

Although cultural tourism remains a key segment of the tourism industry, which includes about 35%, in Italy the 17.6% of the Italians and foreigners expenditure is represented by expenses for cultural activities (i.e. 12.6 billion euro in 2012). For these reasons, it was necessary understanding how to direct the population interest towards cultural and natural heritage (Barbi et al., 2012).

In this context, we should consider that landscape is an immense good, which could be declined in different disciplines, as a touristic product; in this way, we could spread the landscape culture, the love and the attraction for this resource full of opportunities (Serafini, 2015). Landscape is an expression used to indicate the complex interaction between society and nature and the stratification of processes that accompanied the production over time, it is one of the most important categories of the UNESCO World Heritage List. Introduced into the system of the World Heritage Convention in 1992, with the term "cultural landscape", this category was chosen by many states worldwide to identify and protect areas of special beauty and great cultural and spiritual value. Today, there are 66 cultural landscapes listed in World Heritage List, belonging to different regions and cultures of the world, and they attest the wealth and the importance of landscape for the identity cultural of peoples (Serafini, 2015). For these reasons, the correct definition of landscape is the one that is described in the European Landscape Convention (ELC, 2000): "[...] it designates a certain portion of territory, as perceived by people, whose character derives from natural and/or human actions and their interrelationships" (Art.1).

Furthermore, in the Convention there is the first definition of identity landscapes: "[...] The quality of the landscape is, in fact, appeared for a growing number of European

citizens, as an opportunity to reaffirm their identity, increase opportunities for physical and mental wellbeing and, simultaneously, promote a sustainable economic development" (Cartei, 2007).

In this context, Italy has a very special and privileged role. Its physical conformation, geographic location and rich historical events have allowed, in a relatively small area, the creation of a variety of cultural landscapes of extraordinary beauty, with few parallels in the world.

For example, the Calabria region offers an incomparable landscapes heritage forged by man, representative of the many historical periods and civilizations that have left footprints on our territory.

But the landscape question should be addressed in all its complexity, without any concession to nostalgic approaches, or to the illusory quest of a nature completely subtracted to human influence, instead considering its role as an added value for the rural areas development, for the conservation of the environment, and for the improvement of population quality life.

Questions are: is it possible to develop an analysis based on the economy of landscape? Is landscape a topic that can be examined according to logical categories of economic analysis? We can find a possible answer in the place marketing theory and strategies. The tag "place marketing" includes two concepts, marketing and territory, each of which has its own uniqueness; but also it contains three different metaphors:

- marketing in the territory: where territory is assumed as a market;
- marketing of the territory: where territory is a product;
- marketing made from territory: where territory acts as a business.

At the same time, the value of landscape derives from its ability to satisfy three types of questions: preservation of cultural heritage of which landscape is an integral part; preservation of people, territory and of their identity cultures; improvement of citizens and users welfare.

The place marketing has the responsibility to identify the needs of an area and define the most appropriate actions to fulfill them, so that there is a mutual benefit, economic and social, for citizens and investors (better defined as stakeholders) and customers/markets.

If we analyze the different activities that derive from place marketing strategies, there are many possible interventions. In general, however, we could group them into two main categories: the visible or just perceptible activities, and activities that generate or transfer value on territory (Tempesta, 2006).

The strategy that we have applied in this research project can be placed between the actions only perceptible and the actions that develop a change. In fact, the research work is based on the creation of "ALForLab" platform, a computer system able to promote and disclose the cultural and natural heritage and the identity of landscapes, to valorize and enhancing this heritage, and to promote an economic development through the tourism activity.

In this paper we present the "ALForLab" project and the strategy applied to develop the ALforLab Geographical Information System Platform able to promote and disclose

the cultural and natural heritage and the identity of landscapes, to enhance this heritage, and to promote an economic development through the tourism activity.

This paper is structured as follows: Section 2 illustrates the contest of the project; section 3 illustrates the ALforLab Geographical Information System Platform created to exploit cultural and natural heritage from a touristic perspective, the methodology adopted to identify identity and perceptive paths of Calabria and the technological system and the devices settled along the touristic itinerary. Finally, Section 4 presents the conclusions of this work.

2   The contest of the project

The project 'ALForLab' (PON03_00024_1 - Co-funded by the National Operational Programme for Re-search and Competitiveness, 2007–2013) aims to the development and the integration of innovative technologies, improving the mobilization and utilization of forest resources, ecosystem services and the wood material of Calabria region, in Southern Italy. The 'ALForLab' Project activities are interwoven in a complex system because wood is a renewable material that has a wide range of uses (housing, energy, furnishings) and in recent years, has been the focus of sharp tensions on the market price. The specific objectives of the project aim to optimize the forest-wood chain, covering all the phases from production to harvesting and manufacturing, down to final products, with the aim of reducing the costs of wood mobilization and increasing the efficiency of the value chain. The reference market is represented by the enterprises working with wood harvesting and technology. Therefore, the main targets of 'ALForLab' Project are as follows:

- to develop advanced methodologies to monitor, inventory and build, in real time, the productivity scenarios of forest resources as well as the provision of "environmental services";
- to promote an integrated planning and management approach of the forest-wood-environment value chain, aiming at the development of a sustainable supply chain of biomaterials and environmental resources through the application of geomatics technologies and modelling;
- to define, develop and promote the control and reduction of the processes of ecosystem degradation related to soil erosion, extreme climatic events and forest fires while increasing the resilience of ecosystems and protecting the landscape from natural hazards;
- to identify, design and implement appropriate and advanced technological innovation of processes and products to increase the availability, quality and processing of wood manufacturing;
- to implement innovative procedures for traceability and eco-certification of forest resources while quantifying their role in climate change mitigation;
- to enhance and protect cultural and natural heritage (like woods), through customized strategies, which would also include the reuse of wood, and dissemination of results.

GIS have been widely used in many areas of study and research, from geological and territorial studies (Carrara et al, 1995) to criminological investigations (Chainey and Ratcliffe, 2013), from real estate applications (Ciuna et al, 2017) to administrative purposes (Stevens et al, 2007). As far as we know, nothing has been done about landscape resources and identity features.

The benefit of this project is the integrated approach of the different aspects related to the forest-wood chain value, thus facilitating the optimization of the technologies and resources involved in the process. In this framework, our research group planned, designed and implemented the ALForLab Geographical Information System (GIS) with the aim to:

- provide a tool for the management of woods in the perspective of the landscape protection;
- identify a test area of identity landscapes within which to promote ecotourism;
- implement an information tool to support the promotion of development strategies in prestigious environments.
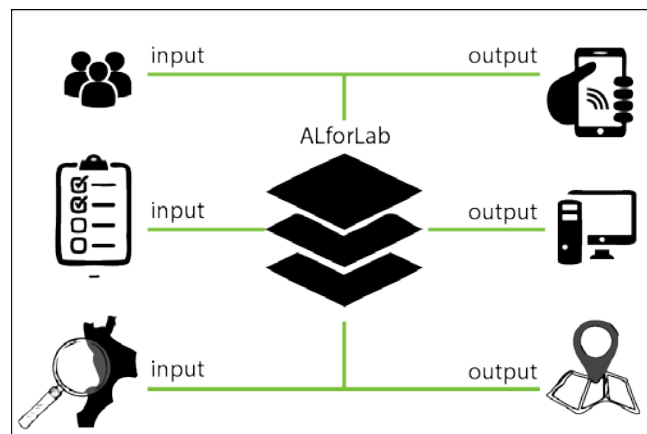
Fig. 1. Schematic concept of the ALforLab GIS Platform functioning

3   The ALforLab Geographic Information System (GIS) Platform

The adopted methodology was designed to create a digital cultural heritage management platform through digitization and georeferencing of local cultural heritage information. The main objectives are:

1. Identification, fruition and valorization of strategies of wood heritage of Calabria;

2. Implementation of a Web-GIS geographic information system for the realization of a system for the protection and enhancement of identity landscapes of Calabria;

3. Environmental characterization of residential and touristic wooden modules;

4. Surveying to identify perceptive and educational identity paths of Calabria Landscape.

With reference to literature recommendation and to the project's specific aims, a logical design scheme has been outlined. The logical design is the first, principal and crucial phase of the database building and it involves participation of every member of the project in order to ensure semantical coherency. In fact, design foresees communication between the different groups of participants as they mitigate their differences, find common understandings, and find coherency (Harvey, 1997). The GIS logical design consists of a graphical scheme able to show the GIS architecture, highlighting the main aims required by the different members (Marble et al, 1972). Once the main GIS aims have been defined and the expected results have been identified (in terms of maps, reports, charts), the database scheme specifies the main feature classes, their geometric shape and the corresponding fields and data formats, and any domains or subtypes. The design scheme has to be reported in a graphic art, aimed to return in visual form the project structure. According to the design concepts, the database physical structure has been done using the ESRI ArcGIS® software, through the implementation of a personal geodata-base containing the following elements and feature classes:

- four different feature datasets, every one for each of the test areas (Sila, Pollino, Serre Vibonesi, Coast);
- four different layers for each dataset, containing information relevant for the purposes of landscape valuations, and in particular: a polygonal geometry layer to map forest resources; a punctual geometry layer to catalogue urban settlements; a punctual geometry layer to classify the Points of Interest (POI); a punctual geometry layer to position the wooden devices useful to eco-tourism activities (observation points, facilities for bird watching, information points, etc.);
- two networks to define both the identity paths and the perceptive ones.

For each of the feature class described above, the information fields with the corresponding domains and subtypes were defined. Geographical Information layers have been prepared according to technical and formal standards identified by the Directive 2007/2/EC of the European Parliament and Council of the 14th March 2007. The directive, which has led to the establishment of INSPIRE (acronym for Infra-structure for Spatial Information in Europe), provides guidance about the construction of layers and metadata relative to georeferenced environmental information, so that they can be homogeneous and shareable, and they can provide adequate support to environmental policies or any other activity that may affect environment. More specifically, the Directive defines the rules for:

- the metadata, that is, the data describing the data (description of geographic data within the spatial data catalog). The main objectives of a metadata system are:

Search, Location, Selection, Semantic interoperability, Resourse management, Availability;

• Geographic data models and themes: INSPIRE defines three annexes of data specifications. Each of these annexes establishes a data model for each theme and a data structure to be respected for communication and data exchange in that particular sector.

The landascape GIS has also a cartographic base, consisting of land use informations (Corine Land Cover), roads' data and ortophotos, acquired from the National Geo-portal and from the Cartographic Portal of the Calabria Region. Once the physical structure of the GIS has been defined, the landscape data have been incorporated into the database, using their geographical coordinates. Settlements data contain attributes related to population and types of settlement (low urbanization settlements, rural towns, historical centers, permanent settlements), while landscape identity features, represented by Points of Interest feature class, give information about cultural and historical heritage, religious heritage, rural and natural heritage, industrial archaeology, highlighting whether their quality is officially recognized or not valuable. For each of the identified POI, through the hyperlink tool, an information sheet has been built, interactively connected to map. On the basis of the POI position and panoramic point of views, two different kind of networks have been built, one for the identity paths and one for the perceptive ones, showing information about type of path (vehicular or pedestrian) and travel time. Along the paths, the wooden touristic devices were placed, with a representative symbology for services inside (shelter, bus stop, toilet, info point, exhibition space, bookshop, terrace, bike repair, restaurant point, food distribution point). The landscape GIS database has then been made available on mobile devices for tourism purposes. The ALforLab GIS platform recognizes users' geographical position and allows them to discover the landscape identity features and the paths to reach them. This system allows to easily manage different data such as images, text documents, photos, videos, etc.
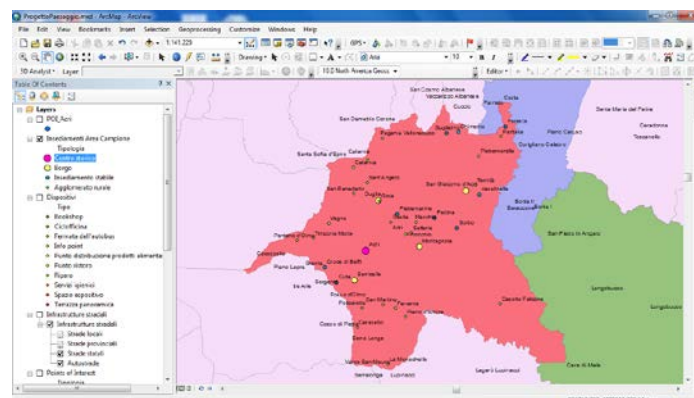
Fig. 2. Geolocation of the main settlements in the test area of Acri (Map View)

3.1 Cultural and natural heritage: the Calabrian region and its exploitation from a touristic perspective

According to the guidelines on the importance of identity landscapes issued by the ELC, we have studied the identity characters of the areas of Pollino, Sila, Serre Vibonesi, and Coast. To do this, we have identified the identity characteristics of the following categories: woods, urban settlements and points of interest (POI), in order to be able to collect directly on the territory all the information and data necessary for the ALForLab platform development. It is important to point out that forest resources represent an important part of the cultural heritage, because they represent territorial and population's identity features. In particular, as regards the woods, we gave information on the type of trees, as regards the settlements we gave information on the type of plan, and as regards the POI we have divided them into industrial archeology, cultural and historical heritage, religious heritage and rural and natural heritage. After the general classification, we have chosen a test area on which we focused the research. The test area is the Bonis river basin; it is located in Sila, and includes the following three locations: Acri, Corigliano Calabro and Longobucco. At the end of the research conducted on these three communities, we have entered all the information, data, and results of statistical and psychological - perceptive surveys (Section 3.2) in the ALforLab GIS Platform.

3.2 A survey to identify perceptive and educational identity paths of Calabria Landscape

According as the European Landscape Convention (ELC, 2000), "landscape is the way how people perceived the environment". In this definition, the important aspect of the "social perception" is underlined, stressing on "how" people perceives the landscape. Yet, according to Shamsuddin et al. (2012), landscape perception is the result of interactions between natural, cultural and historical environmental components.

From a psychological point of view, it is really important to understand how subjects perceive landscape and what it represents from an identity point of view. Social representations of a phenomenon and, in this specific case, how people perceive landscape, can be influenced by the cultural and symbolic values, by popular beliefs, by economic interests, or by individual or social interests.

In this framework, a psychological survey aimed to identify identity, perceptive and educational paths of Calabria with the aim to better exploit landscape, has to take into account all the material and immaterial elements linked to the cultural identity (folklore, crafts, food, etc.), legends or historical events with evocative and/or educational power.

Using the method of semi-structured interview, guided by a set of predetermined questions, we collected information with the following target of people: subjects that work in the touristic fields (tourist guides), agencies in charge of tourism promotion of the territory and old natives.

Thanks to this preliminary work, the interviews gave us important suggestions on the information to insert in the final survey.

The final questionnaire has been developed by using Google Form. This digital tool allows to reach a larger number of users, contacting them also through social media.

The questionnaire consists of four sections. The first section is devoted to collect users' demographic characteristics (e.g. age, gender, level of schooling, residence) and their personal opinion regarding the activities that they believe interesting or useful during a touristic path in an old town, during a cultural or a religious route and during a naturalistic path.

Each of the three next sections, presents questions regarding the location belonging to the testing area (Acri, Corigliano Calabro and Longobucco) on some Point of Interest (historical, cultural, industrial, archaeological, religious, rural and natural heritage) that we identified through the preliminary interviews.

Users have to indicate if they know the mentioned Points of Interest. In the case of affirmative answer, users have to specify their opinion according to a three point Likert scale, where 1= "no value"; 3="high value". Also, we listed some cultural, religious, or festival events. Users have to choose which of them they know or they have participated in.

At the end, using the modality of open answer, users can indicate one or more historical, cultural, religious, rural and natural heritage or panoramic point or naturalistic route not mentioned in the questionnaire.

We planned to run a descriptive statistics. The results analysis will give important suggestions to support the GIS developers in improving and implementing the educational, identity and perceptive paths or to create customizable and usable navigation paths. In fact, as stressed by different authors (Mahdjoub et al., 2010; Paredes and Martins, 2011; Alfano, Carini, Gabriele, 2012, Bertacchini et al., 2015;) and Human-Computer Interaction (HCI) studies, the fulfillment of user requirements is an important prerequisite for the development of successful products on the market, to respond to the really end-user expectations.

3.3   Systems and devices: technological presidium of the territory

To make the intervention of identity and perceptive paths easily recognizable, visitors can find during the way specific objects that define the itinerary, which are useful for many functions. The most interesting points of the area are characterized with the localization of a device made of wood that has different featured depending on the surrounding context.

The project in fact aims to realize a wood prototype in order to make greater use of renewable raw materials available in the Sila-area, which can be use in different situation and for several scopes. That is why it is designed to be sustainable, flexible, temporary, easy to build and anti-seismic, able to host residential issues (social housing, temporary house, emergency house, places of refuge) but even tertiary sector activities (exhibitions, info point etc.).

To minimize the environmental impact, in addition to the use of easily available materials, it is important to focus on energy-saving solutions. The starting point of the research was the bioclimatic philosophy. The key-elements of bioclimatic design are pas-

sive systems, which run without being dependent on mechanical equipment or subsidiary power supply, but deal exclusively with design and local resources. The passive strategies included suitable material selection, space layout and orientation, openness, passive ventilation, natural daylighting, shading and vegetation, especially when the device has the most complex asset and it has to be used as a house. Sustainable additions include a roof-based solar panel system, rainwater harvesting and gray-water recycling systems, energy-efficient LED lighting and a building management system.

The devises are important not only because of their construction skills, but even for what they host in the inside; they are the shelter of different types of technologies that allow three kind of experiences:

- Augmented reality, that allows the visualization of virtual elements in a real context, such as the Sila forest.
- Immersive reality, that allows the users to immerse themselves in a 3D virtual environment and interact with it.
- Interactive systems: that allows the creation of relationship between users and devices throw infrared systems that detect the presence of human body in the space, and trace his movement in real time.
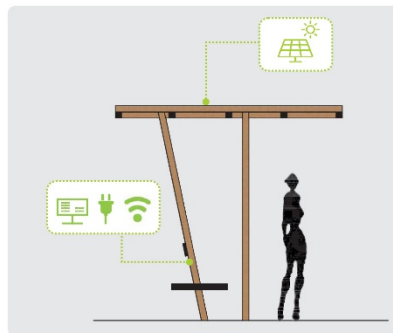
Fig.3: example of shelter-device   **Fig.4:** example of interactive totem

4   Conclusions and future perspectives

The proposed work shows the possibility of using the natural and cultural heritage as the main resource to attract tourist flows; to do this, we suggest a new strategy of valorization based on an immersive digital platform that helps the local economy to increase touristic flows in a sustainable way.

The platform is a geographic information system for tourism, whose operational logic is to create a highly interactive space with the users. The main results achieved by the creation of the ALforLab GIS platform include:

- attracting the tourist by offering diversified touristic paths;
- supporting the tourist by providing all information about local products, traditions, touristic attractors and accommodations;

- tempting the tourist to visit identity landscapes, cultural, historical and natural heritage present in Calabria.

To achieve these goals we have created, within the test area, specific paths that users can select and query through the ALforLab platform using a smart device connected to the main server. These paths are of two types:

- identity paths, built on the basis of the identified identity characters;
- perceptive paths, that are the final result of the conducted perceptive survey.

In particular, once chosen the path, users will plan short and long stays, because they will find, within the platform, all the information about the destination, the type of the path and its travel time, the natural and cultural heritage on the territory (through hyperlinks), typical products, traditions or events, and special devices present on the paths. In fact, both routes are characterized by punctual elements, which perform various functions to: find shelter; have visible points for bus or shuttles stops; visit exhibitions outdoors; have at least one point for toilets, refreshment or relax; find along the path some info point or informative totems, have a bike sharing service and a cycle workshop; have the chance to enjoy of panoramic views; practice flora and fauna watching, or find picnic areas.

The goal for the future is to improve this network of paths, also including educational paths, in order to engage the educational sector on the theme of the protection and enhancement of natural and cultural heritage.

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