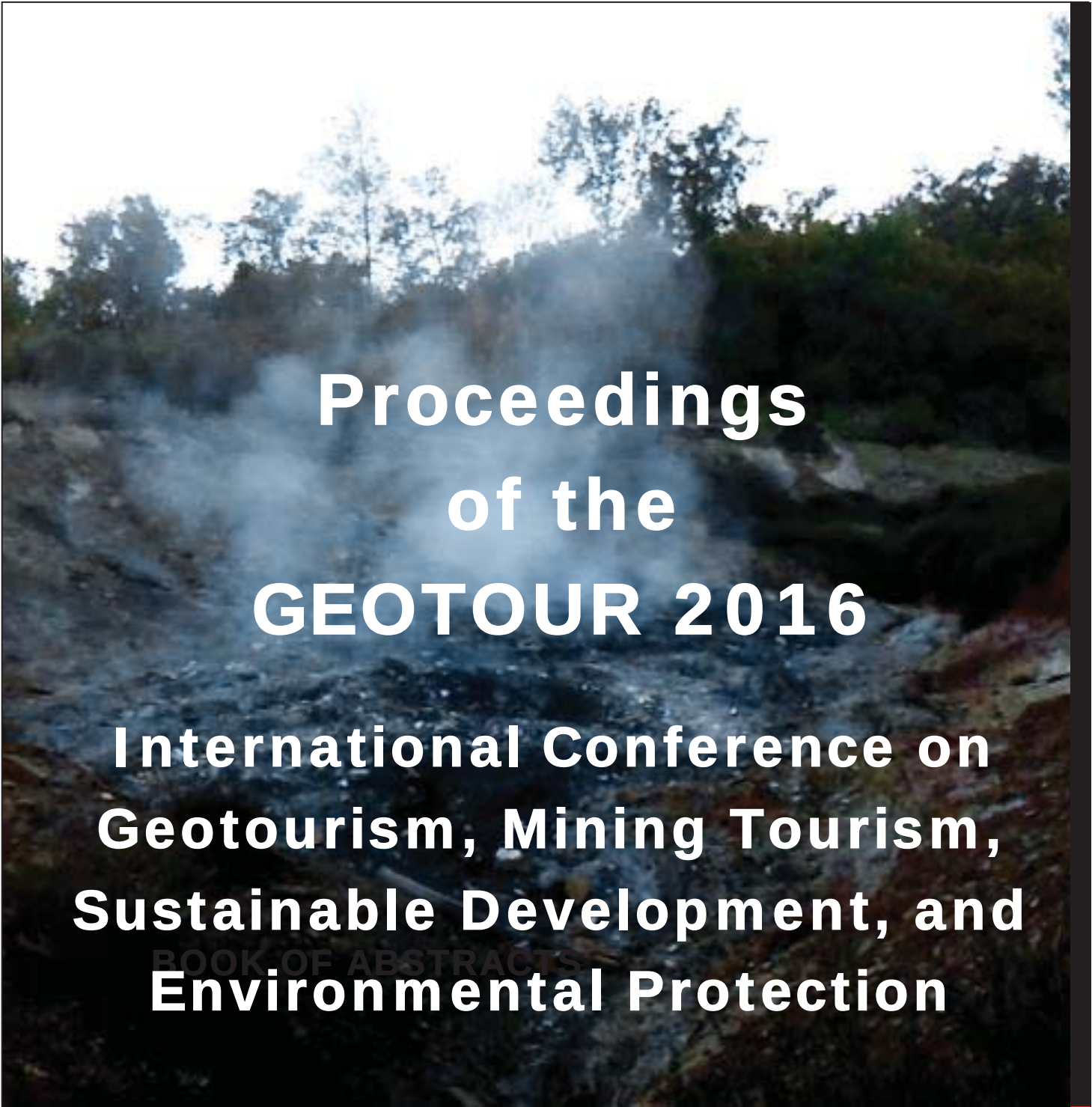




Proceedings of the GEOTOUR 2016

**International Conference on
Geotourism, Mining Tourism,
Sustainable Development, and
Environmental Protection**

***18-20 October 2016
Aula Magna of the SAGAS Department,
Università di Firenze***

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Book of Abstracts of the GEOTOUR2016 Conference. International Conference on Geotourism, Mining Tourism, Sustainable Development, and Environmental Protection. 18-20 October 2016, Firenze.
Ugolini Francesca, Marchi Valentina, Trampetti Sonia, Pearlmutter David, Raschi Antonio (Eds.)

Published and printed by IBIMET-CNR, Firenze.
ISBN: 978-889-559-73-17

PROCEEDINGS

GEOTOUR2016 CONFERENCE

18-20 October 2016

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THE MINING PATH OF SANTA BARBARA IN THE SULCIS IGLESIENTE IN SARDINIA (ITALY) BETWEEN MEMORY AND RE-USE

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Abstract

The territory of Sulcis-Iglesiente is characterized by the significant presence of abandoned mining sites (113 of the total 169 sites in Sardinia are present there). This paper focuses on the Mining Path of Santa Barbara (*Cammino Minerario di Santa Barbara*), a 400 km long circular route, and aims to revive the memories of these places, proposing a geo-tourist path subdivided into 24 stops, for local economic conversion, from little-known mineral deposits to tourist sites. The path through the Geo-mining Park of Sardinia is in one of the oldest places in Europe.

The first part of this paper is devoted to the cognitive study of Sulcis-Iglesiente territory and of the case-study area. Following this, the authors propose a strategic tourist path for the Mining Path of Santa Barbara (the patron saint of miners and of everyone who deals with fire risks) in which it will be possible, not only to bring back the ancient paths of the miners (from home to work), but also to restore the fascinating mining infrastructure such as railways and roads, the main means of communication. The proposed strategic tourist route thus provides sustainable mobility and a communication tool of the various mining centers and with appropriate variations, can be crossed by trekking, cycling and on horseback using bridle paths. The data are collected in a geodatabase with information on the precise positioning of the signs and the points of interest with particular attention to geological, natural, architectural, historical and industrial archeology, in addition to the list of receptivity and museums. This paper ends by presenting the results of research.

Keywords: mining villages, cultural tourism, Sulcis-Iglesiente, geotourism, sustainable tourism

Introduction

This paper focuses on the drafting of the Mining path of Santa Barbara (*Cammino Minerario di Santa Barbara*), located in the Sulcis-Iglesiente in Sardinia (Italy) that has significant signs of past mining activities. It is a tourist-hiking infrastructure, addressed to active tourism¹ developed throughout Europe and recently also in Sardinia (Fortezza, 2015).

Material and Immaterial procedures of recovery and of enhancement have been researched, identified and developed for about 20 years in the Geo-mining Historical Environmental Park of Sardinia, recognized by UNESCO in 1998. The drafting of the Mining Path of Santa Barbara is located in this place-based context, upon the proposal of several associations, among which is the "Onlus Pozzo Sella for the Geo-mining Park Association".

The mining path of Santa Barbara is like a ring extending about 400 kilometers, and is subdivided into 24 stages, with the aim of interconnecting the mining villages, located in the territory of Sulcis-Iglesiente and of Guspinese, using old mining paths (cart tracks and mule tracks, railways, paved

¹ Active tourism is characterized by outdoor activities, also with a strong identitarian connotation (such as: trekking, climbing, mountain bikes, etc.). In Sardinia it can be practiced in all seasons because of favorable climatic conditions (<http://www.regione.sardegna.it/j/v/40?s=1&v=9&c=7106&na=1&n=10&va=2>).

roads and bridges, etc.), in order to help the area flourish and also to commemorate the historical memory of the places.

Along the mining path of Santa Barbara, the old mining value is accompanied by strong environmental, archaeological and natural elements, that give the local context a particular uniqueness of its type between nature and artifice (Balletto et al., 2012; 2013).

In this regard, the authors propose a geo-tourist path, in order to enhance not only the disused mining context, but also the environmental and natural features of that same context.

The Sulcis-Iglesiente and the case study area

The French geographer Pierre Birot described the Sardinian landforms as a residual of Hercynian base, with multiple faults, covered by the secondary and Eocene strip, and in the western part hidden by volcanic accumulations, due to activity started in the Oligocene. Plateaus are the most common shape of relief, with high precipitous costs, that create a beautiful and wild landscape (Birot, 1955). In this synthesis he brought to light the origin of antiquity and the fragmentation of the Sardinian landforms. The western part of the island is very heterogeneous in terms of morphology and geology. In the southwest Sardinia, the region called Sulcis-Iglesiente, evidence appears of granitic rocks, that some Geologists connect to mythological Tirrenide. This name was coined by CJ Forsyth Major in 1882 to designate the continent originating in the Mesozoic in the western Mediterranean area. Precisely the Iglesias region, so named from the main urban center of Iglesias (the toponymy of which corresponds to the term "churches"), is characterized by the presence of abundant mineral resources, such as lead, zinc and especially coal, documented from ancient times. Deposits are located mainly in Silurian shales and limestones above the basic granite layers and contributed to the flourishing of a mining region among one of the richest in Italy.

A gap between the Gonnese Gulf and the lagoon of Cagliari clearly separates this block into two parts: the northern one, culminating in the granite mass of the Linas (1,236 m). Here the most important mines are located on the western side, from Montevecchio to Monteponi, with a concentration of activities on Iglesias. The southern block is constituted by Sulcis region, and is characterized by plateaus arranged in a series from the northwest to the southeast (the Nieddu Mount). The subsoil abounded with bituminous coal and lignite picea (so called Sulcis coal), that were extracted in the Bacu Abis and Carbonia areas (Almagià, 1959; Mezzolani, 2007).

The mining path of Santa Barbara (Figure 1) is placed in an area with strong landscape and environment connotations whose geology dates back some 550 million years ago, which also gives a value of paleontological, mineralogical and caving type (Aymerich et al., 2003).

The previous mining activities in the Sulcis region bequeathed serious phenomena of pollution and environmental damage, as well as a system of particularly innovative mining infrastructure² (such as: the *Porto Flavia* gallery, first port on the sea, built in 1924, using an excavation inside the mountain of about 600 meters and designed to improve the economic efficiency and working conditions; the *Henry* Gallery, excavated in 1865 and designed for the transport of minerals; the first electric-powered railroads, such as *Cala Domestica* installed in 1904 among the first in Italy, for the transport of minerals in small ports).

Part of these structures has been restored, enhanced and made accessible. The most significant examples are: the *Villa Marina* Gallery, Pozzo Sella (the Monteponi mine), the Old Central in Buggerru mine, the Management and the *Pozzo Sant'Antonio* (the Montevecchio mine), the *Santa Barbara* Gallery (the Rosas mine), the gallery and the loading facility of *Porto Flavia* (the Masua mine), and the Henry Gallery (Buggerru).

² The mining system of Sardinia has very ancient origins as early as in prehistoric times, but the nineteenth century highlighted the best production results, involving international mining companies, and triggering innovative achievements, through the progressive start of new technological processes.



Figure 1. The mining path of Santa Barbara

(Graphic elaboration of Michele Pinna. Source of the images: the Henry Gallery [Buggeru] and the Monteponi, and the Masua mines www.igeaspa.it; the Montevecchio mine www.comune.guspini.vs.it; the Rosas mine www.sardegnaigitallibrary.it)

Detection method and design of the Santa Barbara Path

During the preliminary stage, the definition of the mining path of Santa Barbara was made possible by identifying the route through the study of maps, documentary evidence, photographic repertoires and analysis of landscape, environmental and mining points of interest (POIs). A reference model for the design of the path has defined, after consulting the bibliography (Azzari et al., 2004; Zamperlin, 2010; Garau, 2015; Buhalis et al., 2015; Boes et al., 2016), and the numerous case studies of the Emilia Romagna Region, that is at the forefront for detection and realization of hiking tourist infrastructures³. In a second phase, a recognition in the field was performed (Figure 2), during which the previously processed paths were verified and then the related digital data were acquired, preparing in this way the geodatabase and the final cartographic elaborations.

The total length of the path (about 400 km) and the diversity of the POIs to be inventoried involved a significant number of people with different disciplinary expertise, from geology, landscape planning, to architectural history and natural sciences.

The state of consistency and of maintenance to the mining path as well as the infrastructure with the identification of possible restoration work have been subject of particular attention. During the detection stage, the routes were mapped both as linear elements (classified into different types of

³ Emilia Romagna Region 2013.

roads and paths, etc.) and as punctual elements of interest (POIs), including different types of signage, settlements, water points and picnic areas. Two devices were used, a Garmin GPS "Monterra" model, and a smartphone, both with Android OS which allowed the installation on devices of two applications, respectively "OruxMaps" (free download) on the Garmin, and "Supersurv" of the SuperGeo society (commercial version) on the smartphone.



Figure 2. The mining path of Santa Barbara

The use of two different devices is justified by the different precision characteristics in the acquisition of the data: the Garmin, equipped with high-precision GPS, was used to record the tracks (linear traits and POIs), while the smartphone was used to record tracks and POIs in a compatible format with GIS software. In addition, the smartphone made it possible to match data, through an easy interface, already during the detection of the path file, by recording data with standard identification codes of the Italian Alpine Club (*Club Alpino Italiano* CAI), speeding up the population of the database. In particular, Figure 3 shows some typologies of viability (codes T01 T04): dirt roads (codes T01 C01), paved carriage roads (codes T01 C02), and cobbled carriage roads (codes T01 C03); dirt mule tracks, charcoal burning and abandoned railways roads (codes T02 C01); bridleways and cycle paths with tarmac pavement (codes T02 C02); and paved mule tracks (codes T02 C03); paths (codes T03 C01) and unbeaten tracks (codes T04 C01).

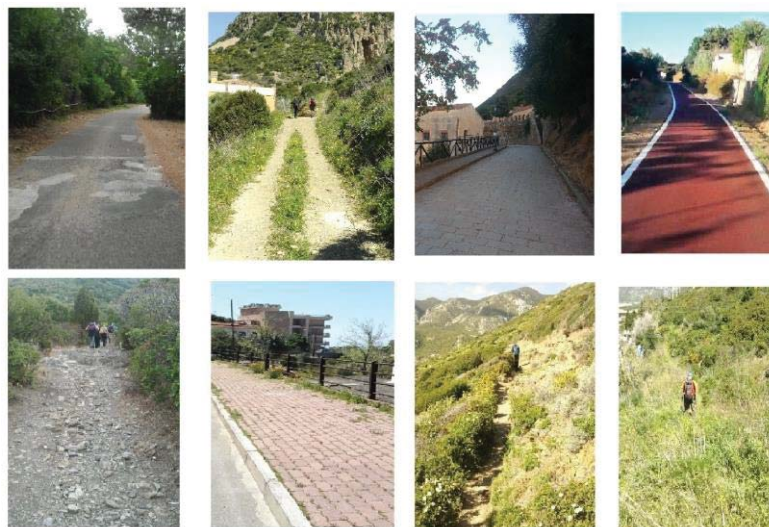


Figure 3. Main typologies of collected roads

The track recording phase is schematically represented by the three screens shown in Figure 4.

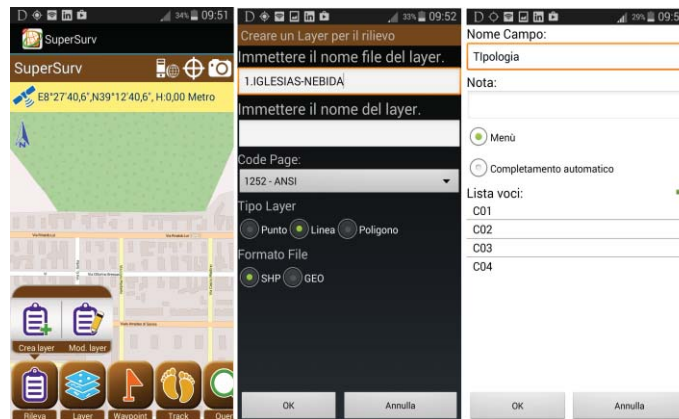


Figura 4. Screenshots obtained during the creation of the shapefile and related tables

Table 1 shows the summary scheme of the 24 routes designed according to the following characteristics:

1. presence of one or more places of worship dedicated to Saint Barbara
2. the path length, between 10 and 20 km
3. accommodation, mainly resulting from the recovery of mining facilities

Table 1. Kilometers and incidence as a percentage of the individual sections and associated typologies

Tracking routes of mining path of Saint Barbara

Routes	km	%	TIPOLOGY	km	%
Total	395.18	100.00		395.18	100.00
1. Iglesias – Nebida	14.88	3.77	T03 C01	32.71	8.28
2. Nebida – Masua	9.43	2.39	T04 C01	26.97	6.83
3. Masua – Buggerru	19.82	5.02	T02 C01	62.84	15.90
4. Buggerru – Portixeddu	11.21	2.84	T02 C02	2.34	0.59
5. Portixeddu – Piscinas	16.70	4.23	T02 C03	23.38	5.92
6. Piscinas – Montevecchio	19.12	4.84	T01 C01	160.50	40.61
7. Montevecchio – Perde Pibera	22.42	5.67	T02 C02	79.52	20.12
8. Perde Pibera – Villacidro	15.29	3.87	T01 C03	6.92	1.75
9. Villacidro – Monte Mannu	18.12	4.58			
10. Monte Mannu – Arenas	15.51	3.93			
11. Arenas – San Benedetto	12.54	3.17	Difficulty T (TURISTIC)	188.86	47.79
12. San Benedetto - Case Marganai	8.59	2.17	Difficulty H (HIKING)	205.16	51.92
13. Case Marganai – Domusnovas	11.06	2.80	Difficulty EH (EXPERT HIKING)	1.16	0.29
14. Domusnovas – Orbai	16.23	4.11		395.18	100.00
15. Orbai – Rosas	16.57	4.19			
16. Rosas – Nuxis	15.71	3.97	Railways	53.04	13.42
17. Nuxis – Santadi	17.55	4.44	inclined surfaces	518.529	131.21
18. Santadi – Grotte Is Zuddas	18.27	4.62			0.00
19. Grotte Is Zuddas – Masainas	20.08	5.08			
20. Masainas – Sant’antioco	23.82	6.03	forest institution	40.12676	10.15
21. Sabt’antioco – Carbonia	21.49	5.44	Geo-mining Park	373.54	94.52
22. Carbonia – Nuraxi Figus	19.48	4.93	SIC	149.527	37.84
23. Nuraxi Figus – Bacu Abis	15.48	3.92	disused mining areas	89.57	22.67
24. Bacu Abis – Iglesias	15.82	4.00	Fauna oasis	10.31	2.61

Discussion and conclusions

The systematization of all the geo-historical information relating to the interest in sites belonging to the mining path of Saint Barbara and the digital acquisition of the tracks, contextual to working towards the assessment of their state of practicability and overall conservation of artifacts, confirmed the potential in terms of cultural and environmental tourism of the Geo-mining Historical environmental Park of Sardinia, unfortunately still not fully expressed. For these reasons, the project of an application intended for possible users of the mining path started, in order to encourage attendance by facilitating their access to information. Currently the demo application, called SULKY_WALKABILITY, is under revision and is expected to be available by 2016.

The sustainable mobility infrastructure proposal is compliant with the guidelines of the Region of Sardinia on the "identitarian, Cultural and Religious Tourism"⁴, which aims to offer active tourism in Sardinia in major national and International tourism networks.

In addition, the mining path of Saint Barbara is also to be understood as an intangible identitarian heritage, not only because of the historical, economic, and environmental reasons relating to the mining path, but also in a Smart Territory approach along the mining path. In fact, the latter can create renewed ties between territorial contexts in the past subjected to mining activities that compromised its environmental integrity, in favor of a new cultural tourist sustainable use.

This careful research of the natural, historical and cultural heritage, which was followed by a mapping for the recovery and development of critical areas for a wider usability, should be the starting point for the recovery, enhancement and sharing of cultural and environmental heritage (tangible and intangible) that were originated in the economic exploitation of a territory, but it left evident signs of an age-old relationship that has taken place here between man and environment, with a strong identitarian connotation.

The next step is to provide the entire territory of Sulcis Iglesiente with a contribution oriented to sustainable mobility, enjoyment of sport and well-being, whose careful management can create local economic development.

Acknowledgements

This paper is the result of the joint work of the authors. In particular, 'Detection method and design of the Santa Barbara Path' has been jointly written by the authors. Chiara Garau has written the introduction. Paola Zamperlin has written 'The Sulcis-Iglesiente and the case study area', and Ginevra Balletto has written 'Discussion and conclusions'.

This study is supported by the MIUR (Ministry of Education, Universities and Research [Italy]) through a project entitled *Governing the smart city: a governance-centred approach to Smart urbanism - GHOST* (Project code:RBSI14FDPF; CUP Code: F22I15000070008) financed with the SIR (Scientific Independence of young Researchers) programme. We authorize the MIUR to reproduce and distribute reprints for Governmental purposes notwithstanding any copyright notation thereon. Any opinions, findings and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the MIUR.

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⁴ Official page of the Region of Sardinia dedicated to tourism:
<http://www.regione.sardegna.it/argomenti/turismo/>

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