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Challenges in the Conservation of Mining Heritage: Sites of the Camino Real de Tierra Adentro

Desafíos en la conservación del patrimonio minero: sitios del Camino Real de Tierra Adentro

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ABSTRACT/ This research contributes to the study of industrial mining heritage, its relevance, vulnerability, and the challenges for its conservation and enhancement, taking as a context the ancient royal mine towns of the Royal Road of the Interior Land. This cultural thoroughfare was recognized by UNESCO and is originated in the discovery and exploitation of rich mineral deposits. Mining heritage sites have been identified through historical-documentary research and an analysis of their assessment by local communities, through surveys and interviews. Additionally, the technical and legal instruments that recommend dismantling these structures –ignoring their social and cultural dimension– as part of environmental regulations were reviewed. The study exposes the unsustainable situation affecting this heritage, despite its potential to be revitalized through adaptive reuse and to contribute to the inclusive development of communities impacted by natural resource depletion. **RESUMEN/** La presente investigación abona al estudio del patrimonio industrial minero, su relevancia, su vulnerabilidad y los desafíos para su conservación y puesta en valor, tomando como contexto los antiguos Reales de Minas del Camino Real de Tierra Adentro. Se trata de un itinerario cultural reconocido por la UNESCO originado en el hallazgo y la explotación de ricos yacimientos minerales. Los sitios de patrimonio minero se han identificado mediante una investigación histórico-documental y un análisis de su valoración por la comunidad local mediante encuestas y entrevistas. Además, se revisaron los instrumentos técnicos y legales que recomiendan el desmantelamiento de estas estructuras como parte de las regulaciones de carácter medioambiental, las cuales ignoran su dimensión social y cultural. El estudio revela una situación insostenible para este patrimonio, a pesar de su potencial para revitalizarse mediante el reúso adaptativo y contribuir con ello al desarrollo integral de las comunidades afectadas por el abatimiento de sus recursos naturales.

INTRODUCTION

The mining heritage contains the remnants of a bygone era that was crucial for modern societies; industrialization was the most significant catalyst for change in human history (Douet, 2012). These historic sites not only represent an invaluable cultural legacy but also offer a tangible connection

to the hard work and innovation that shaped entire communities. However, as the 21st century progresses, many of these silent witnesses to history face an uncertain fate due to accelerated dismantling, not only permitted by the State but, in many cases, recommended as an environmental impact mitigation action by some of the

few existing regulations concerning mine closures¹. This article addresses the issue of the dismantling of industrial mining heritage, a topic of growing concern in the field of heritage conservation, and the importance of raising awareness about the value of industrial heritage (Vukmirović & Nikolić, 2023). The research focuses on the case of

¹ Environmental Protection Actions in Mining Activities, SEMARNAT <https://www.gob.mx/se/acciones-y-programas/mineria-legislacion-normatividad-y-convenios-internacionales-6986?state=published>

Mexico, but it applies to similar contexts in countries with a cultural tradition linked to ore extraction industries, which lack a clear regulatory framework on mine closures and the fate of this kind of heritage (Morales & Domas, 2020).

Through in-depth analysis, the research seeks to understand how technical and legal tools related to mine closures, primarily focused on environmental considerations, have overlooked essential aspects of the social and cultural dimension of this heritage, as Norbert Tempel points out in his chapter, “when a mine is abandoned, the remediation of environmental pollution – the cleaning up of a site so that no traces are left – takes priority over the preservation of cultural heritage” (Douet, 2012, p. 142). By losing built heritage, subtle issues are lost; built industrial heritage is the reflection of an entire cultural background and the components of mining heritage go beyond simple physical structures (figure 1).

The potential loss of these places goes beyond the mere disappearance of physical structures and entails the erosion of collective identity. The demolition of heritage buildings is now seen as an ecological waste and as the disposal of local identity, cultural heritage, and socio-economic values (Misiurllsoy & Günçe, 2016), and the dissolution of historical ties that connect communities to their past and play an important role in building the future (Harrison, 2015).

Due to abandonment and oblivion, a negative public perception of these spaces has risen (Loures, 2008). Despite this, there is the possibility of revitalizing these “misunderstood heritage” sites (Douet, 2012) and assigning them a new role in communities’ social and economic fabric. Some studies have identified and assessed the diverse values associated with these industrial remnants of industrial activity, including historical, technological, artistic, economic, and social values, “reflecting the connection between industrial heritage and social life, customs,



Figure 1. Mining heritage and mining industrial heritage definitions. (source: Prepared by the authors based on TICCIH, Nizhny Tagil Charter on Industrial Heritage, the Spanish Geological and Mining Institute, and an interview with Belém Oviedo Gámez, heritage historian, expert in mining industries, and founding member of TICCHI México, 2024).

and ideas” (Liu *et al.*, 2018). Additionally, these sites hold cultural values as perceived by local communities. They also serve as spaces for reflection and critical analysis of both the positive and negative aspects of mining exploitation.

METHODOLOGY

Due to the complexity of the research objectives, a predominantly qualitative mixed methodology with a descriptive scope was proposed, employing a diverse array of tools and techniques specifically designed to achieve the stated goals.

For the first objective, which involved identifying ancient colonial mining towns along the CRTA², we employed a comprehensive methodological approach that integrated historical research and cartographic analysis, Nicolas de Lafora’s 1771 map was one of several maps analyzed to create an updated map of mining towns (figure 2). Key works were consulted for the historical review, including

those by Philip Powell, Aurelio de los Reyes³, and the UNESCO CRTA Dossier⁴, as well as colonial documents from the historical archives of Hidalgo del Parral and Zacatecas. Particular attention was given to documents that described mining routes, mine locations, and the foundation of mining towns.

The second objective aimed at understanding the impact of current legislations on mine closures in these heritage sites through a regulatory analysis and a case study. National laws and regulations governing mine closures were reviewed, contrasting the results with the reality in the sites visited.

For the third objective, which consisted of learning about these sites’ potential to become development agents through adaptive use, a bibliography relevant to the topic was consulted and successful cases were sought. For the final objective, we aimed at improving our understanding of how local communities perceive the heritage value of ancient mining sites, for which surveys were designed and

2 Acronym for Camino Real de Tierra Adentro.

3 Philip Powell and Aurelio de los Reyes have a significant relationship with the subject of the CRTA due to their contributions to the historiography and the study of this historic route’s cultural heritage. For more information, see (De Los Reyes, 1991).

4 Nomination Summary CRTA UNESCO 2009. <https://whc.unesco.org/uploads/nominations/1351.pdf>.

administered to local community members in three case study sites.

Validation of the Instrument

Once all the mining towns within the context of the Camino Real were identified, three case studies were selected based on the criterion that each represented a different status of the mine site; Hidalgo del Parral, where the mine is currently a tourist site where cultural activities are conducted; Sombrerete, where the historical mine is currently abandoned; and Fresnillo, currently under extraction operations.

After selecting these paradigmatic cases, the sample size for finite populations was calculated using the QuestionPro® tool, with a 95% confidence level and a 5% error margin. Age groups and gender stratified the sample to ensure representativeness, thus better reflecting the general population's opinions. For example, in the case of Parral, where the urban population aged 15 and older amounts to 85,319 inhabitants⁵, the sample was 62 men and 64 women aged 15 to 29, 92 men and 97 women aged 30 to 59, 31 men and 38 women aged 60 and older, for a total of 384 respondents.

Initially, quick surveys were conducted to gather some preliminary opinions from the population. Then, a comprehensive survey was designed and implemented in two stages, a pilot survey with 10% of the total sample was conducted to test the reliability of the instrument using IBM SPSS Statistics®, and the final survey was administered to the full sample in the towns selected. The Cronbach's alpha value for our 18 items was .886.

First Poll:

The objective of this poll was to learn whether the population considers the mine site as their cultural heritage and it included the following questions.

1. How important is the protection of cultural heritage for you?
2. What uses would you like heritage sites to have?
3. Mention five places in your city that you consider a fundamental part of our cultural heritage.

Survey

The objective of the survey was to learn about the local community's assessment of the site's social and cultural value. It includes Age, Gender, Duration of Residence in the town, and the following sentences in the Likert scale:

1. Parral⁶ still retains its essence as a mining town.
2. Preserving the mine facilities is important for local culture.
3. The mine site contributes to Parral residents' sense of identity and pride.
4. The mine has great potential as a tourist site.
5. It is important to use the mine site appropriately so it can be visited.
6. The community should be more involved in conserving the mine site.
7. I am interested in keeping informed about actions or activities at the mine site.
8. More public resources should be invested in the preservation of the mine site.
9. The mine facilities should be preserved for future generations.
10. The stories and legends related to the mine are valuable to the community.
11. The mine should be used for cultural and educational activities.
12. The mine can generate economic benefits for the town.
13. Parral residents have an emotional connection to the mine.
14. The mine is important to our town's history.
15. Preserving the mine can improve the quality of life in the community.

16. The mine should be more actively promoted as a tourist attraction.
17. Conservation initiatives for the mine should involve young people.
18. Cultural activities at the mine site enrich community life.

RESULTS AND DISCUSSION

The results are presented in four sections. First, the identification of the former Royal Mining Towns (Reales de Minas), which are the present-day cities along the CRTA emerged in the wake of the discovery and exploitation of ore deposits, primarily silver and gold (figure 3). Second, the review of the legal framework in Mexico, and mine closure policies from the perspective of cultural heritage conservation, describing the potential risks to this heritage. Third, the potential for adaptive use of this heritage is assessed. Finally, in the fourth section, the findings of surveys gauging public perceptions of the value and importance of the industrial mining heritage in the former Royal Mining Towns are presented.

The Royal Mining Towns of CRTA

If there is one point of consensus among all CRTA researchers and historians, is that its primary driving force was mining (Bargellini, 1991; De Los Reyes, 1991; Powell & Utrilla, 1984). The silver extracted from these mines would finance conquest enterprises and the subjugation of Chichimeca territories by the late 16th century (Powell & Utrilla, 1984). Consequently, the *Reales de Minas* -as mentioned in ancient maps (figure 2) were



Figures 2a and 2b. Map of the entire border of the King's dominions in northern America by Nicolas de Lafora dated 1771's details. source: United States Library of Congress. (a) Reales de Minas symbols used by de Lafora, and (b) map fragment showing Zacatecas, Fresnillo, and Sombrerete. 1771).

⁵ Data from the INEGI Population Census 2020.

⁶ For the application of each survey, the name of the population and of the mining site of the place where it was conducted were changed.

the strategic points along the route, dictating the pace of activity throughout the journey. If one mine ceased production and another entered a period of prosperity, it could even alter the course of the route. As noted by Bagellini, "Parral became more prosperous

than Durango[...] a direct route was even opened between Parral and Zacatecas" (Bargellini, 1991, p. 22). An inventory was compiled (table 1) to catalog the historic mining towns, listing the sites identified in the maps consulted. The map developed

with this information shows how the Real de Minas sites are located along the main road, evidencing their influence on the road's layout to interconnect these points of great interest to the Spanish crown.

No.	Former Mining Town	Mine Name	Year of Foundation	Geographical Coordinates		Source	Mine Site Status
				Latitude	Longitude		
1	Comanja, Jal.	El Horcón	1531	21°19'39.76"N	101°42'24.80"O	Humboldt ⁷	Abandoned
2	Zacatecas, Zac.	Quebradilla - El Edén	1546	22°46'34.29"N	102°34'19.45"O	Powell ⁸	Adaptive use
3	Real de Asientos, Ags.	Santa Francisca	1548	22°14'18.49"N	102° 5'20.46"O	López de Haro ⁹	Partially in operation
4	Vetagrande, Zac.	La Albarrada de San Benito	1548	22°49'45.95"N	102°33'14.24"O	Humboldt	Abandoned
5	Real de Pánuco, Zac.	Nuestra Señora del Buen Suceso	1548	22°52'15.80"N	102°32'35.05"O	Humboldt	Abandoned
6	Fresnillo, Zac.	Proaño	1554	23°10'30.83"N	102°52'5.71"O	Lafora ¹⁰	In operation
7	Noria de San Pantaleón, Zac	San Pantaleón	1554	23°39'16.77"N	103°46'22.40"O	UNESCO ¹¹	Abandoned
8	Sombrerete, Zac.	Tocayos	1555	23°38'5.77"N	103°38'16.25"O	Lafora	Abandoned
9	Real de Avino, Dgo.	Avino	1555	24°31'25.04"N	104°17'57.40"O	Lafora	In operation
10	San Martín, Zac.	San Martín Sabinas	1556	23°40'17.81"N	103°44'54.86"O	Powell	In operation
11	Indé, Dgo.	Clarines de Navidad	1563	25°54'48.94"N	105°13'23.35"O	UNESCO	In operation
12	Plateros, Zac.	Santo Niño	1566	23°13'43.95"N	102°50'26.72"O	UNESCO	Abandoned
13	Santa Bárbara, Chih.	San Diego	1567	26°48'58.02"N	105°48'56.86"O	Lafora	In operation
14	Guanajuato, Gto.	Valenciana, Rayas, Sirena.	1570	21° 2'22.50"N	101°15'40.72"O	Powell	Adaptive use, Abandoned
15	Tepesalá, Ags.	Minerva	1573	22°13'24.92"N	102°10'2.77"O	López de Haro	Abandoned
16	Mineral de Pozos, Gto.	Cinco Señores	1576	21°13'30.15"N	100°30'8.70"O	Humboldt	Abandoned
17	San Luis Potosí, SLP.	Cerro de San Pedro	1590	22°13'8.25"N	100°48'5.07"O	López de Haro	In operation
18	Real de Pinos, Zac.	La Candelaria	1594	22°17'50.56"N	101°34'23.82"O	López de Haro	Abandoned

7 General chart of the kingdom of New Spain bent parallels of 16 & 38° N. 1804 by Alexander Von Humboldt <https://www.loc.gov/item/2001622416/?locid=blogint>.

8 The map "Roads and Towns on the Northern Frontier of New Spain 1550" (made by Philip Wayne Powell in 1969) which is found in the book "Soldiers, Indians, & Silver: The Northward Advance of New Spain, 1550-1600." p. 20.

9 "Geographic Map of the Kingdom of N.E." by Gonzalo López de Haro in 1810 https://bibliotecavirtual.defensa.gob.es/BVMDefensa/es/catalogo_imagenes/grupo.do?presentacion=pagina&posicion=1&pat h=143431®istrardownload=0.

10 Map of the entire border of the King's dominions in North America" from 1730 by Nicolás de Lafora (Library of Congress of the USA). <https://www.loc.gov/resource/g4410.ct000553/>

11 "General Location Map of the Sites of the CRTA Belonging in Mexico" by UNESCO 2010 <https://whc.unesco.org/en/list/1351/maps/>.

19	Ojo Caliente, Zac.	El Coronel	1597	22°34'26.47"N	102°15'10.56"O	Powell	In operation
20	Mapimí, Dgo.	Ojuela	1598	25°47'36.80"N	103°47'28.69"O	UNESCO	Abandoned
21	Minas nuevas, Chih.	San Diego	1607	26°59'40.66"N	105°43'37.42"O	Lafora	Abandoned
22	Hidalgo del Parral, Chih.	La Prieta	1631	26°56'12.47"N	105°39'50.96"O	Lafora	Adaptive use
23	San Francisco del Oro, Chih.	San Francisco	1658	26°52'40.16"N	105°50'42.76"O	Lafora	In operation
24	Santa Eulalia, Chih.	San Francisco	1702	28°35'42.36"N	105°53'13.97"O	Lafora	Abandoned
25	Noria de Ángeles, Zac.	Real de Ángeles	1705	22°26'35.94"N	101°54'36.56"O	UNESCO	Missing
26	Villa de Santo Domingo, Chih.	Mina de Potosí	1735	28°36'21.98"N	105°52'26.66"O	Humboldt	Abandoned
27	Santa María del Oro, Dgo.	Mina del Sapo	1758	25°57'13.54"N	105°21'52.25"O	Lafora	Abandoned
28	Guanaceví, Dgo.	Santa Cruz	1790	25°55'53.88"N	105°57'16.84"O	Lafora	In operation

Table 1. CRTA Royal Mines in chronological order of foundation, (source: Prepared by the authors, 2024).

Mine Closure Legislation: A Purely Environmental Perspective

The 27th article of the Mexican Constitution Article 27 of the Political Constitution of Mexico¹² establishes the fundamental principles related to land ownership and natural resources in Mexico. In general terms, this law section seeks to ensure the nation’s ownership of natural resources, including ore deposits. Regarding mining, the first clause establishes that ore resources are the property of the nation, which means that the Mexican government has the authority to grant concessions and regulate their exploitation. This has significantly impacted how mining activities are conducted in the country because companies interested in mineral exploitation must obtain concessions and comply with government-established regulations. Precisely in the realm of regulatory compliance, Mexico currently faces an unresolved issue concerning the cultural heritage of the mining industry.

The reason is that mining operations are regulated by the Mining Act derived from the Constitution, and this act fails to address matters related to the cultural heritage of mining sites.

The Mexican Mining Act

The Mexican Mining Act specifies the government’s regulations in the mining field. In its latest amendment dated May 8, 2023, chapter four, it addresses the obligations imposed on concessionaires benefiting from mining assignments. Among these obligations, clause XX, states that they must “have a mine closure program authorized by SEMARNAT (Secretariat of Environment and Natural Resources) and provided for in the General Act of Ecological Balance and Environmental Protection”¹³. The new act introduces an orderly mine closure process that will include a closure work plan to the mandatory environmental measures so that

at the end of the mining activity, restoration or remediation is carried out depending on the ecological impacts caused. However, the assessment and conservation of mining cultural heritage has not been included. The Mexican General Act on Ecological Balance and Environmental Protection Article 107B, in Chapter II of this legal tool –dealing with the preservation and sustainable use of land and its resources– requires mining concession holders to have a mine closure program¹⁴.

SEMARNAT Mine Closure Plan Program

The plan describes how the dismantling of mining facilities will take place, including the removal of equipment, machinery, and obsolete structures. No mention is made in any of the current criteria to the assessment of the cultural value of the mining facilities and their adaptation potential to new compatible uses, as is currently the case in the Tocayos

12 <https://www.supremacorte.gob.mx/sites/default/files/cpeum/documento/2017-03/CPEUM-027.pdf>.
 13 <https://www.diputados.gob.mx/LeyesBiblio/pdf/LMin.pdf>.
 14 <https://www.diputados.gob.mx/LeyesBiblio/pdf/LGEEPA.pdf>.

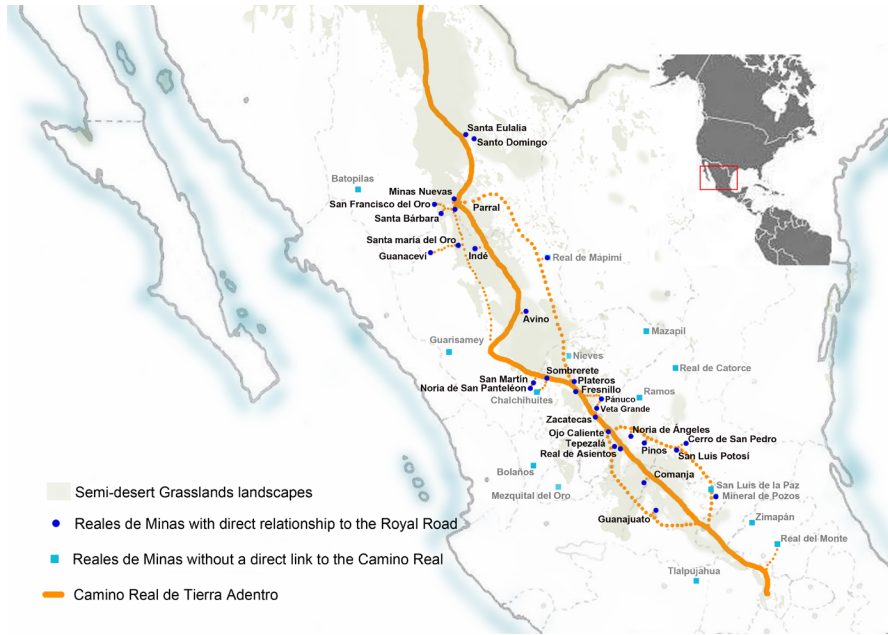


Figure 3. Map of the CRTA Reales de Minas (source: Prepared by the authors based on the New Spain old maps and Camino Real bibliography, 2024).

Mine in Sombrerete, which is under the dismantling process (images 1 and 2). The primary objective of Mine Closure Plans is to mitigate environmental impacts, focusing on site remediation, risk minimization, and adequate reforestation. Among the recommendations is the dismantling of the facilities “from their foundations”, as well as the removal of obsolete machinery and equipment. (SEMARNAT, n.d.). This type of approach is the one that predominates in North and South America and is detailed in the Methodological Guide for Mine Closure (Morales & Domas, 2020). This study was funded by the UN Economic Commission for Latin America and the Caribbean and German cooperation and analyzes the current legislation in several Latin American countries. Therefore, it can be stated that in Mexico the sustainability of mining cultural heritage is not contemplated in the legislation, unlike instruments available in European countries, including England and Spain (Alberruche

del Campo, 2012). This explains why ancient mining sites that still exist are those that were abandoned several decades ago due to missing government regulations at the time;



Image 1. Tocayos mine dismantling process in the last 20 years. Comparative analysis with satellite views of Tocayos mine's facilities in Sombrerete, Zac in (a) 2003 and (b) 2023 [23°37'51.84" North latitude and 103°37'26.96" West longitude], (source: Google Earth, 2023).

“many mining companies that operated until the 1990s simply ended their activities and withdrew without taking any action to restore the mined site” (Silva Ontiveros, 2021, p. 4).

The Re-Adaptive Potential of the Mining Industrial Heritage and its Interrelation with Urban Sustainability

Mine closure in the context of the mining industry poses significant challenges in terms of industrial heritage conservation. Despite the evolution of the concept of heritage and efforts to develop a culture of mine closure planning, there is a worrying lack of consideration for the sustainability of cultural heritage in this process. Mine closure planning focuses on an environmentalist approach but pays no attention to cultural aspects. Numerous authors have underscored the significance of adaptive reuse in the preservation of industrial heritage. Prominent figures such as Mark Watson, Benjamin Fragner, and Jaime Migone have championed this approach. For this study, one of the solutions for urban obsolescence in ancient mining towns is a keen focus on repurposing abandoned mining structures and facilities. This strategy has been acknowledged for its substantial positive effects on sustainable development across multiple domains, including economic, social, cultural, and environmental aspects. “Progressively, more companies are identifying opportunities to repurpose mine infrastructure and are taking action in this regard. In addition, there

is increased government and community recognition of the environmental, social and economic benefits associated with these opportunities” (Finucane & Tarnowy, 2019).



Image 2. Tocayos mine in Sombrerete, currently not under operation and in a dismantling process (source: Author's own, 2023).

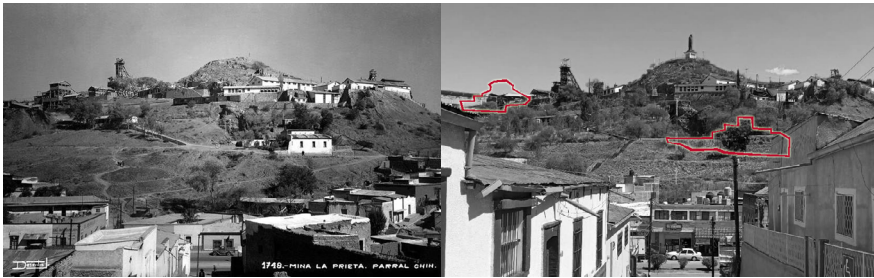


Image 3. Lost structures from La Prieta mine. Both images provide a photographic comparison as they were taken from the same place at different times, (a) in 1935 and (b) in October 2023 (source: (a) Historical Archive, Parral, 1935; (b) Author's, 2023).

Vardopoulos notes that adaptive reuse drives economic development, social regeneration, ecological efficiency, and the preservation of cultural heritage (Vardopoulos, 2019). Mısırlısoy has developed a strategic model for the adaptive reuse of heritage buildings,

including abandoned or underused industrial heritage buildings. This model defines a process. The first step involves the identification of decision-making stakeholders, including users. The next steps consist of the analysis of existing structures, considering

the needs of the local community, and the definition of conservation focuses on determining the potential for adaptive reuse (Mısırlısoy & Günçe, 2016).

However, current planning standards pose challenges, as industrial heritage sites that do not meet certain safety standards can face demolition (Sun et al., 2019). To address these issues, the International Council on Monuments and Sites (ICOMOS) and The International Committee for the Conservation of the Industrial Heritage (TICCIH) have promoted the Dublin Principles for the conservation of industrial heritage, highlighting the vulnerability of this heritage and the need for awareness-raising, documentation, recognition, and protection¹⁵.

The adaptive use potential of mining industrial heritage is revealed as a valuable tool to achieve a balance between financial investment, environmental conservation, cultural heritage protection, and urban regeneration. The adaptive reuse of built heritage, mainly in mining heritage contexts, can be considered an emerging discipline with a holistic vision that responds to the conditions of contemporary society in search of more sustainable practices in line with our time (Plevoets & Van Cleempoel, 2019). The examples that have emerged on the international scene are as varied as the use of old mine tunnels as ideal cellars for aging wines and cheeses, considering that underground galleries preserve constant temperatures between 12 °C and 13 °C, and humidity of around 60 %. This is the case of the Moya mine in the town of Humahuaca, Jujuy, Argentina, or the Italian “sparkling” wine in Paola mine, Turin, northern Italy. Additional examples include eccentric hotels, such as Sala Silvergruva in Västmanland, Sweden; nightclubs like La Mina Club, Zacatecas, Mexico; and impressive chapels located in the Wieliczka salt mine in southern Poland. Many of these examples are site museums and have guided tours, such as the Mina de

¹⁵ Dublin Principles ICOMOS 2011.

Acosta Site Museum, in Mineral del Monte, Hidalgo, Mexico; La Prieta mine in Parral, Chihuahua, Mexico; or the Chiflón del Diablo coal mine in the city of Lota, southern Chile. Other examples include cultural centers, such as the Zollverein complex in the city of Essen, Germany, which has become a cultural reference in Europe, and the list goes on: adventure tourism, sports caving, potholing, scientific research, academic training in topics related to mining, arts, and crafts. Creativity is required to transform these environmental liabilities into cultural assets.

In developing countries, cities with ancient extractive industrial traditions that undergo adaptive reuses of their industrial heritage become a crucial alternative in the transition to new economic sectors (Yuan *et al.*, 2019). However, it is important to note that this heritage has been underestimated in terms of its sociocultural and economic potential compared to other types of cultural heritage, resulting in a relative paucity in terms of research (Varriale *et al.*, 2023). Regarding the sustainability of industrial heritage, two fundamental objectives of the new protection policy are the creation of a comprehensive building registry and raising public awareness about the value of this type of heritage (Vukmirović & Nikolić, 2023). It is essential to involve society in the preservation of this historical and cultural legacy.

The Assessment of Mining Heritage by Current Societies of Former Mining Towns

To better understand societal perception and interest in preserving mining industrial heritage, a survey was conducted among residents of Hidalgo del Parral, Fresnillo, and Sombrerete. The results were revealing: over 75 % of those interviewed in Sombrerete identified their town as essentially a mining town. In an initial poll, however, when asked an open question about their key cultural heritage sites without prompting about mining, the mine was mentioned by only 8.6 % of those interviewed. In contrast, nearly 70% of respondents in Parral -where the mine site has an adaptive reuse- considered the mine as a central part of their cultural

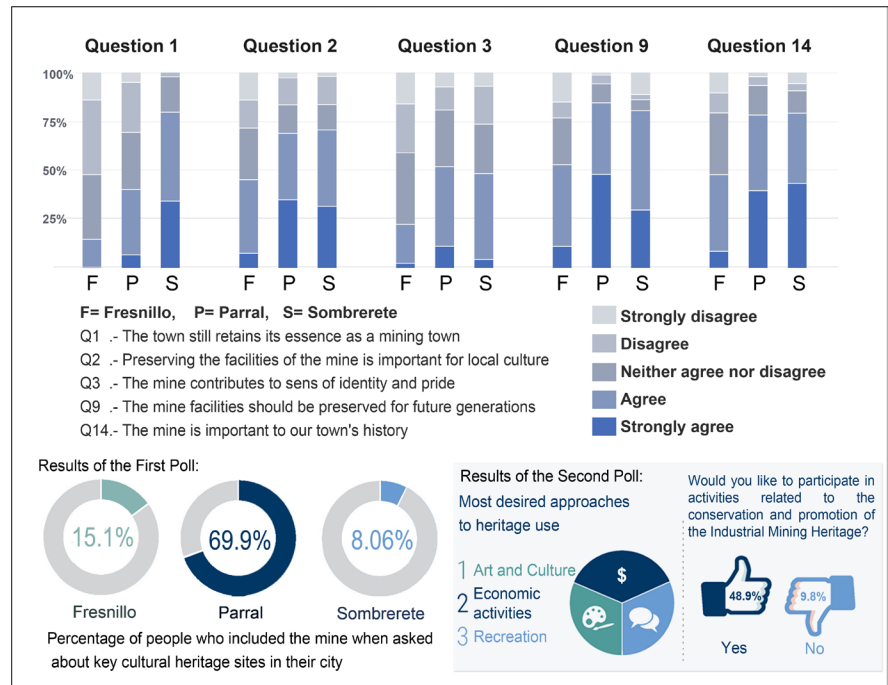


Figure 4.- Distribution of responses to certain key statements. Five key statements were selected to make the infographic clearer (source: Prepared by the authors based on research/data, 2023).

heritage, though less than 50% felt that Parral still retained its nature as a mining town. Similarly, around 50 % of people surveyed in Fresnillo, acknowledged the mine's *historical significance*, and believed its facilities should be preserved; yet they felt that their city did not preserve its mining town essence. In all three cities, close to 50% of those interviewed expressed an interest in participating in activities related to the conservation and promotion of their mining heritage (figure 4).

CONCLUSIONS

The discoveries of ore deposits, mainly silver, in the northern center of New Spain, defined the route of the CRTA and served as the driving force for the Spanish conquest. The venture continued to meet resistance from north indigenous tribes, where the silver extracted from the mines would be used to fund additional conquest and domination

enterprises of the Chichimeca territories from the fall of Tenochtitlan in 1521 until the end of the 16th century.

The former Reales de Minas retain a strong cultural burden and identity with mining activity, even in places where operations stopped decades ago, as shown by surveys in towns such as Parral, and Sombrerete. Despite this, no plans are in place in Mexico for the preservation and management of the mining industrial heritage, not even in sites where this heritage can be visited for cultural tourism purposes. This is the case of "La Prieta" mine in Parral, which to date lacks a management plan, resulting in a constant loss of the integrity and authenticity of the site (image 3). It is important to acknowledge, however, that the identification of a site as a cultural heritage, specifically within the evolving concept of mining heritage, is relatively recent.

In addition, the study allowed us to see when mine sites have restricted access to visitors (as in Proaño mine, Fresnillo, image 4) society is not aware of this heritage. The interest in the rescue and conservation of old mine facilities is greater in cities where people have had the opportunity to visit them. This reminds us of the famous phrase in conservation: "You cannot love what you do not know, nor defend what you do not love". - Adaptive reuse must be considered in mine closure planning to ensure the sustainability of valuable industrial heritage within new sustainable urbanism. Reusing buildings with cultural significance is essential, adapting them to current uses. Industrial heritage reuse can catalyze positive changes by contributing to environmental, social, cultural, and economic aspects, particularly in protecting cultural heritage, fostering social cohesion, and empowering community participation. Such projects positively impact security perception and economic development, priorities on the national agenda. Adaptive reuse promotes sustainable development goals, turning historically exploitative sites into spaces for critical reflection and improving ethical, environmental, and social responsibilities. The active participation of society, the consideration of adaptive reuse, and a broader perspective on sustainability are essential to



Image 4.- Old Cornish pumps of English technology at Proaño mine, Fresnillo, (source: Authors' own, 2024).

preserve and revitalize the valuable mining industrial heritage and mitigate the negative impacts that the depletion of deposits has brought to local communities. The methodology applied in this article proved that society cares much more than expected about preserving these types of sites. Additionally, we consider there is significant potential for successful restoration

to improve economic opportunities for such abandoned mines, presenting a challenge to these communities to preserve their heritage. This article highlights the cultural value of the CRTA mines and advocates for the careful legal registration of relevant mines to adopt legislative changes, aiming for sustainable adaptive reuse plans. ▲■■

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