

Article

Dismissed Mines: From the Past to the Future

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Abstract: Today, dismissed mines are considered significant local tangible and intangible cultural heritage elements and they are more and more often at the core of dedicated enhancement processes, being sometimes inscribed in the UNESCO list; included in geoparks; transformed worldwide into industrial museums; or reused. Italy has a peculiar approach to the topic even if it has been underestimated, and research in the field might be improved. Which models should be looked at? Is it possible to identify some basic criteria to look at to obtain positive results? If yes, where should one start? Our proposal is that the application to the newly born class underground built heritage (UBH) can provide instruments for their historical functional classification and introducing several criteria for their interpretation and reuse could eventually support future enhancement projects in this specific sector. This methodology has been already applied worldwide to this category of good, giving positive results and motivating the authors to continue the research following this hypothesis, with the aim of creating a framework of good practices to be used as a reference for new projects. This paper summarizes the authors' research in this direction. After the introduction of the academic scenario and the UBH theoretical approach, this study proposes the results from applying this new methodology to several worldwide case studies from Greece, Germany, Italy, Japan, and Poland in order to evaluate best practices and/or unsuccessful stories. This study, based on data collected during onsite inspections by the authors within several international financed projects, consists of two steps. In the first, a general overview of all the aspects connected to the historical and contemporary reuses of dismissed mines under analysis was carried out, proposing a reclassification on the basis of the UBH methodology. The second section is dedicated to a new case study: Valle Imperina dismissed mines complex. This section includes an analysis of tangible and intangible values connected to the site and that of the state of the art of the corresponding enhancement. At the end, an evaluation of its potentialities and some critical issues was conducted.

Keywords: dismissed mines; underground built heritage; tangible values; intangible values; reuses; enhancement



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1. Introduction

Dismissed mines are, today, commonly considered significant elements of local cultural heritage. All over the world, there are many examples of former mines which have been reclaimed, redeveloped, and reused. With so many tangible and intangible values connected, it is not surprising that several former mines are currently inscribed in the UNESCO World Heritage Site list [1] or the tentative one. That is the case of the serial site “Mining Historical Heritage” of Spain, which has been waiting for an evaluation since 2017 [2]. More ex-mining sites have been listed in the UNESCO Global Geoparks network (UGGPs). That is the case of the Comarca Minera, Hidalgo UGGP (2017), in the Hidalgo region (Mexico) and the Tuscan mining UGGP (2010) in the Tuscany region (Italy) [3,4], while others are included in the areas of UGGPs, thus benefiting from the strategy of

protection, communication, and enhancement of UNESCO properties. Rocca di Cerere UGGP (2008) in the Sicily region (Italy) [5] falls into this last case, which also includes numerous dismissed mines and the Floristella-Grottacalda Mining Park, one of the most significant industrial archaeology sites in southern Italy. That is also the case of the Japanese Toi Gold Mine in Izu Peninsula UGGP; both cited cases are analysed in the following text.

The elaboration of data from the UNESCO list confirms this mine-oriented approach to enhancing local cultural heritage. In particular, at a global level, the word “mine” has been found in the description of 613 properties covering over 53% of the total [1].

Nonetheless, all over the world, numerous dismissed mines are laying in abandonment. Rarely, they have been subjected to reclamation, safety, regeneration, reuse, and/or enhancement projects still waiting for funding and/or political and institutional synergies to translate the projects into practice.

The most famous cases were turned into museums or equipped for educational and/or tourist purposes, and in this regard, there is extensive literature [6–10]. These kinds of museums are generally born with the vocation of enhancing the productive history, the technological advances and the genius of a community, and the related social problems, thus communicating and enhancing both tangible and intangible values associated with the archaeoindustrial remains.

They constitute a very varied museum sector, which escapes univocal definitions. Eco-museums, mining sites with labourer villages, mining sites and museums, museums on mining history and technology, etc., are only a few typologies one may find worldwide aiming to enhance the former mines in their geographical setting.

On the European scale, musealization is one of the most frequent methods of reuse [11–19], which has obtained important recognition in some cases. From this point of view, a reference on the topic is the Luigi Micheletti Award [20], a European recognition of excellence in the museum field, established in 1996 and specifically addressed to industrial and technical museums, assigned by the Micheletti Foundation (Italy) together with the European Museum Academy.

This trend has been confirmed by the recent launch of the European Route of Industrial Heritage (ERIH) (2019) [21], which is one of the Cultural Routes of the Council of Europe, counting over 2200 sites of all branches of industry from 51 countries that are partly or entirely considered part of Europe. One of the theme routes is dedicated to mines [22], counting over 321 between anchor points, associated member sites, and sites registered in the ERIH database. In this amount, Italy counts only two anchor points, i.e., the Italian Centre for Coal Mining Culture and the great Serbariu mine at Carbonia—analysed in the following text—and the Mines of Montevecchio at Guspini, both in the Geological Mining Park of Sardinia. On the route, two sites are associated, such as the Abbadia San Salvatore Mining Museum at Abbadia San Salvatore and the Geological Mining Park of Sardinia. Finally, 23 sites were registered in ERIH DB.

That is a small number of sites compared to countries such as Germany and the United Kingdom. Furthermore, it is significant that among the 58 Italian sites on the UNESCO list, none is a former mine [1] except for the aforementioned cases included in the UGGPs list.

These numbers are partially due to cultural and ideological reasons linked to the history of industrialization in Italy and the need to preserve the memory of the 20th century and the workers’ world in the “new globalised economy era”. There is a general delay in opening up to this topic compared to the rest of Europe [23,24]. Even with national peculiarities, this museum typology has been developed as more community-oriented, based on the efforts of volunteers and associations who have restored, maintained and revitalized industrial heritage, particularly the mining one [25,26].

Generally, these projects aim to deliver the reuse of industrial heritage and the reskilling of human capital. The strengthening of the communities’ sense of identity is based on achieving this double goal. This is a model in progress, constantly looking for ideas or models to refer to and to express all the potentials of the archaeoindustrial site, in terms of interpretation, communication, management and enhancement. That is

precisely what happens in the Italian cases of Floristella-Grottacalda and Lercara Friddi and Valle Imperina which are the subject of study by the authors, within the context of various projects. These cases, presented below, exemplify a very frequent problem, that is the incapability in keeping up with the evolution of society, the expectations of the public, and the communities it represents despite the high tourist potential. Thus, it would need to identify alternative interpretative schemes of the values of local communities and the territory, aiming at cultivating the feeling for the industrial past and evaluating strategies capable of governing an entire territorial system.

Therefore, the Italian context is very peculiar, because if on the one hand, the musealization of dismissed mines it reflects the conception of the industry's history experienced by the country, on the other hand, there has been a lack of research and adequate investments in the topic. That has probably been due to an underestimation of its sociocultural and economic potential compared to other kinds of cultural heritage.

Finally, especially in the Italian context, the high number of museums and cultural sites that are most promoted has distracted the attention of the public, investors, and institutions from this specific type of asset.

As recently demonstrated by the international [27] and national [28] debate on the role of museums in post-COVID renewal, all the conditions are in place to face the specific issue of industrial museums. From this perspective, significantly, there were a growing number of projects and proposals submitted in Italy in pre-COVID times, demonstrating that the problem is felt.

Furthermore, at this stage, Italy shows a different sensitivity to the key issues inherent in this sector, potentially affected by the corresponding funding policy inaugurated thanks to the National Recovery and Resilience Plan (PNRR) [29]. For the transition to a post-COVID future, for the renewal of the country's image and economic recovery, Mission 1—Component 3 indicates the need to focus on the enhancement of culture and identity. The PNRR specifies the need for a change in strategic vision in systemic logic and integration at various levels, acting on some vital elements of our economic system, including the enhancement of cultural heritage and the promotion of tourism. The interventions envisaged by the plan are dedicated to the most famous heritage sites and the enhancement of the minor and lesser-known ones, strengthening places' identity and local communities. These concepts are transversal to the topic of industrial museums and still need to be addressed in planning the role of museums for the future.

Thus, an improvement in the research in the sector is fundamental in order to identify more effective models and strategies to be applied in the specific Italian context to reinvent the role of museums for the future and make them more resilient to crisis factors.

Which models should be looked at? Is it possible to identify some basic criteria to look at to obtain positive results? If yes, where to start?

Our thesis is that the first step of the work must be the reclassification of this type of asset, aiming at a better understanding of its potential, in cultural, social and economic terms. Starting from this understanding, options for enhancement could subsequently be evaluated, for example in the museum sense, or of restitution to society for various forms of reuse.

In this context, our proposal is that these processes might be supported by the adoption of the theoretical approach to cultural heritage elements, that can be included in the newly born underground built heritage (UBH) class [30]. This is an original class identified by the authors which includes a series of historical artifacts buried underground, such as artificial caves, mines, dismissed infrastructure, or human settlements.

In this perspective, the review of international case studies, selected in the context of CNR ongoing projects by the authors and on which the same reclassification activity has been started, aims to define if this analysis can support the identification of the minimum and indispensable criteria in defining valorisation, and if it is so, what that leveraged for reuse or valorisation must be to be successful.

We have to say that some of these case studies have previously been considered in the context of international CNR projects by authors and past research to formulate comparative

considerations about various national systems, aiming at defining the value of the more general underground element in the characterization of the local cultural heritage [31–33]. Furthermore, few of these cases were studied within the context of the research on the concept of the diffused geopark, considering them—such as other underground typologies of goods—as valuable resources in which to invest, seeking the improvement of the interpretation, communication, enhancement and the economic development based on geotourism [34].

This paper, instead, focuses on their enhancement and reuse in the sense of musealization being its goal and the codification of general criteria to obtain a general a framework of good reuse and enhancement practices.

The subsequent analysis of Valle Imperina shows still-ongoing activity by the authors, starting from the analysis of the site’s criticalities, and aimed at reclassifying and interpreting its tangible and intangible values on the basis of the UBH approach.

The case was evaluated by applying the abovementioned set of criteria, and trying to evaluate possible solutions to improve the communication, the enhancement, and the reuse of the site.

2. Materials and Methods

The methodology adopted in this research is the recently published theoretical approach elaborated for the class of UBH.

UBH is the class that includes manmade elements historically buried underground to manage eight different functions to solve selected environmental conflicts or social interactions: Transport, Living Space, Sanitary, Water, Food, Defence, Burial and Rituals (which recently substituted the class Religion) and Economy [30] (Figure 1). The methodology allows both the analysis of the primary function and the possible historical reuses as well. For example, when studying an extraction cave, the function connected to its excavation is Economy since this activity is classified by an economist in the first sector. However, if the cavity, after dismissal, is then adopted to store food and then to recover refugees, passages from one function to the other can be visualized in the chart as well by adopting arrows which remark the functional flux.

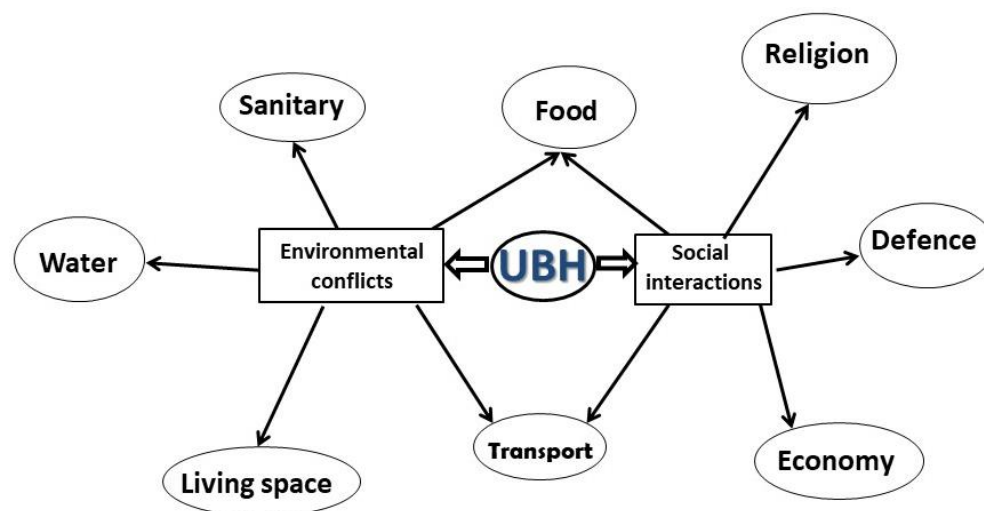


Figure 1. UBH chart (by R.V.).

Today, those artefacts, with reference to their intangible and tangible values, both connected to their primary and secondary functions, are very often considered significant elements of local cultural heritage and, eventually, at the core, a wide range of contemporary reuses and enhancement actions.

The UBH theoretical approach provides four different levels of reuses for elements included in the correspondent class:

- **Reinventing:** this level refers to dismissed mines whose significant tangible and intangible values motivate their transformation into industrial museums.
- **Reintroducing:** This level refers to those dismissed mines that can be reopened; these cases will imply new technologies and management. References to historical uses of technologies should always be made by displaying iconographic material or through the exhibition of period tools or machinery to keep the intangible value of the mines alive.
- **Reinterpreting:** This level refers to dismissed mines that have been adopted for other uses after their dismissal. In this case, new uses and the original function should offer a diachronic approach to visitors.
- **Rebuilding:** this level refers to galleries that simulate the historical mines by introducing old types of machinery or their replica figurines and tools to support the divulgation of local economic and industrial history.

The theoretical approach we briefly introduced was adopted to analyse several world-wide case studies selected to provide the widest variety of dismissed mines concerning the following topics: the historical period of use, the natural resources involved, historical reuses, and the enhancement actions carried out.

All case studies included in this study have been inspected within the activities of several financed national and international projects between 2015 and 2022, within which the UBH approach was refined. This is the case of the CNR interdepartmental project concerning the analysis of underground settlements in Southern Italy (2015—ongoing) that concerns the analysis of historical underground artefacts in Southern Italy, aiming to define good practices for their recovery, reuse, and enhancement [31].

The second one is the Cost Action 18110 (2019–2023) which uses underground built heritage as a catalyser for community valorisation, led by CNR and involving over thirty countries partly or entirely considered part of Europe [35]. The project has aimed to promote balanced and sustainable approaches to the conservation, reuse, and enhancement of underground space in urban and rural areas for regeneration policies. It has pursued the dissemination of knowledge on underground culture and assistance for local communities' decision making with adequate cultural, scientific, and technical knowledge of the underground built environment from many different aspects (i.e., archaeology, geotechnics, history, urban planning, cultural anthropology, economics, architecture, and cultural tourism). In this context, many former mines were considered, such as those in Poland, Greece, Germany, Spain, Romania, and Italy.

The third project, whose outputs have been adopted as sources for this paper, is the bilateral project for the damage assessment and conservation of underground space as valuable resources for human activities and uses in Italy and Japan, between CNR and the Japanese Society for Promotion of Sciences (JSPS) (2018–2019/2020–2021) [36]. The project consisted of joint study and experimentation activities with the UBH approach to reuse and enhance various categories of cultural heritage that can be included in the UBH class, such as the former mines in partner countries. In this project, dismissed mines from Italy and Japan have been studied.

Thus, elements for the evaluation of the selected international cases have been collected during meetings with local bodies, institutions, and stakeholders, such as during in-field research. Many typologies of sources have been adopted, such as bibliographic, iconographic, photographic, and geological; interviews to representatives of local bodies, associations, and parks have been carried out as well.

Each case was briefly introduced, highlighting the main characteristics of historical/contemporary reuse and/or musealization. Subsequently, the information was organized in a summary table (Table 1) to assist the reader and a summary chart has been elaborated as well (Figure 21).

Table 1. Worldwide case study (by R.V.).

Onsite Visit	Country	Name	Mineral	Opened	Closed	Re-Inv	Re-Int	Re-Bui	Enhancement	Network	Historical Period	Social Issues	Miner Village	Facilities	Multi medial	Miniatures and Simulation	Former workers Inv.	Documentation	Criticism
2019	Japan	Ikeshima	Coal	1959	2001	✓			National cultural heritage		Meiji Revolution	Family life and social life	Yes	Divulcation and education centre		✓	Yes	Education centre and documentation centre	The village is not opened to the public
2019	Japan	Gunkanjima	Coal	1887	1974	✓			UNESCO List 2014 (serial)	Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding and Coal Mining	Meiji Revolution	Immigrants and slavery; overpopulation of the village	Yes	Museum, exposition	✓		Yes	Maps and data	Galleries are not opened to the public
2019	Japan	Toi Gold mine	Gold	16th century	1965	✓			UGGP Izu Peninsula		Edo period and economic history	Workers' health issues	No	Divulcation centre and exposition		✓		Gold market	Very tourist-oriented
2019	Greece	Mylos	Marble				✓		Limits to sale		Since the Neolithic period		No	Mining museum					Some are abandoned
2019	Poland	Wieliczka	Salt	13th century	1965	✓	✓		UNESCO List 1978		Polish economy and the Second World War	Jewish village	No	Divulcation centre	✓				No inclusion of the story about the Jewish prisoners
2020	Italy	Serbariu	Coal	1937	1964	✓			Cultural site, Sardinia Geopark	Cammino di Santa Barbara	Fascism	Social upgrading, national money, and national industry	Yes	Museum and exposition		✓	Yes	Library, documentation centre, movie lab, and historical archive	No diachronic exposition; acrylic walls
2021	Italy	Floristella	Sulphur	18th century	1986	✓			UGGP Rocca di Cerere	Ente Parco Minerario Floristella-Grottaalda	Sicilian economic history	Local family enterprise	No	Planned					The galleries are not opened to the public
2021	Italy	Comitini	Sulphur	1808	1970						Sicilian economic history	Child labour	No					Private documentation archive	No enhancement
2021	Italy	Lercara Friddi	Sulphur	19th century	1969					Madonie UGGP	Sicilian economic history	Miners' revendications							No enhancement
2021	Greece	Sarantara of Moutsouna	Emery	Hellenic period	1990	✓			National heritage		National industrial history and the Second World War		No	Billboards and open air museum					Very poor enhancement
2022	Japan	Iwami Ginzan	Silver	16th century	20th century	✓			UNESCO List 2007		Meiji Revolution			Museum and education centre		✓		Documentation centre	

Table 1. Cont.

Onsite Visit	Country	Name	Mineral	Opened	Closed	Re-Inv	Re-Int	Re-Bui	Enhancement	Network	Historical Period	Social Issues	Miner Village	Facilities	Multi medial	Miniatures and Simulation	Former workers Inv.	Documentation	Criticism
2022	Japan	Osarizawa	Gold, copper, iron, and quartz	748	1978	✓	✓		Cultural site and mine land	Japanese Heritage of Industrial Modernization	Japan economic history	Women's involvement and religious persecution	No	Museum, divulgation centre, and education centre		✓		Documentation centre	No diachronic exposition
2022	Japan	Kosaka vilage	Gold, silver, copper, lead, and zinc	1816	1990	✓			Cultural site		Japan economic history	Western influence and Japanese resilience	Yes	Historic museum and mine office	✓			Documentation centre	
2022	Italy	Majella	Bitumen	1844	1950	✓			National Park la Majella	Majellando	Local economic history	Emigration, the depopulation of mountain areas, and the involvement of SWW prisoners		Trekking path				Historical archive	
2017	Germany	Deutsches Museum	Exposition					✓	Museum		Local economic history					✓			

From this perspective, an analytical chapter has been prepared which, starting from the comparison of the cases, derives a general framework of good practices in terms of reuse and enhancement.

After this general worldwide overview, the fourth paragraph focuses on the Valle Imperina case study in Italy. This is the subject of still-ongoing research by the authors, which started in 2006 and is highly representative of the Italian context. Starting from the analysis of the site's criticalities, possible future implementations of reuses of the analysed elements are pointed out, based on the reclassification of the Valle Imperina context through the UBH approach and thanks to the aforementioned framework.

3. Dismissed Mines from the World: The Overview

Case studies have been selected in the following countries: Greece, Germany, Italy, Japan, and Poland; they cover a wide variety of dismissed mines regarding all the aspects under evaluation. The selection was not casual; we tried to include a selection of dismissed mines connected to the extraction of a large variety of natural resources: gold, silver, copper, emery, marble, iron, quartz, bitumen, salt, sulphur, and coal. We also decided to select those that better represented the economic history of the corresponding country, the widest variety of historical reuses, and those whose intangible values are, or can be eventually included, in the enhancement processes. Our idea was to collect best practices and unsuccessful stories to address the enhancement of our current case study: Valle Imperina.

3.1. Greece

It is a fact that Greece is not usually considered a role model concerning industrial archaeology. Surprisingly, on the Cyclades Islands, unique examples of dismissed mines can be found both about the role played by those artefacts in the history of the country and to their historical and contemporary reuses.

3.1.1. Milos and Its Coastal Marble Caves

Known worldwide as where the homonymous marble masterpiece Venus was carved, the Milos marble caves are the negative spaces of several Hellenic statues. Since their excavation, they have formed part of the local coastal landscape. They were inspected in 2019, and they can be classified into two main groups: abandoned caves, such as those that can be found in the area of Sarakiniko, the most famous and most photographed beach on the island, and the so-called *syrmata* (Figure 2). While the first ones are today part of the local scenario, *syrmata* represent a typical example of reuse at the level of reinterpreting since, once abandoned, those spaces have been transformed into spaces where fishermen store their boats in the winter. Eventually, the caves' entrances were closed, and the colourful wooden doors characterised the coastal villages. Today, those spaces, equipped for summertime living spaces, are used as a touristic resource; most of them are owned by the municipality to protect them from speculative actions, but even if locals owned them, they could not be sold. The history of the local mine industry is at the core of the Mining Museum of Milos.



Figure 2. Coastal marble caves in Sarakiniko (a,b) and *syrmata* (c) in Milos (by R.V.).

3.1.2. Naxos

The emery mine of Santara has a very singular history; it was inspected in 2021. The mineral, the hardest after diamonds, has been used since antiquity. The island of Naxos retained its extraction monopoly until the 19th century, with the discovery of emery deposits in Turkey and the USA [37]. This mineral became crucial for the economy of all countries during the Second World War since it was adopted as abrasive dust in manufacturing weapons. With such a significant role within the Greek economy, the coastal village of Moutsouna was

shaped around the facilities of the mine: the equipped port, the air railway, the barracks for workers, and administrative offices. Since its dismissal in the 1990s, the mine has been included in the National Cultural Properties list. However, the village offers visitors an immersive experience and a unique example of a reinventing approach for dismissed mines, even if the museum is not finished yet and the galleries are not opened to the public (Figure 3).



Figure 3. The Santara emery mine: an immersive experience in the mine-shaped coastal village of Moutsouna on the Cycladic Island of Naxos (by R.V.).

3.2. Germany

To celebrate the significance of the role played by the mining industry on German economic history, its influence on migrations, its welfare system, the local environment, its urban history, and several related social issues as well, the subsoil of the Deutsches Museum in Munich has been transformed into a rebuilt mine. Figurines of workers, original equipment, and their replica have been organised to allow an immersive experience in the fascinating mine world. The site was inspected in 2017, and its results are a unique example of a dislocated museum in the sector of dismissed mines (Figure 4).



Figure 4. Deutsches Museum in Munich: a tribute to historical mines (by R.V.).

3.3. Italy

Italy is not generally known as a mining country; several unconnected examples of historical mines can be listed concerning selected minerals. Their history is so significant that they have often been adopted as a cultural source after their dismissal.

3.3.1. Serbariu Coal Mine in Carbonia

Italy's underground is not rich in carbon; this lack influenced the starting phases of its industrial revolution, causing recurrent energetic crises and the chronic dependence of the country on foreign countries from outside as regards energy sources.

However, during the last phases of fascism, which included an autarchic approach, the regime tried to invest in the energetic sector; the Serbariu mine, opened in 1937, is the most important case study concerning this historical phase. The mine was opened in Southern Sardinia in an area known as Sulcis Iglesiente, whose mine activity in the iron sector dates back to the Phoenician era. The singular aspect is that, since the area was not urbanized at that time, a city, Carbonia, was founded precisely to support the mining activity; this is why Carbonia is known as a foundation city [38]. This aspect not only influenced its development and the urban space organization, but it also became crucial after the dismissal of the mine in 1964.

In fact, after various unsuccessful experiences in reconverting the local economy, the enhancement of the dismissed mine as a cultural site is perceived mainly as one of the last opportunities to keep the city alive and interrupt its dramatic decline; it is a surviving challenge. Reinventing action with reference to the Serbariu mine consists of a dedicated museum and its inclusion, both within the Sardinia Geopark [39] and the cultural itinerary Cammino di Santa Barbara [40] (Figure 5). However, the impact of all these activities on the local economy has not inverted the city's demographic decline yet.



Figure 5. Reinventing Serbariu mine in Carbonia: the open-air museum (a), the underground route and the involvement of former workers in the enhancement process (b), the exposition (c) (by R.V.).

To support these efforts, the mine has been selected as a case study within the activities of the bilateral project between Italy and Japan [36].

The site was inspected in 2021, and some critical issues have already been pointed out:

- The insufficient presence in the city centre of connecting elements between the mine and historical and social life, such as figurines that simulate the use of different spaces and a museum dedicated to the local intangible issues;
- The reinventing process was realized by making the walls safe by insulating them with acrylic materials, which compromised the set-up's realistic nature;
- The exposition of machinery is not organized in a diachronic way.

To implement the strategic approach dedicated to the enhancement process and in order to include this experience in an international network, in 2021, we signed a memorandum of understanding among the Institute of Studies on the Mediterranean (ISMed) from the National Research Council of Italy (CNR), the Sardinian Superintendence for Historical Achieves and the Municipality of Carbonia (prot. ISMed 606/2021, 26 July 2021).

3.3.2. Sulphur Mines in Sicily: Floristella, Comitini, and Lercara Friddi

In Sicily, dismissed mines are today perceived as a significant piece of cultural heritage to be exploited [41] and a potential focus for the diversification of local tourism, which is today focused on the natural beauty of its coastal and insular areas, on its geosites, and its archaeological and urban historical heritage. Dismissed mines possess a different potential, connected to the economic history of the area and, overall, to several social issues. The history of sulphur mines is prevalent on the island, and their history has a significant narrative role regarding the social and economic power of the local elite in contrast with the poor conditions of workers, mainly children—the so-called *carusi*. They are strictly connected to the rise and decline in internal areas, and they can offer a different perspective to visitors, following the footprints of Luigi Pirandello's masterpieces.

Based on the abovementioned consideration, we selected case studies concerning different levels of reinventing: Floristella because it is included in the Rocca di Cerere UGGP [42], Comitini because of its variety of properties and the presence of a dedicated private archive, and Lercara Friddi because of its state of abandonment. Our onsite inspections took place in 2021 (Figure 6).



Figure 6. The future access door to Floristella mine (a), grill ovens in Comitini (b), remains of aboveground structures in Lercara Friddi (c) (by R.V.).

Floristella mine has much potential, and the park management has selected the owner's house as an access door to the site. The open-air museum is already open to visitors and includes grill ovens, trolleys and some aboveground machinery, the park has provided billboards, but the galleries are closed to the public. To support the activities of the park, a memorandum of understanding between the Institute of Studies on the Mediterranean (ISMed) from the National Research Council of Italy (CNR) and the Società Rocca di Cerere Geopark (prot. ISMed 79/2022, 30 January 2022).

The area of Comitini includes 111 private mines [43] and has a great potential connection to data collected in the local archive and to the remains of aboveground structures; the entrances to the galleries are visible from the outside, but they are not accessible to visitors. To support the local municipality in submitting proposals to obtain funds to address the enhancement of the area, we signed a memorandum of understanding between the Institute of Studies on the Mediterranean (ISMed) from the National Research Council of Italy (CNR) and the Municipality of Comitini (prot. ISMed 383/22, 12 April 2022).

The Lercara Friddi sulphur mines are entirely unexploited. The current administration is planning activities in this direction. In order to support them, we signed a memorandum of understanding between the Institute of Studies on the Mediterranean (ISMed) from the National Research Council of Italy (CNR) and the Municipality of Lercara Friddi (prot. ISMed 927/2021, 11 November 2021).

3.3.3. Maiella Bitumen Mine

Opened in 1844 and closed in 1950, the bitumen mines are located on Majella Mountain, and they have only recently been perceived as having potential and been opened to the public; the corresponding level of reinventing is still at an experimental level. The dismissed mine is included within the borders of the Majella UGGP [44] and it can benefit from the billboards by the park. In addition, the city of Lettomanoppello is an open-air museum with several engravings representing several social issues connected to the activity of the mine. The site was inspected in 2022, the path was recently opened, and the galleries are accessible to the public. A local organization, Majellando [45], is testing this new activity and trying to adopt elements from the local archive to integrate the storytelling dedicated to tourists (Figure 7).



Figure 7. The Lettomanoppello miners' route: billboards (a), narrative engravings (b), the entrance to the gallery (c) (by R.V.).

3.4. Japan

Japan has a special relationship with its mines: they are perceived as the physical signs of the Japanese industrial revolution [46]. However, they also represent the linkage with its rich natural resources, the access door to the local geological conformation, and the focus for migrations and urban development studies.

With so many tangible and intangible values connected, it is not surprising that several dismissed mines are currently inscribed in the UNESCO list [1] or listed as geosites in the nine Japanese UGGPs inscribed in the list [47]. The elaboration of data from the UNESCO list confirms the mine-oriented approach to enhancing local cultural heritage. In particular, as we already underlined in the introduction, while at a global level the word “mine” has been found in the description of 613 properties out of a total of 1154 (53% of the total), in the case of Japan, 18 properties inscribed out of a total of 25 have been described by adopting the word “mine” (72% of the total) [1].

This relevance is reflected by the wide range of reinventing and reinterpreting approaches to dismissed mines in the country. It motivated the selection of Japanese case studies within the aforementioned two subsequent bilateral projects between the National Research Council of Italy (CNR) and the Japan Society for the Promotion of Science (JSPS) and focused on various elements classified as UBH, dismissed mines included [32,36].

A wide range of dismissed mines have been studied during onsite inspections in 2018, 2019, and 2022. In this research, we included two coal mines (Gunkanjima and Ikeshima), a gold mine (TOI), a silver mine (Iwami Ginzanthe), a mining city (Kosaka), and a copper mine (Osarizawa).

3.4.1. Gunkanjima Coal Mine

Gunkanjima is maybe the most popular dismissed mine in the world. It is located on an abandoned island in the Pacific Ocean. Its village skyline is the result of a unique approach to urban and economic development. It is the perfect celebration of the Japanese Meiji Revolution and the place that represents several local social issues as well. For all these reasons, Gunkanjima coal mine was inscribed in the UNESCO serial site “Japan’s Meiji Industrial Revolution: Iron and Steel, Shipbuilding and Coal Mining” in 2014 [48]. However, the integrity and significance of this site are not the only reasons why this dismissed mine can be considered a role model in this sector. The reinventing process includes: the involvement of former workers as guides, the multimedia museums, and the inclusive storytelling which transformed the dismissed industrial site into one of the most popular national attractions. However, as comes out from visitors’ feedback [49] and as was experienced during the inspection, the underground routes were inaccessible to the public, and the limited open space on the concrete platforms and difficulties in landing on the islands—sometimes, the visit is limited to a boat trip due to bad weather conditions—afflicts the immersive experience (Figure 8).



Figure 8. The iconic site of Gunkanjima included in the UNESCO serial site “Sites of Japan’s Meiji Industrial Revolution: Iron and Steel, Shipbuilding and Coal Mining”: landing on the island and the storytelling of the virtual museum (by R.V.).

3.4.2. TOI Gold Mine

The dismissed TOI gold mine is located in the Izu Peninsula and is one of the most visited geosites of the homonymous UNESCO Global Geopark (UGGP) [50]. It was inspected in 2019 and was one of the sites selected for our diffuse geoparks approach [34]. Although, as we have already highlighted in our previous work, the reinventing process which was carried out transformed it into a very commercial, family-oriented tourist attraction; the site represents a good gateway for knowledge of issues relating to the trade of precious materials. So, in the specific context of this research, the exhibition methods, the storytelling adopted, and the simulations of mining activities allow even the youngest to approach the themes of industrial archaeology (Figure 9).



Figure 9. TOI gold mine as a touristic attraction in the IZU Peninsula UGGP (by R.V.).

3.4.3. Ikeshima Coal Mine

Ikeshima coal mine is a Japanese cultural site, and it was inspected in 2019. Even if this dismissed mine is less famous and visited compared to the big attractor of Gunkanjima

coal mine, the reinventing process adopted several interesting and innovative actions and potentialities to be exploited in the future as well:

- The inclusion of former workers in the enhancement process;
- Active experiences;
- Introduction to the history of the coal extraction industry;
- Immersive visits;
- A miners' village.

Since the mining village is in the continuity of use and a few families of former workers still live there, those citizens are actively involved in the enhancement process; they welcome guests, teach at the education centre, and they lead the immersive visits. The divulgation centre is adopted to introduce visitors to the site, its history, and the sector of the national coal industries within the historical national context. Visitors can access galleries on board the original train adapted for touristic use during the immersive tour; they are equipped with helmets and lights. They can visit the interiors of the dismissed mine, where they can safely experience the use of adapted machinery and the most significant phases of the productive process (Figure 10).



Figure 10. Ikeshima coal mine: the immersive experience guided by former workers (by R.V.).

The village's presence is a missed opportunity since abandoned houses are closed to visitors. During the inspection, the team suggested that the management include those spaces as access doors to significant intangible elements connected to the dismissed mine: the community social life, the role of women, and family life.

3.4.4. Iwami Ginzan Silver Mine

Iwami Ginzan silver mine was inspected in 2022. Its reinventing process includes the inscription, together with its cultural landscape, in the UNESCO list in 2007; the property's borders were restricted in 2010 [51]. The mine is located within a typical Japanese natural landscape at the top of a typical village whose roofs are covered with local typical grey ceramic tiles. A beautiful river, scenic bridges, and walking paths complete the idyllic scenery that can be visited on rented electric bikes. The distance from the starting point is about two kilometres; billboards indicate grill ovens and several mine facilities. The gallery entrance is on the top of the hill, the underground route is open to the public, and the visit is focused on the geological stratification rather than on the historically adopted technology (Figure 11). The village facilities include typical restaurants serving local specialities and artisanal shops dedicated to tourists. However, it is still inhabited by local citizens, and it hosts a primary school and several services for residents. The equilibrium between urban functions and facilities for tourists, always characterized by cultural and territorial coherence with the site, results in an imposing application of UNESCO criteria: ii—regarding local economic history in the period 16th/17th centuries, iii—concerning the technologic development connected to the mining industry, and v—concerning the local landscape [52].

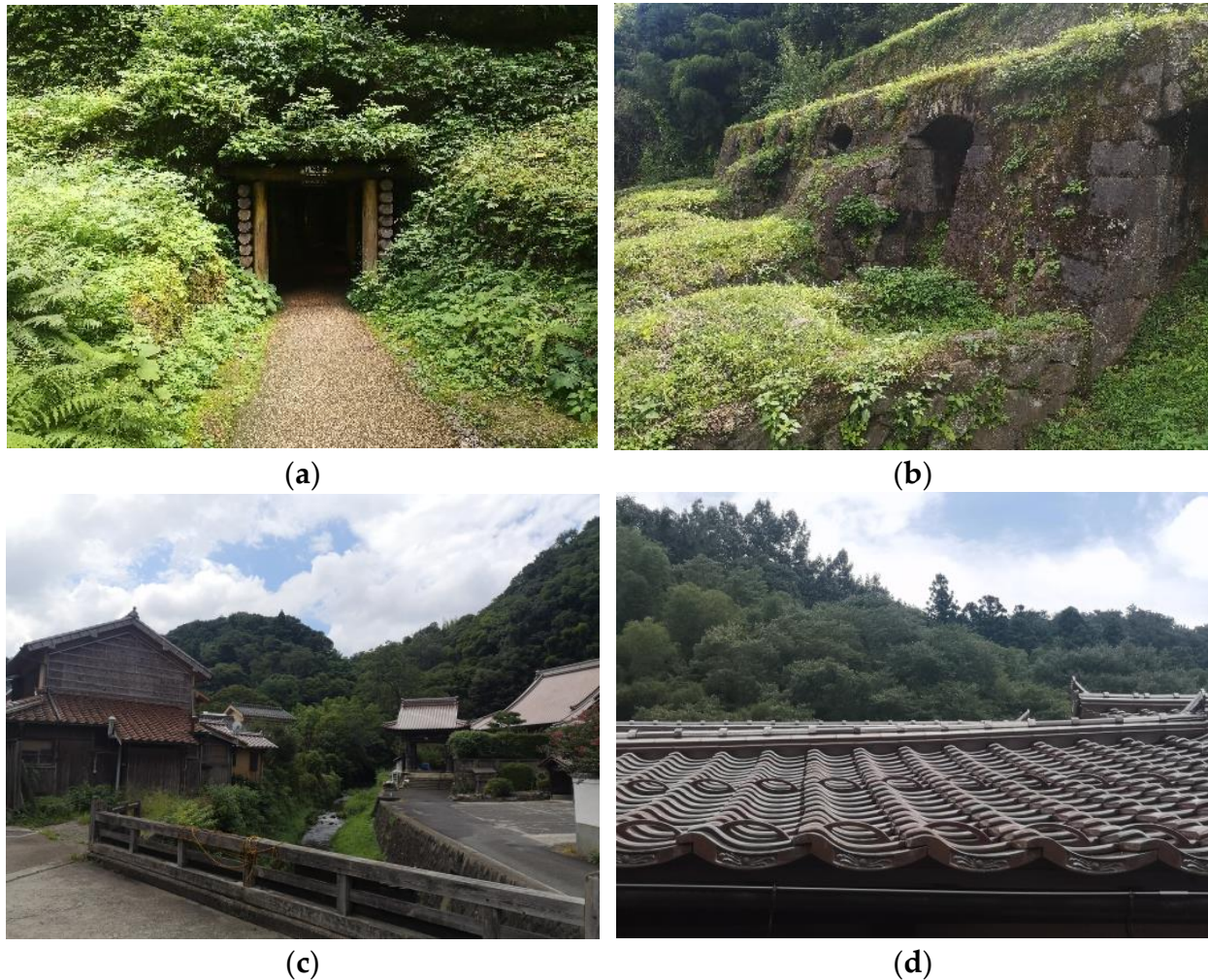


Figure 11. Iwami Ginzanthe silver mine: the entrance to the gallery (a), grill ovens (b), the village (c), and roof tales (d) (by R.V.).

3.4.5. Kosaka, the Mining Village

The case study of Kosaka, inspected in 2022, was selected because it is a stunning example of the Western influence exerted by the mine industry management, both on the local urban development and social life, and on the resilience of Japanese intangible values to this impact. That is why our case study is not about the mine itself but the mining village.

The peculiarity of this village is the role played by Curt Adolph Netto, a German metallurgist and educator [53], that the Japanese government recruited to manage the mine starting from 1873. Under its influence, productive methods were modernised, and urban development adopted a typical Western style.

That is a distinctive element of the city, and this singular aspect is largely adopted in the enhancement process of the village as a touristic destination.

The focus of its reinventing is the former mine office, built in 1950 as a Western-style building, which was transformed into a documentation centre and mine museum. The city centre is animated by bronze figurines representing Western people walking in the streets nearby the Western-style historical buildings and enjoying the promenade (Figure 12).

The resilience of traditional Japanese intangible values is represented by the Korakukan Theater, built in 1910 as a facility for local miners. The theatre, boasting a white and blue Western-style façade, has traditional Japanese interiors and has always hosted only typical Japanese performances; the top-up Westernization of the appearance did not affect the Japanese soul of the city and its inhabitants (Figure 13).



Figure 12. Kosaka: the main mine office (by R.V.).



Figure 13. Korakukan Theater in Kosaka: Western-style appearance and a Japanese hearth (by R.V.).

3.4.6. Osarizawa Mine

Osarizawa mine is only one of the mines that characterize the so-called Japanese mine land and is recognized as a Japanese Heritage of Industrial Modernization site [54] (Figure 14). It was inspected in 2022 and can be considered a role model, both in the storytelling adopted in the reinventing process and several levels of historical reinterpreting as well.



(a)



(b)

Figure 14. Osarizawa mine within the Japanese “mine land”: trolleys **(a)** and the entrance of the copper mine **(b)** (by R.V.).

The immersive visit to the dismissed galleries includes dismissed machinery and figurines that simulate the various phases of extraction and several related activities (Figure 15).



(a)



(b)



(c)



(d)

Figure 15. Storytelling in Osarizawa mine: workers' (a), employees (b), engineers (c), underground facilities for workers (d) (by R.V.).

The visit is structured in two alternative underground routes, the first of about 700 m and the second of about 2 kilometres. Concerning this option, problems were found in the diachronic organization of the storytelling. Only the longer route includes the representation of the oldest phases of the extraction with the installation of correspondent figurines and historical pictures, and the exposition of the mine museum only partially integrates the missed elements (Figure 16).



Figure 16. Osarizawa mine: a very long history (by R.V.).

The exposition includes elements connected to several social issues, such as the role played by women in the extraction process, and to several historical reinterpretations: the adoption of galleries as shelters for persecuted Christians, as well as vineries and as shrines (Figure 17).

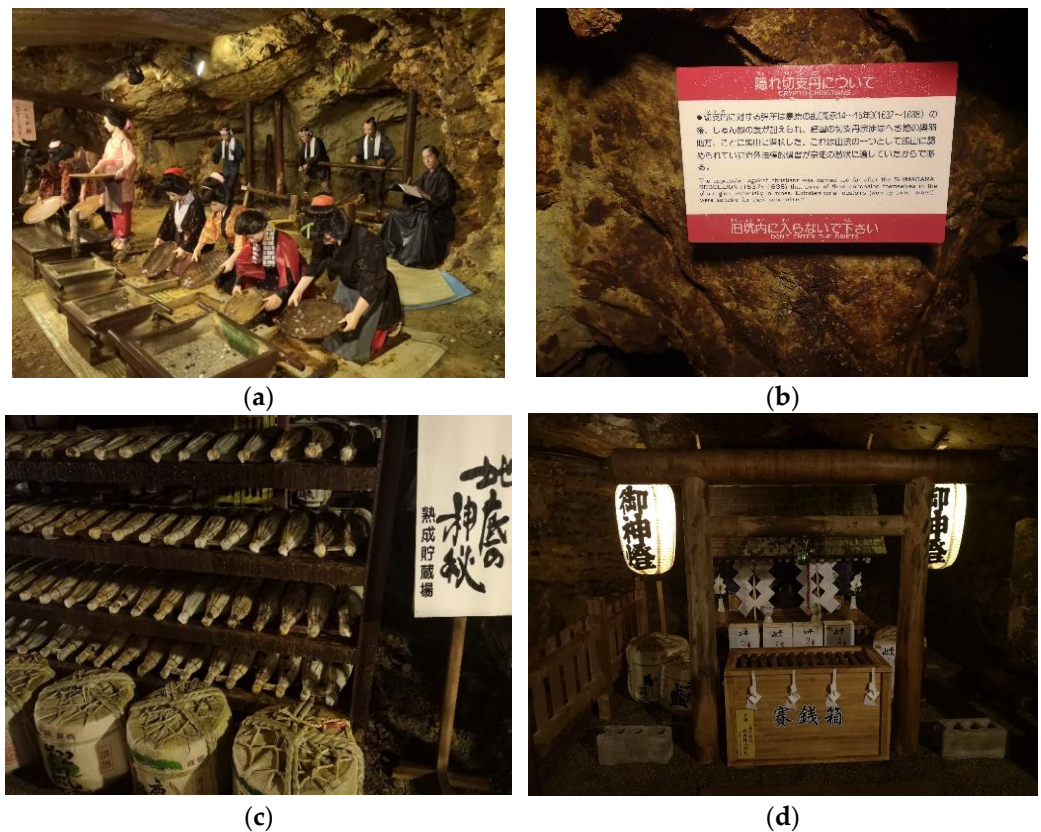


Figure 17. Tribute to women's work in Osarizawa mine (a); reinterpreting: shelter for persecuted Christians (b), the vinery (c), and the shrine (d) (by R.V.).

Today, the galleries are reinterpreted again as spaces for contemporary art (Figure 18).



Figure 18. Osarizawa mine: the contemporary art gallery (by R.V.).

3.5. Poland

Wieliczka mine is one of the sites which was inscribed in the UNESCO list in 1978 under the name “Wieliczka and Bochnia Royal Salt Mines” [55]. It was selected because, besides its significant role within the Polish economy for more than 700 years, it is characterized by significant historical and contemporary reuses. In the 17th century, when the extraction activity was still running, some of the exhausted galleries were reinterpreted as an astonishing underground Catholic church (Figure 19).



Figure 19. Wieliczka mine: from the salt mine (a) to the historical reinterpretation as a religious site (b,c) (by R.V.).

After the dismissal in 1965, the galleries were reinvented; today, the dismissed mine is one of the area's big attractors with a multimedia divulgation space, several facilities for tourists, and dedicated shops (Figure 20).

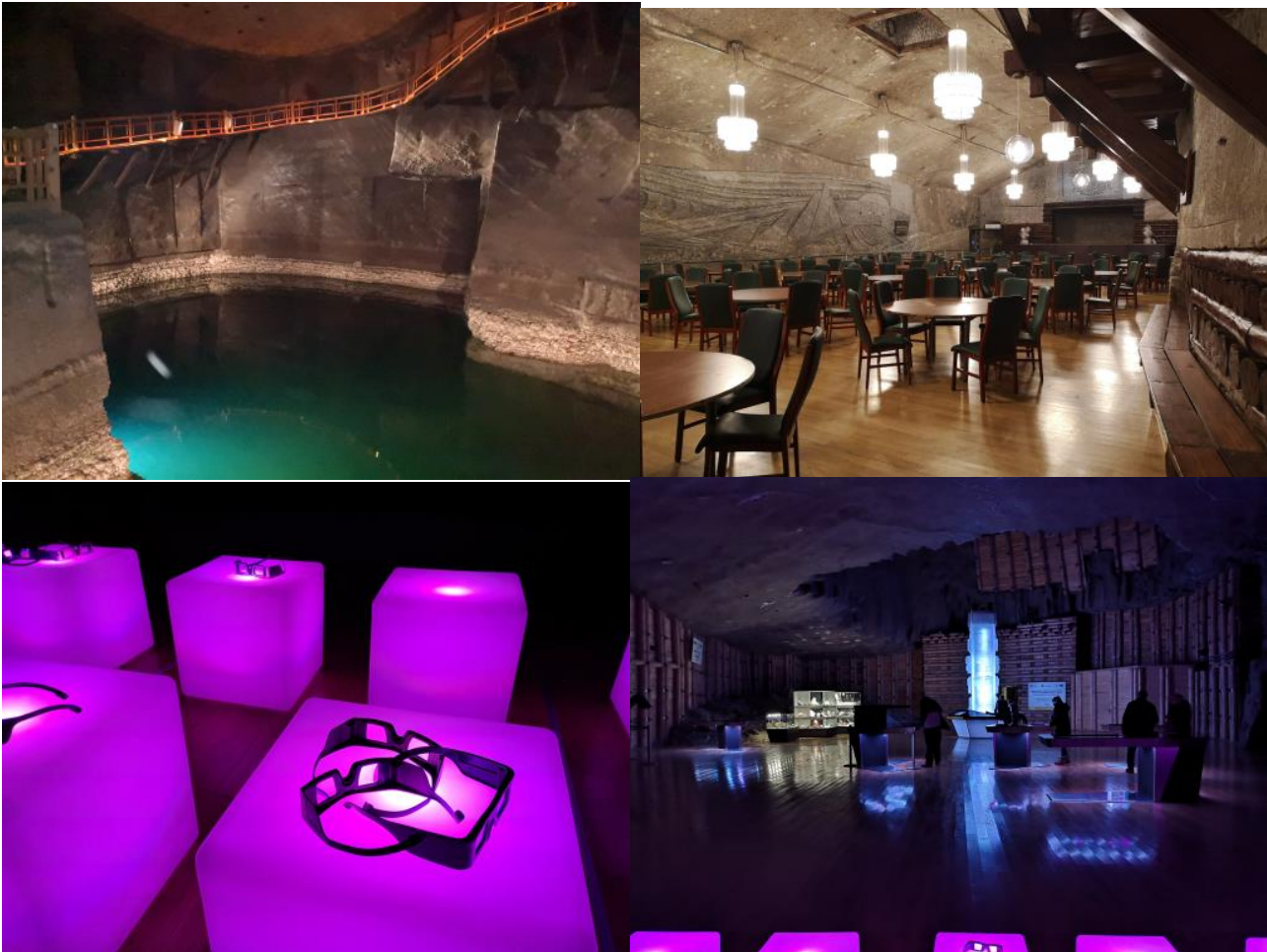


Figure 20. Touristic reinventing in Wieliczka mine (R.V.).

However, the site is quite controversial because some intangible values are missing in its storytelling; we refer to the connections with the local Jewish community before the Second World War and the adoption of prisoners from the nearby Nazi concentration camps as forced workers during the conflict [56].

3.6. Analysis

Data coming from on-site inspections, local bibliographic archives and iconographic research, and from interviews conducted with local stakeholders and representative from local bodies were organized in a database about dismissed mines.

Our aim was to categorize our information in homogeneous classes in order to point out analogies and differences among our case studies.

The first aspect which was noted was that the historical period of activity of a mine is always the focus of the storytelling adopted in successful enhancement processes. Additionally, information about the sector of activity and its connections with the national and international context are usually provided in billboards' text, video reconstructions, historical and geographical maps, or in dedicated divulgation centres.

With reference to the historical reuses, we summarize in Figure 21 the results of our analysis by adopting the UBH methodological approach. We reported the transformation of dismissed caves in religious places, such as in the cases of Wieliczka and Osarizawa: in

these cases, former UBH elements classified in the function Economy were transformed into elements included in the function Ritual and Burial (yellow in Figure 21). Again, in Osarizawa, the same spaces were transformed in canteens, in the Food function (blue in Figure 21), and shelters for persecuted people, in the Defence function (green in Figure 21). In the case of Milos, the transformation of dismissed mines into coastal houses for fishermen, *symmata*, caused the reclassification of those cavities in the Living Space function (violet in Figure 21). All these transformations, implementing the significance of each property, have been successfully included in the correspondent enhancement processes.

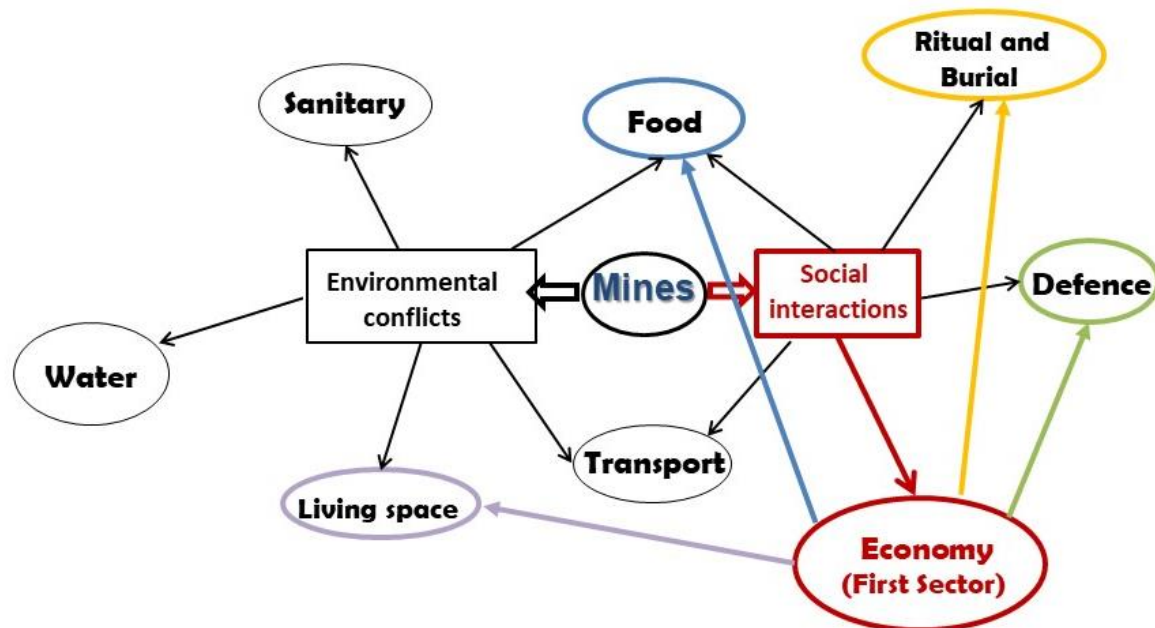


Figure 21. Reinterpreting dismissed mines (R.V.).

With reference to the social issues connected to the dismissed mines, their inclusion in the storytelling is very controversial; for example, very often, topics such as family life, the cultural influence of the mine on the settlement, women's work, and training activities are included in the storytelling since they are considered distinctive elements, but several critical issues are neglected. In fact, from one side, we reported the inclusion of child work in the Comitini mine and women's work in Osarizawa, the cultural linkage between the city and the mine in Serbariu and Kosaka, and the storytelling about child work in Comitini; from the other, we reported some missing elements. In the Wieliczka case study, the relationship with the Jewish village and the use of slavery was not included in the storytelling at all. It seemed to be a missed opportunity because Auschwitz concentration camp is one of the best local attractors of the area and the linkage between the two sites could integrate the storytelling of both of them. Additionally, in the case of Gunkanjima, the forced labour from Korean workers was not included in the storytelling.

Another topic we analysed was the museum layout of underground galleries. Immersive visits are considered distinctive elements in this sector; however, different situations were reported. Sometimes, sanitary measures caused the insulation of natural walls, such as in the case of Serbariu, to collapse after the dismissal, such as in the Sicilian case studies, which did not allow the opening to the public of the galleries; sometimes, in the absence of an immersive experience, such as in the case of Gunkanjima, virtual tours were successfully adopted.

One of the most distinctive characters of these properties was the involvement, when possible, of former workers in the enhancement processes; when it was not possible, figurines of workers simulated the extraction activity, but pictures, paintings, and archive documents were displayed in the correspondent museum layout.

We summarize the collected data in the worldwide overview in Table 1.

4. Valle Imperina, the Current Case Study

Valle Imperina mine is within the administrative boundaries of the Municipality of Rivamonte Agordino, in the Province of Belluno, in the Veneto region. It is included in the Belluno Dolomites National Park area [57], which marks one of the northern boundary points. It, therefore, falls within the buffer area of the Sistema3 UNESCO: Pale di San Martino San Lucano–Dolomiti Bellunesi–Vette Feltrine [58]. It is located about 3 km south of Agordo, along the S.R. 203 Agordina road, near the locality of “Le Campe”; it can be accessed on foot across the footbridge over the Cordévole stream (Figure 22).

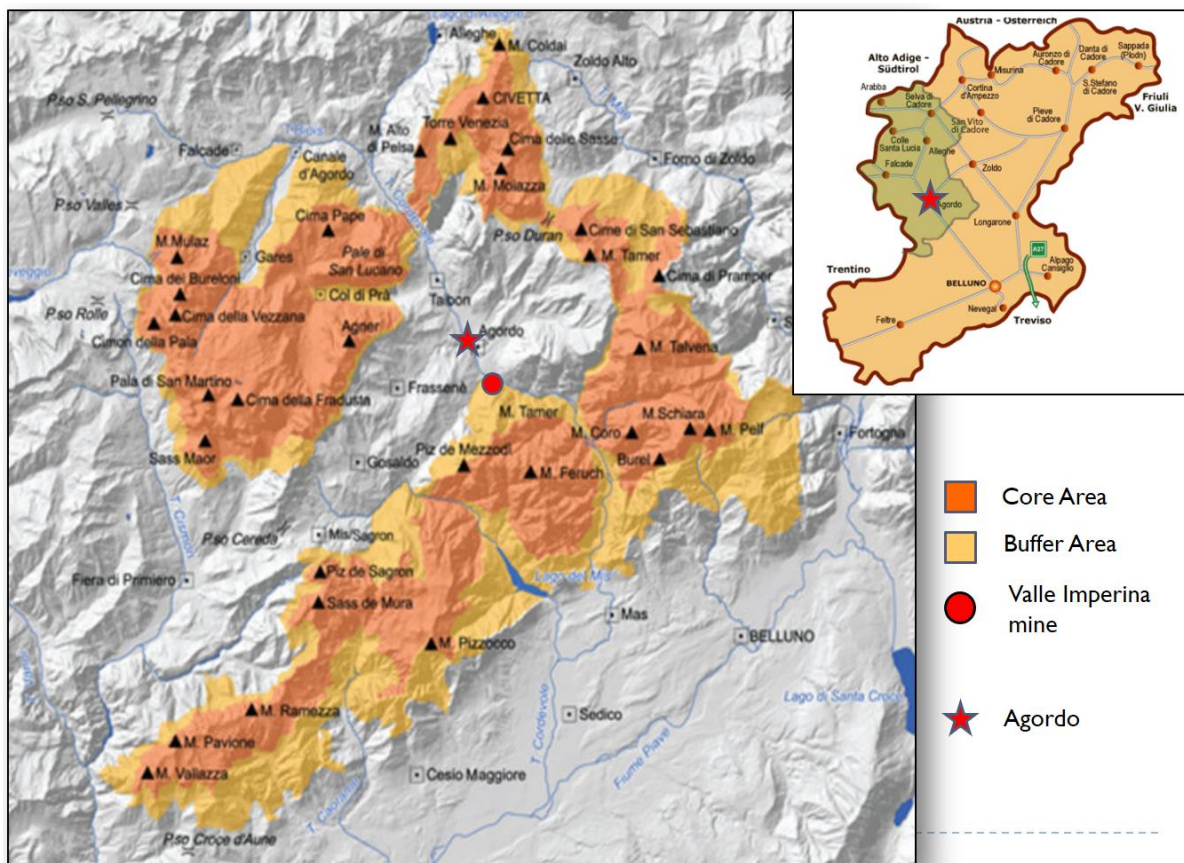


Figure 22. UNESCO System3_Pale di San Martino, San Lucano, Dolomiti Bellunesi, Vette Feltrine, and location of Valle Imperina mine (B.A., L.G.).

Valle Imperina is a highly representative case of the Italian context. It is a historical site of high cultural value and very renowned.

Valle Imperina is an expression of a valley in which economic, social, and cultural aspects have been linked to mining activities for over five centuries, between 1417 and its final closure in 1962. As evidenced by the more than 70 mining concessions issued from the mid-1700s to the mid-1800s, various minerals have been cultivated at the site, such as iron, lead, and silver [59].

Although the Valle Imperina mine is not a leading mining and metallurgical site on the continent, it is of great interest for several reasons. Its practically uninterrupted duration over several centuries reflects the elements of European mining history and the principal events in history. Furthermore, the documentation allows an in-depth knowledge of the site and its history [60], despite the fire of 1636 that destroyed the archives of the mines [61]. Moreover, traces of preindustrial mining exploitation are still legible in the mine’s surrounding architectures.

Since 1962, the mining world has been neglected by local communities for a long time. This was due to a double phenomenon. On the one hand, it was due to the negative lifestyle

and the traumatic emigration experienced by miners after the mines' closure. This is a very common reaction, as observed in many Italian contexts, such as in the Sicilian contexts previously analysed.

On the other hand, the reconversion of unskilled labour to factory life in Luxottica factory, founded in the Conca Agordina in 1961, has been representing the primary employment resource. That has led to a general lack of interest in the mining history enhancement for tourist offer and its related market.

Since the 1990s, on the one hand, significant work has been carried out to recover the main building structures and routes from reconverting the village to a museum and tourist-receptive functions. On the other hand, some local initiatives aimed at rediscovering and preserving the history and culture of the entire Agordina Valley area have not given the proper role to the mine. Thus, over the past few years, the former mine has been considered just one of the points of interest in the natural and historical-cultural heritage scenario. That has meant neglecting the site's importance in evocating the multiple tangible and intangible values at the base of the Agordino territory's identity and the existing links with its cross-border.

Furthermore, many critical issues have underpinned the take-off of an organic communication, management, and enhancement strategy. Field study remains an open question to this day.

In fact, since 2006, the projects carried out within the European-scale project framework, which responded to the need to give a "sense of place" and to preserve the identity of inland and mountainous places, with a view to "cultural revival", have led to the creation of multidisciplinary and multiscale databases.

Thus, Valle Imperina mine was described in the Project DB. The "OPENALP[®] Project: ALPINE Naturalistic Observatory: A model for the enhancement of the mountain territory" (Interreg IIIA Italy-Austria—VEN111072, 2006–2008) [62], a project created to constitute a reference for the use at several levels of detailed and elaborate information concerning geoscientific, tourist, naturalistic, popular, cultural, etc., aspects, as well as in the "Open Alp Maps project" (directed by the GAL (Local Action Group)-Rural Development Regional Plan 2007–2013, Veneto Local Development Plan (V.E.T.T.E., measure 313, action 4 "Information" "Incentives for tourism activities"). This last project was created to create a "community network" in which each user can promote the development of sustainable tourism. Finally, we found a description of Valle Imperina and mining activities in the San Lucano Valley over the centuries in the project "DOLOMIA. The Dolomia Road: a Rock's Journey through the Dolomites—ITAT 2036" (Interreg V-A Italy-Austria 2014–2020) [63] which was born to enhance the shared environmental and cultural heritage linked to the Dolomite stone, to be the key to sustainable regional development, and also in terms of tourism.

Furthermore, the managerial competence on the site, which passed under the Dolomiti Bellunesi National Park Authority's responsibility at the end of the 1990s, sometimes has limited the range of local institutions' action as well as ordinary maintenance and the normal deforestation actions in the area to bring to light all the structures linked to the mining centre and to make them usable for the identification of essential biodiversity features in the area.

In addition, as occurs in other sites of the "Inner Areas", such as Lercara Friddi and Comitini, today the areas of the mining district remain an isolated element, not connected to the network of sites of interest in the area. The lack of an organisational system for mobility, reception, and use of the area has also prevented Valle Imperina from promoting cultural tourism and achieving successes, such as in the case of the Iwami Ginzan silver mine (Japan). In this last case, although located in the middle of a natural park, the mine is reachable via paths, which can be travelled on foot or with rented electric bikes, with the possibility of accommodation in the samurai village at the entrance to the paths.

Moreover, in this inland and mountainous environment, there are other critical climatic issues, such as its location in a narrow valley bottom with steep slopes, which precludes its use from November to April, a period characterised by the absence of sunlight and frost. Additionally, the historical occurrence of extreme events, such as floods and heavy

snowfall, affects the region, with serious repercussions on the preservation of structures and accessibility of the area. We mention the storm “Vaia” in 2018 that destroyed the roofs of some restored buildings.

In Valle Imperina, despite the attempts and projects on a European scale, even though there was no lack of a vision oriented towards tourism development, the discontinuity of funding and the commitment of the institutions meant that a strategic and integrated plan for tourism development in the area was also considered in the regional DM. This resulted in, e.g., the failure of sharing projects in hospitality (widespread hospitality) and the almost total absence of accommodation facilities and services dedicated to tourism.

As a corollary of these multiple experiences, the administrations have recently joined a new project named ReMUSIT (Reinventing Industrial Museums for a new image of Italy) [64]. Led by the CNR (with the ISPC, ISMed, IGAG, and IRPPS institutes involved), with the La Statale University of Milan (UNIMI) and the Mediterranean University of Reggio Calabria (UNIRC), the project has been recently launched. It is a comparative and multidisciplinary study which faces the challenge of identifying, analysing, and codifying best practices in the field of management, enhancement, civic participation, and improvement in the community dimension, and practices that strengthen the resilience of industrial museums against both endogenous and exogenous shocks. The aim is to support industrial museums in approaching and testing the UBH approach and the aforementioned framework of best practices for the definition of alternative interpretative schemes of values, both tangible and intangible, related to museums and their geographical setting. The project involves a wide network of local stakeholders, i.e., local associations and public institutions such as municipalities, schools, and other local stakeholders, who highly expect its positive results.

4.1. The History of the Mine

The Valle Imperina ore was set along a regional fault, the “Valsugana Fault”, between dolomitic banks and ancient metamorphic rocks. They have provided the raw material for the copper industry for centuries, giving rise to one of the largest mining and metallurgical centres in the Veneto region. The principal minerals are chalcopyrite and cupriforous pyrite. In smaller quantities, there are argentiferous galena, malachite, native copper, native silver, and gold. The pyrite ores of Valle Imperina have an average copper content of 1 to 3 per cent, and with over 45 per cent sulphur, they cannot be processed directly by smelting and require furnaces to “roast” the materials.

Over the centuries, the deposit has had different uses. Until the mid-17th century, the deposit was used to extract and process argentiferous galena, silver, and chalcopyrite to obtain copper. From the middle of the 17th century until 1893, it was used to extract and process chalcopyrite to obtain copper, vitriol, and sulphur. Then, until its closure in 1962, the ore was mined to process pyrite for sulphuric acid [65–67]. We summarize the history of the mine in Table 2.

Table 2. The history of Valle Imperina (by B.A.).

Period	Historical Events	Valle Imperina History
Roman times		Some testimonies date the beginning of the exploitation of Valle Imperina to the Roman period.
15th century	Serenissima Republic of Venice.	1417—The first document in which the mine is mentioned: Aycardus Alemanus de Valle Emperina is recorded as producing copper. 1483—Marin Sanudo, a chronicist of the time, mentions Valle Imperina in <i>Itinerario per la terraferma Veneziana</i> .

Table 2. Cont.

Period	Historical Events	Valle Imperina History
16th century	1528-30: The famine. 1545: The earthquake. 1559: The flood of the Valle Imperina area with tunnel flooding. 1549: Saint Inquisition. 1580: All German workers are expelled from the valley.	1580—The mine’s specialised personnel crisis caused damage due to the lack of a cultivation rationale.
17th century	Valle Imperina mine is at the centre of the valley’s economy.	1615—Francesco Crotta became the owner of most of the Agordino mines and promoted prosperous activity. The discovery of the wealthiest mineral deposit in Valle Imperina: the S. Giovanni Cecca.
18th century	The Serenissima Republic of Venice realised the mine’s wealth and the importance of copper, so it centralised copper production. 1775—The first mining “Mountain School” in Agordo was founded as an apprenticeship school to respond to the crisis in expertise and to disastrous mining accidents due to “robbery exploitation” and modernisation in the mining industry.	On the death of the last family heir, Serenissima Republic of Venice acquired all the Crotta family’s mines. In 1778, the furnaces in Valle Imperina produced 50 per cent of the copper requirements of the entire republic for coinage and partly for ship coating.
19th century	1866—The Kingdom of Italy. The decline of the mines began, fundamentally linked to the collapse of the world price of copper following the discovery of large deposits in South America.	Valle Imperina’s production became uncompetitive, and the first large-scale exodus took place. 1893—The State ceded the mine to the Magni company of Vicenza, which extracted and transported the ore to acid and chemical factories in Vicenza and Lombardy to produce sulphuric acid. 1898—The smelting furnaces were closed to become storage warehouses.
20th century	1925—Inauguration of the ordinary gauge, an electrically powered railway from Agordo to Bribano, built to transport ore but later of great use for public transport. 1950: Montecatini had to start cutting mines to comply with the Marshall Plan.	1910—The mine passed to the Montecatini Company, which started a series of significant modernisation works for extracting and transporting ore and producing electrical energy. 8 September 1962—The mine was closed, not because the deposit was exhausted but because of the decrease in demand for pyrite and the high costs involved in its cultivation.

The Post-Closure Phases

After the closure of the mine, the area was simply abandoned and no information is available on the choices made by the then-owner, Montecatini, regarding the potential intended use.

The terrible flood of November 1966 destroyed the entire mining area: buildings collapsed, tunnels and pits collapsed, and the old routes and bridges gave way due to landslides. Post-closure, in the 1980s, a debate began about the destination of the area's use: between who would like to use it as a landfill site and who understood its potential as a historical–cultural site [65].

In 1988, the Municipality of Rivamonte Agordino purchased the entire Valle Imperina complex, land, and buildings from Montedison. In 1993, the National Park of the Belluno Dolomites was created. After almost 30 years of total abandonment, an ambitious architectural recovery of the valuable buildings began, a prerequisite for the tourist–cultural requalification of the mining village.

The Agordina Mountain Community supported a project to recover the still-existing buildings and implemented a powerful synergy with the Belluno Dolomites National Park, which shared the project and was among the primary financiers. The general budget estimate was approximately ITL 18 billion. The Veneto Region, the Agordina Mountain Community, the Belluno Dolomites National Park, the Municipality of Rivamonte, the Belluno Civil Engineers, and the Superintendence of Environmental and Architectural Heritage are involved in the recovery.

European funds largely support all restoration actions. The Agordina Mountain Community is responsible for the restoration of the “ex-warehouse” building to be used as a “Youth hostel” (1994–1997), the construction of the footbridge, the restoration of the smelting furnaces, and the recovery of the internal road network within the mining district (1997–2001).

The park dedicated itself to recovering the ancient paths, creating thematic trails, and restoring the early 20th-century power station to be used as the park's visitor centre (2002–2003). The reconstruction of the bridge over the Imperina and hydraulic defence works and the restoration of the ruins of the warehouse; the restoration of the former recreational area for workers, the Cral stable (2004–2005), of the former horse stables, and of the capital well building; and the recovery of the entrance to the Santa Barbara gallery (2006–2007) followed (Figure 23).



Figure 23. Valle Imperina map with the location of the renovated buildings and the main access points to the mining galleries, which are still accessible but closed to the public, 2022 (B.A., L.G.).

4.2. The State of the Art

Today, the Valle Imperina Mining Centre is managed by the Municipality of Rivamonte Agordino as the owner entity [66].

Access to the mining site is possible by crossing on foot a covered footbridge over the Cordevole stream with a copper roof, connecting the Valle Imperina site to the state road, where you leave your car.

The mining area consists of the old mining village at the bottom of the valley: most of the original buildings of the mining centre have been repaired and secured in recent decades. The complex of the Forni Fusori (smelting furnaces) (Figure 24a–c) is very interesting for in-depth studies of mining activity. It is the most characteristic building in the entire site and exerts a profound impression on the observer.



Figure 24. Valle Imperina. Overview of the “Forni Fusori” building from the outside (a); the melting furnaces on the inside (b); the exhibition spaces in the upper floor (c), 2022 (B.A., L.G.).

The three-aisled building retains four copper furnaces dating back to the 19th century: they are preserved in good condition even if the original chimneys have not been saved. Between the former power station and the smelting furnaces is the 18th century horse stables building, which has two floors, the second of which was initially used as a barn. There are two other large structures: a coal warehouse, currently an impressive ruin without its roof, and what was originally the “Company shop”. The concrete pillars of the cableway that transported cuprififerous pyrite from the mines to the train cars are still visible.

As evidence of the railway line, an electric locomotive of the old Bribano–Agordo railway is on display on the side of the state road. The power station, as well as the associated canalisation, was the work of Montecatini. A dirt road over a kilometre long runs along the valley and connects the furnaces to the areas where mining occurred. As you walk along it, you pass the reconstruction of a roasting rosta for the extracted material. Then, you reach the primary access to the mining area at the Pozzo Capitale, and the Santa Barbara and Magni tunnels. Unfortunately, none of the mining tunnels are open to the public today, although they will be soon. The National Park of the Belluno Dolomites has also dedicated some thematic trails to the Valle Imperina. The “La Montagna Dimenticata” (The Forgotten Mountain) thematic trail retraces the ancient routes used daily by the workers of the Conca Agordina on their way to work at the Mining Centre. Other historical trails (such as the Via degli Ospizi), suitably signposted, wind in or around the centre.

4.3. Intangible Values

The town of Agordo is the major population centre near the Valle Imperina mine and has always been the main town in the valley due to its proximity. It presents many elements that take one back to the mining world and the history of the mine: from the wonderful Palazzo Crotta de Manzoni in the main square, a Villa Veneta-style palace related to the Crotta family, fortunate owners of the Valle Imperina Mine from the mid-16th century, to the altar and the Saint Barbara altarpiece in the Archdeacon Church, patron saint of miners and patron saint of the town; from the historic “Mines” bar in the square to the

plaque commemorating the death of Friedrich Mohs, one of the fathers of mineralogy, to the presence of the mining school, today the ‘U. Follador’ Industrial Technical Institute which was founded in 1867 with the Kingdom of Italy and is a descendant of the first mining Mountain School, an apprenticeship school founded in 1775. Today, this institute, one of the most prestigious in the world, together with numerous associations, keeps alive the traditions and memory of the valley’s mining past. It collects thousands of mineral, rock, and fossil samples in the Geological, Mineralogical, Palaeontological and Mining Art Museum and also accepts donations from many private collections.

Numerous subjects are also taken from mining work for artistic and literary production. These include Augusto Murer, an internationally famous sculptor and painter (1922–1985), whose works, mostly executed in the 1950s, bear witness to the living conditions of miners in the Valle Imperina of Belluno.

5. Discussion

On the basis of the adoption of the theoretical approach dedicated to the UBH class to dismissed mines [30], we classified within the function “Economy” a wide number of worldwide case studies. Thanks to this overview, a wide range of solutions were considered, leading to the definition of six successful focuses connected to the corresponding enhancement processes: contextualization within a historical period, historical reuses, connected social issues, immersive experiences, divulgation centres or museums, and the involvement of former workers in the enhancement project.

With reference to these main focuses, the results of our comparison are summarized in Table 3 where they have been matched, when applicable, to the corresponding case studies.

Table 3. Successful focuses (by R.V.).

Name	Historical Contest	Historical Reuses	Social Issues	Immersive Experience	Divulgation Centre/Museum	Former Workers
Ikeshima	✓		✓	✓	✓	✓
Gunkanjima	✓		✓	✓	✓	✓
Toi Gold mine	✓		✓	✓	✓	
Mylos	✓	✓	✓		✓	
Wieliczka	✓	✓	✓	✓	✓	
Serbariu	✓		✓	✓	✓	✓
Floristella	✓		✓		✓	
Comitini	✓		✓			
Lercara Friddi	✓		✓			
Sarantara of Moutsouna	✓		✓			
Iwami Ginzan	✓	✓	✓	✓	✓	
Osarizawa	✓	✓	✓	✓	✓	
Kosaka vilage	✓		✓	✓	✓	
Majella	✓		✓			
Deutsches Museum	✓		✓	✓	✓	

From the analysis of the table, a very variegated situation emerges. In fact, while we found some case studies that matched with five of our focuses—Ikeshima, Gunkanjima, Wieliczka, Iwami Ginzan, Osarizawa, and Serbariu—and four cases which matched with

four of them—Toi Gold Mine, Mylos, Kosaka, and Deutsches Museum—in the remaining case studies, only three or fewer of our criteria were found.

In the case of Valle Imperina, our current case study, the analysis carried out with reference to the same criteria made it possible to highlight further criticalities, which until now have been underestimated, and to identify possible future operations for the reuse and enhancement of the site in its territorial context.

In particular, so far, in the storytelling of the site, there has been no contextualization of the site in a significant historical period, either for the European mining history or for that of the Conca, which could have been the management period of the Serenissima or the Austrian one.

With regard to connected social issues, the mining experience is still a divisive issue, a sort of wound still open in the conscience of locals. In fact, nobody liked the miners' life and it was neglected for decades after the dismissal of Valle Imperina. Nonetheless, some aspects have been understood and eviscerated both in the figurative arts, such as in the case of Augusto Murer, and in literature with Rigoni Stern. A possible way for the future might be restarting from the arts to mend the tear with the past and build a more serene relationship for local communities with their proper history.

About the immersive experience. Unfortunately, a large part of the site is not accessible for security reasons. As mentioned, the only exception concerns the Forni Fusori building. While the planning of the local authorities is focusing on the reopening to the public of some galleries, the example of other sites—such as the above-considered Japanese sites—invites us to consider alternative visit hypotheses. In this direction goes the hypothesis of the creation of a detailed map of the areas that can be travelled in safely, on explanatory panels, and on the enhancement of the dedicated guided tour service.

Regarding musealization, our hypothesis is that both communication and the enhancement of the tangible and intangible values linked to the dismissed mine need to be completely rethought. A further step must be taken in the direction of tackling the challenge on a scale extended to the territorial dimension. This means organizing and creating a territorial network that includes, in a single communication and management plan, all the small museums scattered throughout the territory and which already deal with the themes of the mine. In this way, the result would be much more incisive, also from the point of view of the participation of the various communities of the Conca Agordina and the valley in the dissemination initiative.

With regard to the latter aspect, the involvement of former workers in the enhancement projects could benefit from the role played by the local Mining Institute with reference to intangible values connected to the mine. The institute, which is the most complete depository of the history and mining technological evolution of the basin, could eventually support the creation of a local archive about testimonies of former workers which could be also profitably involved in the enhancement project as guides. This approach could influence the local unemployment rates, result in a social intergenerational gateway, and eventually reinforce the local sense of place for younger generations.

6. Conclusions

Today, the theme of the recovery and reuse of decommissioned mines is very topical all over the world, as they are commonly considered significant elements of the local cultural heritage. At present, the musealization of these spaces, especially, offers a very broad case history to inspire, as briefly highlighted in the introduction and attested by the cases considered in the paper.

However, some aspects of the research on the topic still remain to be defined and this is particularly evident in the Italian context. This is a very peculiar context, because of a series of criticalities which led to an underestimation of the sociocultural and economic potential of dismissed mines compared to other kinds of cultural heritage and a relative scarcity in research—although there is no lack of eminent studies in the sector [11,12,25,26]—and adequate investments in the topic.

Therefore, at this stage, Italy shows a different sensitivity to the key issues inherent in this sector, potentially affected by the corresponding funding policy inaugurated thanks to the National Recovery and Resilience Plan (PNRR). Thus, an improvement in the research in the sector is fundamental in order to identify more effective models and strategies to be applied in the specific Italian context to reinvent the role of museums for the future and make them more resilient to crisis factors.

Starting from the thesis that the first step of the work must generate a better understanding of the potential—in cultural, social, and economic terms—of this kind of asset, our proposal was to test a new approach in the reclassification of this type of asset on international cases selected for their different characteristics. A general framework of good practices has been derived, which will necessarily be implemented as the authors continue to study.

The subsequent analysis of the Valle Imperina case showed a still-ongoing activity by the authors, aimed at reclassifying and interpreting its tangible and intangible values on the basis of the UBH approach and thanks to the aforementioned framework.

Despite the numerous cases analysed and the multitude of models and best practices identified, the case of Valle Imperina demonstrates how difficult it can be to return to society an asset, such as a dismissed mine, even though all the prerequisites exist for the success of a recovery project and enhancement.

As shown, many criticalities are underlying this situation. In fact, punctual problems related to the context—i.e., geological, climatic, sociocultural, and economic—are added to those of an intermediate scale such as internal and mountain management criticalities, which reflect more general issues related to politics, the economy, and national culture.

Nonetheless, a new chapter in Valle Imperina's history opens thanks to the collaboration of research institutions, universities, public institutions, and local stakeholders aiming to drive the Conca Agordina towards alternative and sustainable development models based on cultural tourism.

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References

1. UNESCO World Heritage List. Available online: <https://whc.unesco.org/en/list/> (accessed on 18 December 2022).
2. UNESCO World Heritage Tentative List. Mining Historical Heritage Serial Site of Spain. Available online: <https://whc.unesco.org/en/tentativelists/5139/> (accessed on 18 December 2022).
3. Tuscan Mining Geopark. Available online: <https://www.unesco.it/it/Geoparchi/Detail/576> (accessed on 18 December 2022).
4. Preite, M. *Masterplan, the Development of the Mining Landscape*; Polistampa: Florence, Italy, 2009.
5. Rocca di Cerere UGGP. Available online: <https://www.unesco.it/it/Geoparchi/Detail/538> (accessed on 18 December 2022).
6. Edwards, J.A.; Llurdés i Coit, J.C. Mines and quarries: Industrial heritage tourism. *Ann. Tour. Res.* **1996**, *23*, 341–363. [CrossRef]
7. Cole, D. Exploring the sustainability of mining heritage tourism. *J. Sustain. Tour.* **2004**, *12*, 480–494. [CrossRef]
8. Wu, X.; Yu, L.; Fang, H.; Wu, J. Research on the Protection and Reuse of Industrial Heritage from the Perspective of Public Participation—A Case Study of Northern Mining Area of Pingdingshan, China. *Land* **2022**, *11*, 16. [CrossRef]
9. Cañizares, M.C. The correct evaluation of the industrial mining heritage: The Mining Park of Almadén (World Heritage Site). In *Patrimonio Cultural y Desarrollo Territorial*; Reuters, A.T., Ed.; Thomson Reuters Aranzandi: Pamplona, Spain, 2016; pp. 339–369.
10. Palmer, M.; Neaverson, P. *Industrial Archaeology: Principles and Practice*; Routledge: London, UK, 1998.
11. Preite, M.; Maciocco, G. *Da Miniera a Museo. Il Recupero dei siti Minerari in Europa*; Alinea: Firenze, Italy, 2000.

12. Negri, M. La musealizzazione del patrimonio minerario. In *Da Miniera a Museo*; Preite, M., Maciocco, G., Eds.; Alinea: Firenze, Italy, 2000.
13. Douet, J. (Ed.) *Industrial Heritage Re-Tooled*. In *The TICCIH Guide to Industrial Heritage Conservation*; Carnegie Publishing: Lancaster, UK, 2012.
14. Chmielewska, M. Conservation of post-industrial cultural heritage in Europe in local and global context. *Reg. Reg.* **2015**, *12*, 133–145.
15. Copic, S.; Djordjevic, J.; Lukic, T.; Stojanovic, V.; Djukicin, S.; Besermenji, S.; Stamenkovic, I.; Tumaric, A. Transformation of industrial heritage: An example of tourism industry development in the Ruhr area (Germany). *Geogr. Pannon.* **2014**, *18*, 43–50. [[CrossRef](#)]
16. Cañizares Ruiz, M.D.C. Patrimonio minero-industrial en Castilla-La Mancha: El área Almadén-Puertollano. *Investig. Geogr.* **2003**, *31*, 87–106. [[CrossRef](#)]
17. Hospers, G.-J. Industrial heritage tourism and regional restructuring in the European Union. *Eur. Plan. Stud.* **2002**, *10*, 397–404. [[CrossRef](#)]
18. Mansilla, L. El Parque Minero de Almadén. Un modelo de recuperación del patrimonio minero industrial. *Her. Mus.* **2011**, *3*, 13–24.
19. El caso de la Unión; Barone, A.; Pironti, P.; Ruggiero, G. (Eds.) *Valorización del Patrimonio Subterráneo y Dinamización de la Comunidad*; CNR Edizioni: Roma, Italy, 2022.
20. Micheletti Foundation Award. Available online: https://www.luigimichelettiaward.eu/the_award/ (accessed on 18 December 2022).
21. European Route of Industrial Heritage—ERIH. 2019. Available online: <https://www.erih.net/> (accessed on 18 December 2022).
22. ERIH—Theme Route Dedicated to Mines. The Italian Sites. Available online: <https://www.erih.net/i-want-to-go-there/themeroute/mining> (accessed on 18 December 2022).
23. Garofano, M.; Govoni, D. Underground Geotourism: A Historic and Economic Overview of Show Caves and Show Mines in Italy. *Geoheritage* **2012**, *4*, 79–92. [[CrossRef](#)]
24. Negri, M. Industrial museums. In *Industrial Heritage Re-Tooled*; Douet, J., Ed.; Carnegie Publishing: Lancaster, UK, 2012; pp. 166–171.
25. Ciuffetti, A.; Parisi, R. (Eds.) *L'archeologia Industriale in Italia*; Franco Angeli: Milano, Italy, 2012.
26. Preite, M.; Maciocco, G. Rediscovered Factories. In *Industrial Heritage and Architectural Project in Italy*; C&P Adver Effigi: Grosseto, Italy, 2022.
27. Supporting Museums: UNESCO Report Points to Options for the Future. 2021. Available online: <https://en.unesco.org/news/supporting-museums-unesco-report-points-options-future> (accessed on 18 December 2022).
28. Piano Triennale per la Digitalizzazione e L'innovazione dei Musei, 2019–2021. Available online: <http://musei.beniculturali.it/wp-content/uploads/2019/08/Piano-Triennale-per-la-Digitalizzazione-e-l%E2%80%99Innovazione-dei-Musei.pdf> (accessed on 18 December 2022).
29. National Recovery and Resilience Plan—PNRR. Available online: <https://www.governo.it/sites/governo.it/files/PNRR.pdf> (accessed on 18 December 2022).
30. Varriale, R. “Underground Built Heritage”: A Theoretical Approach for the Definition of an International Class. *Heritage* **2021**, *4*, 1092–1118. [[CrossRef](#)]
31. Lapenna, V.; Leucci, G.; Parise, M.; Porfyriou, H.; Genovese, L.; Varriale, R. A project to promote the importance of the natural and cultural heritage of the underground environment in southern Italy. In *Proceedings of the International Congress of Speleology in Artificial Caves, Cappadocia, Turkey, 6–10 March 2017*; pp. 128–136.
32. Varriale, R.; Oguchi, C.T.; Parise, M. Introduction to the Special Issue “Damage Assessment and Conservation of Underground Spaces as Valuable Resources for Human Activities in Italy and in Japan”. *Opera Ipogea* **2020**, *5*–12.
33. Varriale, R.; Genovese, L. Underground Built Heritage (UBH) as Valuable Resource in China, Japan and Italy. *Heritage* **2021**, *4*, 3208–3237. [[CrossRef](#)]
34. Varriale, R.; Genovese, L.; Aldighieri, B. “Diffused Geoparks”: Territorial Integration as Solution for a Shared Sustainable Growth Based on Geotourism in Italy, Japan and Tunisia. *Heritage* **2022**, *5*, 2083–2105. [[CrossRef](#)]
35. Cost Action 18110 (2019–2023) Underground Built Heritage as Catalyser for Community Valorisation. Available online: <https://www.cost.eu/actions/CA18110/> (accessed on 18 December 2022).
36. Bilateral Project CNR-JSPS Damage Assessment and Conservation of Underground Space as Valuable Resources for Human Activities Use in Italy and Japan. Available online: <https://www.cnr.it/en/bilateral-agreements/project/2945/damage-assessment-and-conservation-of-underground-space-as-valuable-resources-for-human-activities-use-in-italy-and-japan> (accessed on 18 December 2022).
37. Russell, D. The Emery Mines of Naxos. 2008. Available online: <https://www.mindat.org/article.php/153/The+Emery+Mines+of+Naxos> (accessed on 13 December 2022).
38. Peghin, G.; Sanna, A. *Carbonia. Citta del Novecento*; SKIRA: Milano, Italy, 2009.
39. Parco Geominerario Storico Ambientale Della Sardegna. Available online: <https://parcogeominerario.sardegna.it/> (accessed on 23 December 2022).
40. Cammino Minerario di Santa Barbara. Available online: <https://www.camminominerariodisantabarbara.org/> (accessed on 23 December 2022).
41. Biondi, B. Le Miniere Abbandonate, Patrimonio Siciliano da Riscoprire. *Le Vie Dei Tesori Magazine*. 2020. Available online: <https://magazine.leviedeitesori.com/le-miniery-abbandonate-patrimonio-siciliano-da-riscoprire/> (accessed on 15 December 2022).
42. Rocca di Cerere Geopark. Available online: <http://www.roccadicereregeopark.it/> (accessed on 23 December 2022).

43. Cutaia, A. *Comitini e le sue Zolfare*; Siculgrafica: Agrigento, Italy, 2017.
44. Parco Nazionale Della Maiella. Available online: <https://www.parcomajella.it/> (accessed on 15 December 2022).
45. Majellando. Available online: <https://www.majellando.it/it> (accessed on 23 December 2022).
46. Okuma, C. The Industrial Revolution in Japan. *N. Am. Rev.* **1900**, *171*, 677–691.
47. UNESCO Global Geoparks (UGGp). Available online: <https://en.unesco.org/global-geoparks/list> (accessed on 16 December 2022).
48. Sits of Japan’s Meiji Industrial Revolution: Iron and Steel, Shipbuilding and Coal Mining, UNESCO List. Available online: <https://whc.unesco.org/en/list/1484> (accessed on 16 December 2022).
49. Tripadvisor. Available online: https://www.tripadvisor.it/AttractionProductReview-g298568-d13147323-Visit_Gunkanjima_Island_Battleship_Island_in_Nagasaki-Nagasaki_Nagasaki_Prefecture.html (accessed on 16 December 2022).
50. Izu Peninsula UNESCO Global Geopark. Available online: <https://en.unesco.org/global-geoparks/izu-peninsula> (accessed on 16 December 2022).
51. Iwami Ginzan Silver Mine and its Cultural Landscape, UNESCO List. Available online: <https://whc.unesco.org/en/list/1246> (accessed on 16 December 2022).
52. Nomination of the Iwami Ginzan Silver Mine and Its Cultural Landscape. Available online: <https://whc.unesco.org/uploads/nominations/1246bis.pdf> (accessed on 19 December 2022).
53. Deutsche Biographie. Available online: <https://www.deutsche-biographie.de/sfzN0707.html?language=en> (accessed on 22 January 2023).
54. Historic Site Osarizawa Mine (Kazuno City, Akita Prefecture). Available online: https://www.tohokukanko.jp/en/attractions/detail_1007942.html (accessed on 19 December 2022).
55. Wieliczka and Bochnia Royal Salt Mines. Available online: <https://whc.unesco.org/en/soc/1523/> (accessed on 19 December 2022).
56. Yahrblum, M. Wieliczka—The Salt City. Available online: <https://www.jewishgen.org/yizkor/wieliczka/wiee004.html> (accessed on 19 December 2022).
57. The Dolomiti Bellunesi National Park. Available online: <https://www.dolomitipark.it/> (accessed on 26 December 2022).
58. The UNESCO System3: Pale di San Martino San Lucano-Dolomiti Bellunesi-Vette Feltrine. Available online: <https://www.dolomitiunesco.info/?gruppo-dolomitico=pale-di-san-martino> (accessed on 26 December 2022).
59. Dal Mas, G. *La Conca Agordina Cuore Delle Dolomiti: Guida Agli Aspetti Fisici, Naturalistici, Storici e Artistici*; Agordo Pro Loco: Belluno, Italy, 2007.
60. Vergani, R. Minatori di età preindustriale. Alcuni temi tra storia e società. *Ric. Folk.* **2016**, *71*, 27–35. Available online: <https://www.jstor.org/stable/10.2307/26631922>.
61. Pollazzon, A.; Salton, V. Il centro minerario di Valle Imperina e il suo recupero. In *Proceedings of the Mineralogia e Ricerca Mineraria dal Quattrocento ad oggi*; Lazzari, C., Ed.; Centro Minerario di Valle Imperina: Belluno, Italy, 2012; Volume 27, pp. 27–34.
62. Aldighieri, B.; Testa, B. OPENALP-Permanent Naturalistic Alpine Observatory: A way to increase the alpine land value. In *Proceedings of the Geomorphosites 2009, Paris, France, 10–12 June 2009*; Raising the profile of geomorphological heritage through iconography, inventory and promotion; International Symposium on Geomorphology Paris-Sorbonne University (France); Giusti, C., Ed.; Paris-Sorbonne University: Paris, France, 2012; pp. 11–163.
63. Project ‘DOLOMIA. Available online: <https://www.openalpmaps.it/progettodolomia/en/> (accessed on 26 December 2022).
64. Genovese, L. (CNR-ISPC, Milan, Italy); Aldighieri, B. (CNR-IGAG, Milan, Italy); Varriale, R. (CNR-ISMed, Naples, Italy). Personal communication at the XIV Riunione Scientifica SISTUR, 2022.
65. Vergani, R. *Miniere e Società Nella Montagna del Passato: Alpi Venete; secoli XIII–XIX*; Cierre EdizioniSommampagna: Verona, Italy, 2003.
66. Orlandi, M. *Una Miniera Veneta. Valle Imperina dal 1866 al 1962*; Nuovi Sentieri editore: Belluno, Italy, 1980.
67. Vergani, R. Valle Imperina. Otto secoli di attività mineraria e metallurgica. *Riv. Bellunese* **1975**, *4*, 371–383.

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