

Ancient Mining Paths and Slow Tourism. Assessments and Challenges in Sardinia (Italy)

Ginevra Balletto[1(✉)], Giuseppe Borruso[2], Alessandra Milesi[1], Mara Ladu[1], and Luigi Mundula[1]

[1] DICAAR - Department of Civil and Environmental Engineering and Architecture, University of Cagliari, 09100 Cagliari, Italy
{balletto,mara.ladu,luigimundula}@unica.it

[2] DEAMS - Department of Economics, Business, Mathematics and Statistics Sciences "Bruno de Finetti", University of Trieste, 34127 Trieste, Italy
giuseppe.borruso@deams.units.it

Abstract. Slow tourism is a sustainable way of traveling: it is not based on the consumption of resources and at the same time is linked to the discovery of local places and traditions. This kind of tourism, which favors a harmonious and responsible development of the territory, is spreading more and more in Italy as a form that best responds to the new restrictions and needs related to the health emergency. More precisely, paths have become one of the most successful and appreciated declinations of slow tourism. A comprehensive strategy has been defined by the Region of Sardinia aimed at diversifying the tourist offer where the paths are becoming an integral part of the island's tourism product portfolio, together with other types of tourism related to culture, sport, food, nature. Within this scenario, this paper investigates the role of the paths in the tourist development of the Sardinia Region. It takes the Sulcis Iglesiente area as a research area. Here, the establishment of the Santa Barbara Mining Path (SBP), in a sensitive area marked by intense mining activity, offers the opportunity to set up an initial assessment of the effects of these initiatives in terms of enhancing the landscape and developing the communities settled. The authors analyze and highlight some of the principles potentially replicable to implement a structured walkability strategy at the regional level. Within this framework, the authors define a methodology to compare, by specific index proposal, the new concepts of SBPs with the first SBP realized in Sardinia.

Keywords: Slow tourism · Mining path · Sustainable tourism · Geomineral Park

1 Introduction

Italy has a very ancient tourist tradition thanks to the variety of its landscapes [1] and the rich historical, artistic and natural heritage of global significance [2, 3], confirming itself as the nation that holds the largest number of sites included by UNESCO in the list of world heritage sites (55) [4]. According to the Bank of Italy estimates, the tourism sector in Italy generated just over 5% of the national GDP and over 6% of the employed

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in 2019, which is equivalent to a higher economic impact than that recorded in France and Germany [5].

Although in the last twenty years the tourism sector has experienced exponential growth on a global scale, the health emergency marked a sharp break in that trend that seemed destined to increase in the coming years. In fact, the Covid-19 pandemic has hit the whole world, putting all economic sectors in crisis. In this context, the tourism sector is among the most vulnerable, being affected both in terms of supply and demand [6]: on the one hand, the restrictions imposed on free movement within national and international borders have reduced the number of bookings; on the other hand, the entire sector also had to change the consolidated standards to adapt to the particular contingent moment which altered the lifestyles in everyday life as well as the ways of traveling, forcing us to keep certain distances. In this sense, sustainable tourism, in its declination of slow tourism, is the most responsive to new needs [7]. The 2017 has been defined as the International Year of Sustainable Tourism by the UN, which recognized its specific role in pursuing inclusive economic growth in balance with the environment. In Italy too, after the national year of the paths (2016), of the villages (2017) and of Italian food (2018), 2019 has been declared the year of slow tourism [8], understood as that form of experiential tourism, innovative and sustainable capable of enhancing the territory in all its diversity as it makes movement, even more than halfway, an integral part of the journey [9]. Even the ways of crossing and using the places are the most diverse. They include cultural and natural itineraries, religious and spiritual paths, journeys on horseback and aboard historic trains up to the cycle paths, a significant expression of the changes that are affecting the tourism industry at European level in a sporting, healthy and sustainable way [10]. Within this scenario, the paths are enjoying great success in Italy, becoming one of the main symbols of slow tourism. In fact, in 2017 the MiBACT established the Digital Atlas of the Paths of Italy [11] to support the process of enhancement and promotion of a series of contexts that have been little known up to now, especially in the internal areas of the country. The clear approach adopted at national level to promote new ways of managing and using the territory is the basis of the Strategic Tourism Plan 2017–2022, which identifies sustainability, innovation and accessibility/permeability of territories as transversal principles [12, 13]. These same principles guide government strategies and policies on a regional scale, where the concept of slow tourism finds its precise expression.

On the basis of the considerations set out so far, this contribution investigates the role of slow tourism, in particular of the walks, in defining the policies for the tourism development of the Sardinia Region and takes the territory of Sulcis-Iglesiente as a research area, where the recent establishment of the Santa Barbara Path - Mining Route in a sensitive area marked by intense mining activity, offers the opportunity to set up an initial assessment of the effects of these initiatives in terms of enhancement of the landscape and of development of the local community.

The conception of the mining landscape and the surrounding heritage as an element to be valued originated with the establishment of the GeoMining Historical Environmental Park of Sardinia (Geomineral Park). It was formally established in 2001 after a work begun many years earlier with the aim of safeguarding and enhancing the tangible and intangible values in 8 specific areas of the Region, consisting of the geological context,

the mining engineering heritage of industrial archeology, the traditions and knowledge of the local community.

After an initial assessment of the geomineral contexts and their enhancement, the authors analyze the principles and potentially replicable elements and demonstrate how this first experience is proving to be a best practice for starting a structured planning of walkability at the regional level, also involving other territorial contexts that they choose to promote forms of slow tourism starting from the enhancement of the local environmental, historical and cultural resource.

The present study is organized into the following parts:

- Material (Sect. 2), which focuses on the origins and characteristics of the Santa Barbara Path and the new proposals;
- Methodology to compare the new proposals with Santa Barbara path by index proposal (Sect. 3);
- Case study, where the authors apply the methodology (Sect. 4)
- Study results and conclusions (Sect. 5).

2 Material: The '*Best Practice*' of Mining Path of Santa Barbara (Sardinia, Italy)

The economy of Sardinia, for a long time, has been characterized by an intense mining activity that has bequeathed a landscape of abandoned sites and industrial archeology which, in recent decades, has been at the center of a series of policies and projects aimed at its progressive enhancement. A first action was the establishment, in 2001, of the Geomineral Historic and Environmental park of Sardinia (Geomineral Park), as a tool to protect and safeguard all the tangible and intangible heritage made up of the geological context, the technical-scientific heritage and mining engineering, the heritage of industrial archeology, from the documentary heritage of works and from culture, traditions and knowledge. It extends to the regional level, including the main territorial areas affected by extractive activities. In fact, it is divided into 8 areas covering 81 Municipalities of Sardinia, for a total area of approximately 3800 km^2 [14].

In the wake of this awareness, in Sulcis Iglesiente, a historic region of south-western Sardinia, interesting bottom-up initiatives have been created for the protection and enhancement of the territory. First the birth of the Pozzo Sella Onlus Association in 2001 with the aim of contributing to the development of the Geomineral Park and to which we owe the creation of the Santa Barbara Path, then the establishment, in 2016, of the Foundation called "Cammino Minerario di Santa Barbara", with the task of implementing, promoting and managing the path [15–20].

These are projects in response to the economic crisis and the abandonment of the territory. As a matter of fact, the area of Sulcis Iglesiente has been for millennia interested in a complex mining activity, such as to be considered the main extractive basin not only of the Island but of the whole Mediterranean. This territory was the most important district for national and international mining due to its large production of lead and zinc. The crisis in the mining sector and the subsequent closure of the mines in the 1990s left a rich heritage of industrial archeology and infrastructure, as well as a unique landscape.

01_SBP - SW Sulcis - Iglesiente - Arburese- Guspinese

The Santa Barbara Path [21] retraces the ancient mining routes of the Sulcis Iglesiente - Guspinese, developing as a ring for a length of about 500 km, divided into 30 arches of 16 km each.

It is accessible on foot, by bicycle or by horse and its altitude spans from zero at the sea level to an altitude of 900 m. The 30 stages of the route have been defined on the basis of the following parameters: length in km, difficulty traveling and availability of accommodation facilities. The landscape of the path is characterized by a complex geological heritage and industrial archeology - mineral deposits, excavations and mine dumps and buildings - from an important ancient archeological heritage - domus de nuraghi, sacred wells, etc. - and significant heritage natural (beaches, cliffs, lagoons, etc.). All these elements highlight the vastity of mining operations carried out in the main mining places of the district, such as the great mines of Monteponi, San Giovanni and Masua, and their related processing plants and handling systems, as the historical Laveria Lamarmora and Porto Flavia plants.

Along the route there is also a significant number of points of historical-cultural and naturalistic interest, reception and refreshment activities.

Thanks to its particular features, the Santa Barbara Path has been included in the regional register of historical-religious paths of Sardinia since 2013. Subsequently, in 2017 the Ministry of Cultural Heritage and Activities and Tourism has included it in the first 'Atlas of the Paths of Italy'.

In recent years, the projects have been conceived as a model to other local initiatives.

After the positive experience of the of Santa Barbara Path (01_SBP) of the Sulcis Iglesiente and in the light of the growing interest developed in it, the Pozzo Sella Onlus Association has launched an intense activity aimed at verifying the existence of favorable conditions for the construction of new walks in other island contexts characterized by a similar historical, cultural, environmental and religious heritage inherited from the mining activity developed in Sardinia. These studies have led to the development of the proposal for the establishment of three other itineraries dedicated to the patron saint of miners in order to enhance the former paths linked to mining present in other areas of Sardinia (Fig. 1):

- 02_SBP in the north-west, in the Nurra area
- 03_SBP in the central south in the territories of Ogliastra, Barbagia di Seulo and Sarcidano
- 04_SBP in the south east in the Sarrabus Gerrei area.

02_SBP - NW Nurra

The project of the "Mineral Santa Barbara Path of the North-West" retraces the ancient mining routes of the Nurra - historical region in the North-Western of Sardinia - developing as a ring for a length of about 500 km, involving 7 Municipalities: Sassari (37% of the total length of the itinerary), Alghero (35%), Porto Torres (10%), Olmedo (8%), Putifigari (8%) and Uri (2%). The current definition of the project aimed at making known and enhancing the great historical, cultural, environmental, geological, landscape and

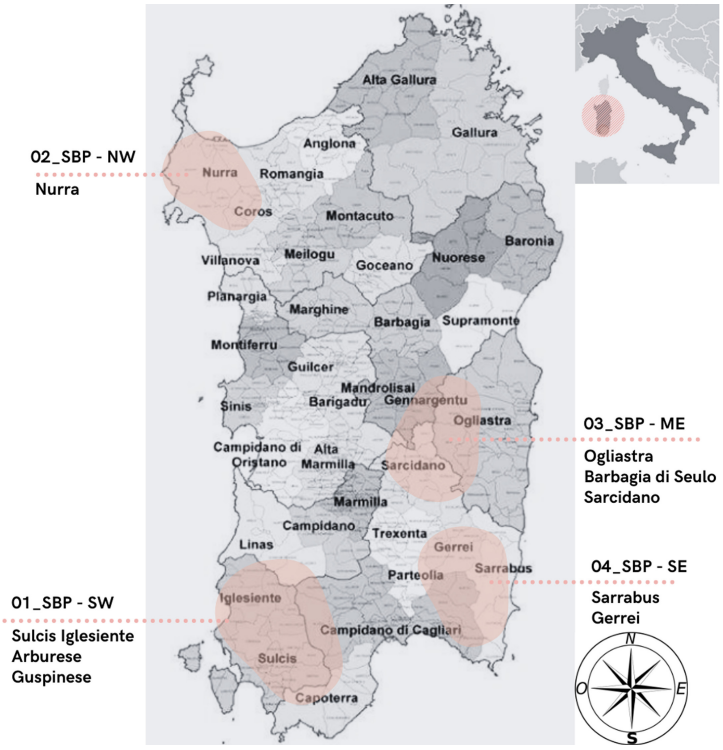

Fig. 1. Location of mining paths of Santa Barbara, Sardinia, Italy (01–04 SBP)

religious heritage linked to the past mining activity and to the other human events that characterize the territory.

The basic conditions that led to conceive and propose the construction of the new Path can be summarized as follows:

- the presence, in the Nurra, of disused mining sites that can be traced back to the Phoenician, Punic and Roman periods, playing an important role in mining production with particular reference to the metal sector;
- the presence, in the former mining sites themselves, of churches and religious buildings dedicated to the patroness of miners, whose veneration is still practiced today with celebrations and processions in the former mines of Olmedo, Argentiera and Canaglia, and of the Orthodox church dedicated to Santa Barbara in historic center of Alghero;
- the coincidence of long stretches of the Santa Barbara Path with some historical routes of the local pilgrimage, such as the one traveled by the faithful from the town of Putifigari to the Sanctuary of N.S. of Valverde in the municipality of Alghero.

These elements reinforce the meaning and the spirituality of the Path. More specifically, it is possible to affirm that the significant heritage present in the territory of Nurra,

together with the presence of ancient and more recent paths that allow to reach the mining sites widespread in the territory with the structures of worship dedicated to Santa Barbara, can be considered the true matrix for the project of the Santa Barbara Mining Path of the North-West.

The proposed itinerary has the following characteristics:

- Length: 204 km along a circular route that starts and ends at the Olmedo mine;
- Stages/days of walking: 11 with an average of 19 km per stage;
- Altimeters from 0 (beaches of Alghero) to 406 m asl Monte Capparone;
- 60% of the route on dirt roads;
- 70% already easily accessible;

Stages and stopping points coinciding with the abandoned mines to be regenerated (Olmedo, Calabona, Argentiera, Canaglia) and with other sites equipped with existing accommodation facilities and/or to be implemented.

The hypothesized route will also allow to reach the main archaeological sites of the territory, the most significant geological emergencies with the relative paleontological peculiarities and the most significant hills of the territory such as Monte Timidone (360 m asl) and Monte Capparone (406 m asl) from which it is possible to admire the Nurra Landscape.

03_SBP - ME Ogliastra-Barbagia di Seulo-Sarcidano

The "Mineral Santa Barbara Path of the Central-South" retraces the ancient mining routes of the Ogliastra Barbagia di Seulo Sarcidano - historical region in the Central South Sardinia - developing as a ring for a length of about 60 km, involving 5 Municipalities: Mandas, Seui, Seulo, Gadoni and Laconi.

Some critical issues in terms of walkability and tourist use, essentially due to the morphological characteristics of the site, the location of the itinerary and the linearity of the existing path, are offset by numerous favorable aspects to the realization of the Path: the presence of ancient paths in the area that can be redeveloped and reused; the possibility of overcoming morphological barriers through the construction of low-impact infrastructures; the possibility of creating a ring route with the integration of other route, including the historic green train; the new life for the Funtana Raminosa mine as a museum and the redevelopment of the industrial archeology structures of the San Sebastiano-Corongiu anthracite mine.

The proposed itinerary has the following characteristics:

- Total length: 175 km (of which 110 in the green train) along a ring route that starts and arrives at Mandas station;
- Stages/days of walking: No. 4 with an average length of 16 km per stage, to which the first and last leg of the itinerary to be covered with the green train must be added;
- Altimeters: from 345 (course of the Flumendosa) to 1100 m asl (in the municipality of Seui);
- 60% of the route with the green train;
- 35% on paths and dirt roads that are already easily accessible;

- 5% on asphalted roads and/or paving in built-up areas;

Stages and stopping points coinciding with the inhabited centers directly involved (Mandas, Seui, Seulo, Santa Sofia and Laconi), where an adequate accommodation system exists and can be implemented. In the "Funtana Ramiosa mine" it is possible to host pilgrims/hikers in the old miners' homes and in the former mine's guesthouse.

04_SBP - SE Sarrabus - Gerrei

The idea of establishing a new itinerary called "Mineral Santa Barbara Path of the "South-Est" arises from the presence in the Sarrabus Gerrei area of numerous disused mining companies that have played an important role in the past mining production and from the presence in the same mining sites of churches and religious buildings dedicated to the patroness of miners as evidence of the ancient veneration for Santa Barbara, still practiced today with celebrations and processions in various municipalities in the area. Furthermore, the presence of ancient and recent paths that allow you to walk to the disused mining sites and the connected places of worship dedicated to Santa Barbara, represents the real opportunity for the realization of the new itinerary. The idea is that of a circular route with the following characteristics:

- length: 235 km along a circular route that starts and arrives from the inhabited center of the municipality of Sinnai;
- Stages/days of walking: n. 10/13 with an average length of 23/18 km per stage, to be defined according to the accommodation facilities or stopping points that can be created in the stages that exceed 30 km in length; (from Villasalto to San Vito, from San Vito to Sardinia Outdoors and from Sardinia Outdoors to Burcei);
- Altimeters from 804 (Sa Cotte and Baccas in the municipality of Donori) to 13 m asl (inhabited center of S. Vito);
- 75% on paths, mule tracks and dirt roads;
- 25% on asphalted and/or paved roads in built-up areas;
- Stages and stopping points coinciding with the inhabited centers crossed (Sinnai, Donori, Silius, Goni, Ballao, Armungia, Villasalto, San Vito and Burcei), while the possibility of creating adequate accommodation facilities and/or stopping points in the structures must be verified abandoned mines starting from the village of Monte Narba.

The itinerary, to be covered on foot, will allow you to reach geosites of considerable importance (fossiliferous geosite with graptolites of Peinconi north of the town of Goni, the course of the Rio Ollastu etc.) which, thanks also to the archaeological and mineralogical heritage put in evidence from the past mining activity, allows to tell the evolution of the earth's crust in the last 350 million years and archaeological sites (archaeological park of Pranu Mutteddu in Goni, sacred well of Funtana Coberta in Ballao, urban nuraghe of Armungia, castle of Orguglioso in Silius etc.) which testify to the presence of man in the territory in the last 5,500 years.

3 A Comparative Methodology: An Index Proposal

The following methodology aims to compare the recently proposed Santa Barbara paths, here named 02, 03 and 04 SBP, with the first realized Santa Barbara path, here named 01_SBP. In particular, considering that 01_SBP represents a 'best practice' [7, 22] in terms of export and replication of the mining path model, a specific replication method based on a composite index was developed, referring to the inclusion of community and environment (ICE Index). In particular, the methodology allows to evaluate how the recent proposals of the new three paths (02–04 SBP) are in line with the Guidelines for the development of the Territorial Tourist Product, Santa Barbara Mining Trail [23], with particular reference to the following factors: *prevention*, through the enhancement of oriented projects to anticipate social and environmental problems; *promotion*, through community-environment policies based on well-being and quality of life; *participation*, through an active and responsible role in terms of the community and the environment; *partnerships*, with network forms for shared planning and joint management of initiatives. In this sense, the main factors of inclusion (community-environment), such as belonging to the Geomining park (an area with strong characterizations in terms of enhancement of the mine landscape; number of municipal administrations involved, local reference population, incidence of natural-original mine paths, …) constitute the first indicators on which the ICE index is based. The ICE index aims to compare proposals and to support decisions for the advancement of their design. The conceptual model of the method is shown below. It will be subject to future application on a larger number of indicators that can be extrapolated from a database built by the authors in previous research [19] and by the Foundation of the Santa Barbara path itself [21], (Fig. 2).

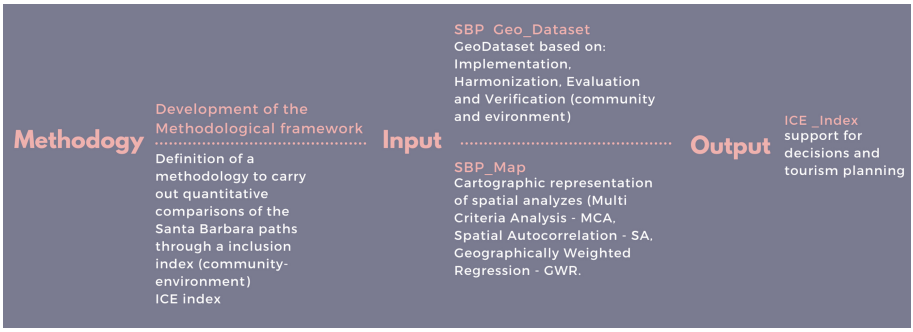

Fig. 2. Methodological framework

In particular, the ICE index can be represented as follow:

$$\text{ICE Index} = \frac{\sum_{i=1}^{n} i * Wi}{\sum_{i=1}^{n} Wi}$$

where i = incidence factor of community-environment inclusion factors (divided into *prevention, promotion, participation, partnerships*). The definition of specific weights,

which also derive from 'Guidelines for the development of the Territorial Tourist Product, Santa Barbara Mining Route' [see note 2], is particularly important in the computation of the different indexes. ICE index must then be divided by maximum Ice index in order to obtain ICE index relating to the group for which the comparison is to be made.

4 Case Study. Methodology Application to the Mining Paths of Santa Barbara in Sardinia (01–04 SBP)

The process of enhancing the real estate assets inherited from the previous mining activity and of redevelopment of the landscape shaped by human actions took place in the past according to the approach aimed at the creation of museums in the sites. The mining landscape, with its buildings and areas, created for functional purposes and, often, without any stylistic pretense, become museums of themselves, according to an approach widespread in large part of national and international disused mining sites which, however, has not given great results. A new approach was adopted on the occasion of the establishment of the Santa Barbara path which, through the enhancement of the existing routes, which connect the various disused mining sites, determines the transition from the concept of node (museum) to the concept of network (landscape). The objective of this contribution is to define criteria for the comparative analysis of the Santa Barbara Path in the Sulcis Iglesiente area with the three new paths being defined in other historical regions of Sardinia, in order to highlight the determining factors for the project's success. A first analysis allowed to compare the four paths obtaining the following summary scheme (Fig. 3):

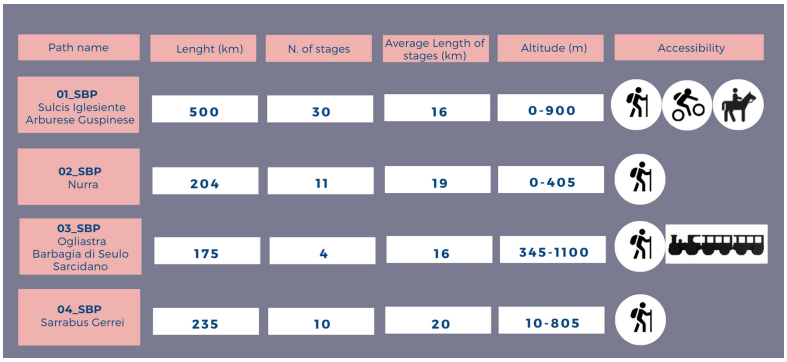

Fig. 3. Synthesis scheme of mining paths 01–04 Santa Barbara Path (SBP), Sardinia.

Furthermore, since the four paths analyzed fall within the Geomineral Park (Fig. 4), it was considered appropriate to evaluate for each one the incidence in terms of territorial area concerned and number of municipalities crossed within the same Park, the population and number of municipalities involved, as well as the percentage incidence of original and/or rural routes.

In this sense, the numerous strategies, which later became actions on the territory (tangible - museums, environmental laboratories - and intangible - training and

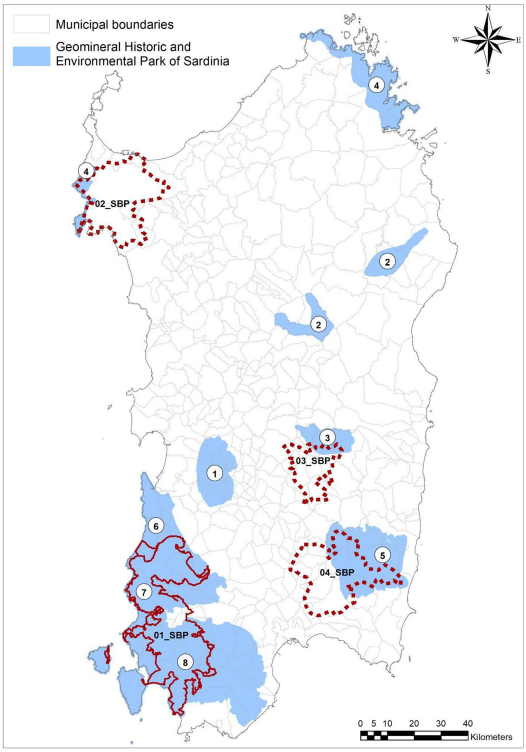

Fig. 4. Framework of the paths within the Geomineral Park.

awareness-raising) for the enhancement of the disused mining heritage promoted in the eight sub-areas of the Geomineral Park of Sardinia [14], constitute the preconditions of the Paths in terms of community-environment inclusion (prevention, promotion, participation, partnerships). In fact, the redevelopment of mining sites is an operation that is not only aimed at the recovery of landscape contexts, but at a real reconversion in terms of prevention of discomfort and marginality resulting from the closure of mines with related environmental problems, by promoting territorial-environmental emergencies and collective creativity, through the active participation of communities and partnerships with public and private institutions. A real transformation bottom-up.

The authors then proceeded to extrapolate the input data, and then elaborate the ICE index referring to the 'best practice' (01_SBP). It should be noted that $w_i = 1/n$, where n = number of incidence factors (*i*), in accordance with the Statute of the Foundation of the Path of Santa Barbara and with the first outcomes of the Strategic Plan of the homonymous route. In the summary scheme (Fig. 5) the inputs and outputs are reported. The first results that emerged are discussed in Sect. 5.

Path name	N. Municipalities sub area of the Geo-mining park	N. Municipalities crossed by the path	Municipalities areas crossed (sq km)	N inhabitants of the municipalities crossed	% of original or natural paths	Network elements	ICE idex
01_SBP Sulcis Iglesiente Arburese Guspinese	39	26	2 416	153 076	75%	Abandoned mining area Mining villages Country churches Archeological sites Geological sites Mine landscapes	1
02_SBP Nurra	5	6	1 020	197 387	60%		0.55
03_SBP Ogliastra Barbagia di Seulo Sarcidano	4	5	420	6 623	35%		0.22
04_SBP Sarrabus Gerrei	11	9	874	29 184	75%		0.41
Total	59	46	4730	386 270			

Fig. 5. Framework - input data and output data

5 Results and Conclusion

The three proposals of Ways 02, 03 and 04 SBP constitute a first territorial application of replication with adaptation of the 'best practice' 01 SBP. In this sense, the evaluation of the ICE index (Fig. 5) allows us to highlight how the three proposals still differ considerably from the reference case, in particular 03_SBP.

In fact, the few municipalities and the small size of the communities involved determine an ICE index about half lower than that of the reference case (01_SBP).

In light of this assessment, in the design phase of the three paths (02–04 SBP) it will be necessary to build solid networks of active participation of communities and institutions also outside the system, in order to achieve similar conditions with respect to the reference case. In addition, even the incidence of the originality of the route - very low in 03 SBP - can be recovered through a slow multimodal mobility system.

In other words, the exportability of the best practice, at the moment, does not occur in absolute terms for the following reasons: the proposed routes insist in marginal portions compared to the sub-areas of the Geomineral Park, and therefore do not benefit from the related direct and the limited number of municipalities involved does not facilitate network actions. In fact, at the basis of the success of the paths, in addition to material actions, the ability to network between institutions and communities plays a strategic role, able to favor the transition from anticommons (mining activities) to commons (museum, cultural tourism activities), through semicommons (temporary cultural and tourist use) [24].

The next phases of the research will be aimed at defining further elements of incidence (i) to support the evaluation of the ICE (Inclusion of Community and Environment) index, organized by macro-categories (prevention, promotion, participation, partnerships) for which the weights will be determined in accordance with the three-year update of the Strategic Plan of the Foundation Mining Path of Santa Barbara.

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