

A web-based geospatial service promoting landscape, cultural and economic assets of Amatrice after the devastating 2016-2017 central Italy earthquake

Andrea SPASIANO, Water Resources Research and Documentation Center
University for Foreigners of Perugia, Italy

Fernando NARDI, Water Resources Research and Documentation Center
University for Foreigners of Perugia, Italy

Umberto BARTOCCINI, University for Foreigners of Perugia, Italy

Abstract

In this case study, the authors illustrate a prototype web GIS solution for the relaunch of economic activities and tourism development in the city of Amatrice (Central Italy) following the earthquake events of 2016-2017. The peculiar characteristics of the economy and the local landscape make Amatrice a suitable example for strategies of regeneration and development of small towns in rural inland areas. The development of a web GIS prototype for the relaunch of economic and tourist activities in Amatrice has the purpose, therefore, to make available location intelligence tools and services to provide basic mapping to public administrations and decision-makers in the exercise of the functions of land use management and governance, with particular regard to the rehabilitation and connection of rural inland areas. Secondly, the web GIS performs tourist promotion functions aimed at a general user (citizens, tourists) to support user experience in the local landscape. In fact, the prototype is equipped with tools for data query, visualization and export of results. At the theoretical and methodological level, the contribution offers a model of data and GIS functions that can be replicated in other geographical contexts characterized by rurality and marginality.

Keywords

webGIS, tourism, central Italy, open data, urban regeneration

1. Introduction

This paper presents the outcomes of scientific research and technology development activities for the purpose of designing webGIS solutions for the revitalization of economic activities based on slow tourism and the enhancement of cultural heritage in the Amatrice area following the earthquake events of 2016-2017.

Amatrice represents a special case study. Its marginality depends, first, on its geographical location in the center of Italy and the morphology of its mountainous landscape. This characteristic currently places

Amatrice in a marginal position with respect to major infrastructure networks and tourism flows. The seismic events of recent years have contributed to exacerbate this marginality.

In the context of strategic programming set on paradigms of slow tourism and enhancement of local resources, cultural and environmental heritage, associated with local traditions and productions, represent a unique and non-reproducible capital for the revitalization of territories (Amodio et al., 2019; Prezioso et al., 2021; Blečić et al., 2023). Such strategies are adapted both in contexts of geographic marginality and in reconstruction processes following disasters and environmental disasters, such as earthquakes (Baldi, 2018). Recent programmatic guidelines such as the Inner Areas Strategy (2014) and the Strategic Tourism Development Plan (2017) provide the programmatic framework within which to design and implement local development strategies on the peculiarities of territories.

Geospatial knowledge can, therefore, play a basic function in setting strategies aimed at enhancing and revitalizing tourism in the city (Meini et al., 2017; Macchia et al., 2022; Spasiano et al., 2022). The development and use of web GIS platforms are widely used in urban planning and promotion of tourism activities in the area (Spasiano & Nardi, 2019). Several studies point out the centrality of tourist routes in the revitalization of local economies and tourism with the support of GIS data and tools (Meini et al., 2012; Favretto et al., 2014).

2. Case study area

Amatrice is a small community located in the Lazio region of central Italy, and is nestled in an agricultural valley near the Gran Sasso National Park. It is approximately 105 km northeast of Rome, 210 km southeast of Florence, and 70 km from the coast of the Adriatic Sea. Amatrice is at an elevation of 955 m, and beautiful views of Mount della Laga can be seen from the village. Amatrice is a town of rich historical, archeological, and natural features with unique cultural heritage and scenic landscapes.

The historical city center was an important pole for trade, communication, and commerce. The location along the Via Salaria made Amatrice a crossroads of trade and commerce over time between Rome and the Adriatic Sea. The natural heritage of Amatrice is characterized by major peaks of the Gorzano Mountains (2458 m), Pizzo di Selvo (2419 m) and important water resources such as rivers and high mountain lakes (Scandarello and Secco). The area includes the Gran Sasso and Laga Mounts National Parks - a significant part is considered as a Site of Community Importance (SCI) by the European Union

In this geographical context, the set of local traditions and knowledge find expression in the agro-pastoral and productive activities spread throughout the territory, constituting its socioeconomic structure (Belluso, 2012; Sabatini 2020). These activities are part of a context of cultural and environmental richness, which finds tangible expression in the forms of the landscape, land uses and toponymy that attests to a peculiar cultural vibrancy throughout history (Belluso, 2012; Sabatini, 2020).

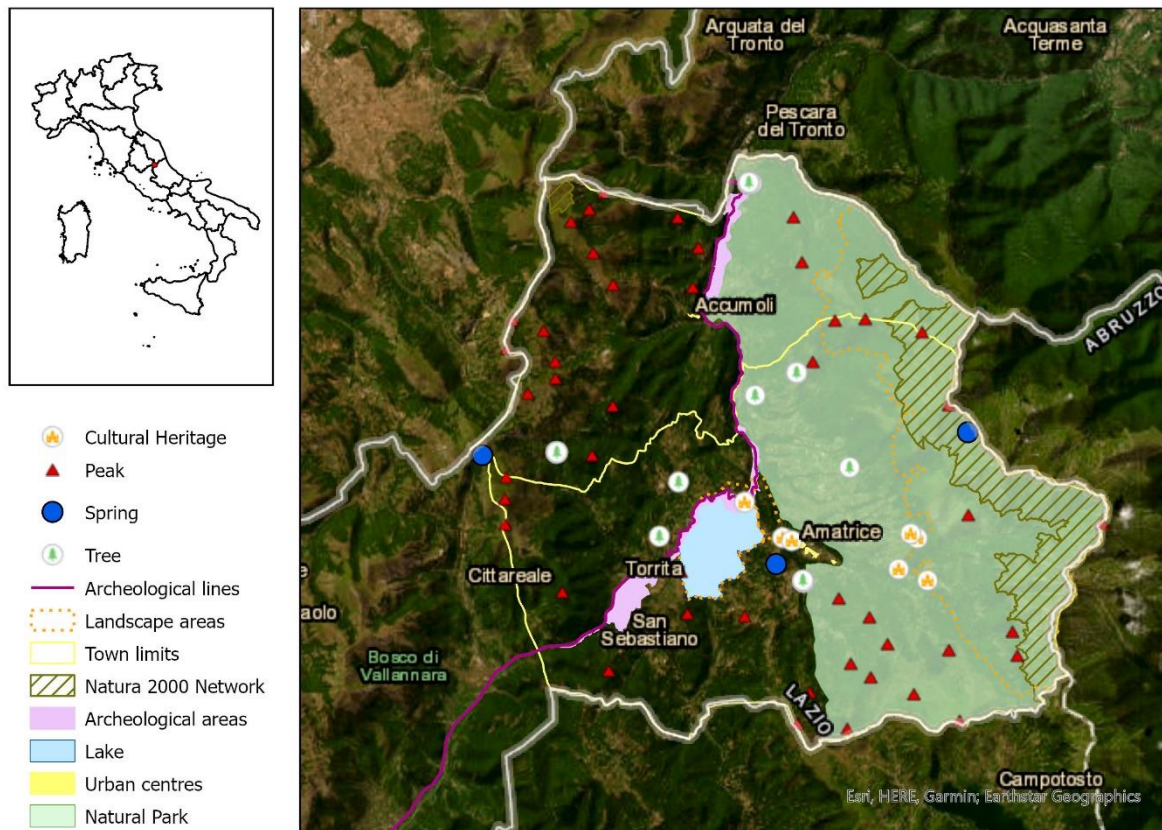


Figure 1. Area of study. Source: Authors.

3. Methods and data model

The prototype of the webGIS was born with the need to create a platform for the interaction of digital content and for the promotion of tourism in Amatrice as a factor of local relaunch, facilitating the accessibility and enjoyment of natural, cultural and productive resources in the area.

The solution is presented as a digital cartographic support tool for tourists and local actors, integrating geographic data different in format, content and source, descriptive of the landscape, environmental and economic-productive structures of the local context.

3.1 Open data sources

Institutional open data platforms provided a first layer of useful data to reconstruct the general layout of the study area. For the creation of the webGIS, we relied mainly on data from the Geoportal of the Lazio Region and the Italian National Institute of Statistics (ISTAT). From the former, data on environmental and landscape constraints under the 2007 Regional Landscape Territorial Plan (PTPR) and lists of environmental and cultural assets under protection were downloaded; the latter, on the other hand, provided the spatial and administrative bases at the municipal level. To this group of data, others related to built-up area and hydrology were added from the Regional Technical Map at a scale of 1: 5,000. These data sources enabled the overall cognitive picture of the Amatrice area to be reconstructed. The data was downloaded in formats compatible with GIS software. To complete the basic framework, we integrated data from the Open Street Map online user community (Haklay & Weber, 2008) regarding the road network.

3.2 Further data sources

Additional data were sourced through the active involvement of local stakeholders and associations. By means of a sample survey, we set up a geospatial dataset for different types of activities such as agritourisms, bed & breakfasts, campsites, restaurants, and farms dedicated to the production and trade of typical gastronomic products of Amatrice. This recognition provided the exact location of the activities, which were concentrated not only in the historic center of Amatrice but distributed around the various hamlets and towns in the municipal area, testifying to the close connection of production and tourist accommodation activities with the local environmental and landscape complexity.

Finally, to complement the webGIS data model, we integrated data on the Amatrice trail network, courtesy of the local Alpine Club. GPS tracks on the trail network fall under the umbrella of VGI, which are field surveys by volunteer users that provide geolocated information on elements, processes, and information about the area (Goodchild, 2007; Sui et al., 2012).

The integration of data on the trail network of the local Alpine Club section is aimed at systematizing data on production and accommodation facilities in the context of Amatrice. In the post-seismic reconstruction activity, in fact, the trails play a role in reconnecting attractive factors with a view to revitalizing local tourism according to criteria of sustainability and respect for environmental and social balances.

Web GIS data model	
Sources	Layers
Italian National Statistics Institute (ISTAT)	Administrative limits
	Toponymy points
Lazio Region Open Data	Buildings
	Level curves
	Hydrography
	PTPR – Archeological Points
	PTPR – Monumental trees
	PTPR - Geosites
	PTPR – Protected Areas
	PTPR – Archeological areas
Open Street Map	Road network
	Trekking trail
Volunteered geographic Information (VGI)	Restaurants, farms and socioeconomic activities

Table 1. Data model of the geospatial service. Source: Authors

4. Tools and function of geospatial service

The prototype consists of a web application in which all the data previously described were collected and put into system, with the addition of some useful tools for navigation and interactive consultation of content, known by the technical term widgets. These widgets are able to increase the functionality of the solution to support the user experience. Below, we report the main functionalities designed for the use of web GIS:

1. Layer list, which is a list of all the data that can be viewed in the application, so that users can turn the various layers on or off based on their navigation and viewing needs and based on the location of interest.
2. Info summary, related to food service activities. This feature allows the display of only the dining establishments in the portion of the map that the user is viewing, updating automatically through the movement of the cursor and through the scale of the map. It also provides a list of the names of the activities, with the possibility of opening informational pop-ups for displaying additional information about the data displayed, such as description of the selected element, information about the environmental and cultural heritage, contact details and opening hours of the accommodation and tourist facilities, and availability of products on site.
3. Info summary related to natural and cultural heritage. This feature has the same technical features as the previous one, the only difference being that it provides data and queryable information on attractions and landscape settings. It provides lists of cultural and environmental assets along the route selected by the user.
4. Trail chart, by means of which the user can select the route of his or her interest and through a real-time generated graph, can check the elevation of the trail at any point along the entire route, its elevation difference, and its total length.
5. The last widget inserted allows the user to view the map through a wide selection of different basemaps, which allows the user to customize the view of the content according to their needs.

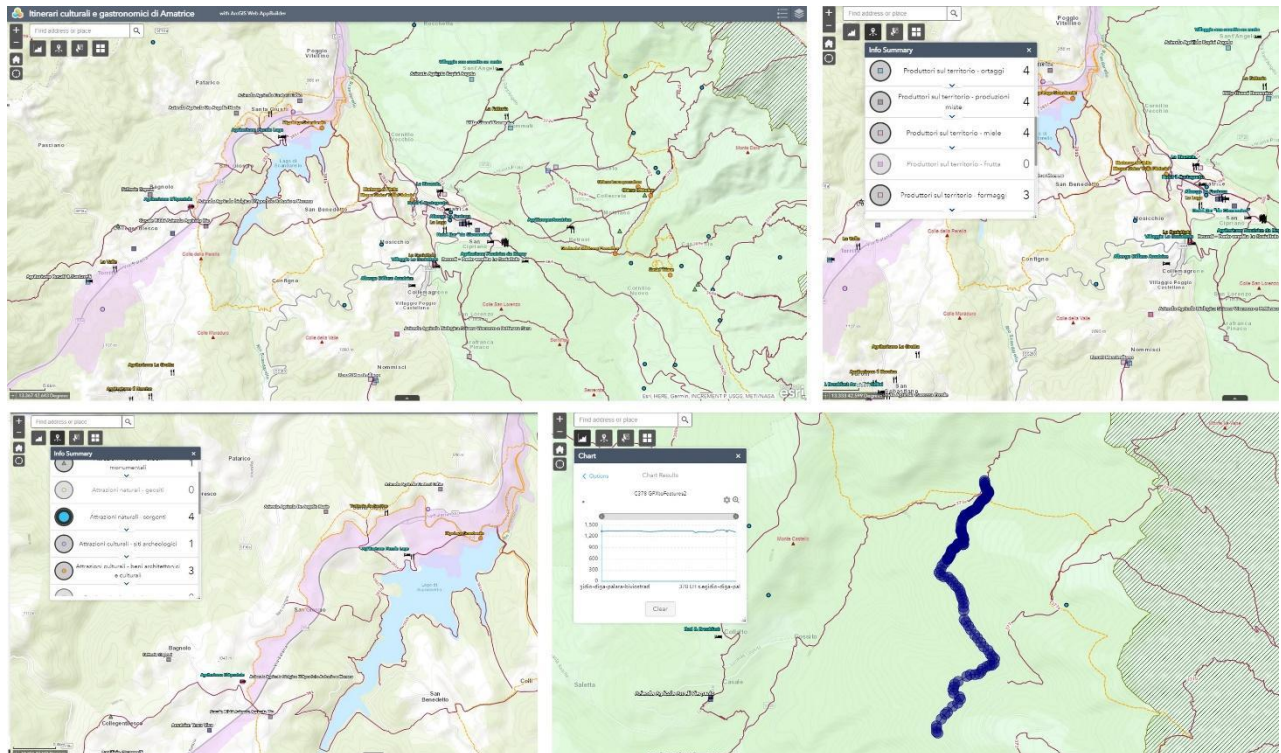


Figure 2. Extracts from the web app and examples of widgets to support the user experience. Source: Authors.

5. Conclusions (broader impacts)

Thus, the development of a prototype web GIS for the revitalization of economic and tourism activities in Amatrice aims to make available location intelligence tools and services to provide basic mapping to public administrations and decision makers in the exercise of land management and governance functions, with particular regard to the redevelopment and connection of inland rural areas. Second, web GIS performs tourism promotion functions aimed at general users (citizens, tourists) to orient themselves within the territory.

The navigation tools are equipped with features that can provide immediate feedback to the user and ensure operability for field or back-office activities. In particular, the prototype is equipped with tools for querying data, visualizing and exporting results. At the theoretical and methodological level, the contribution offers a GIS data and function model that can be replicated in other geographic contexts characterized by rurality and marginality.

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