ASIAN NETWORK OF INDUSTRIAL HERITAGE

亞洲產業文化資產平臺

Eighth Issue BULLETIN | 專刊 第八期

Jun. 2022

ISSUE REPORTS

Cross-Disciplinary and Sustainable Future of Cultural Heritage

本期專題

文化資產跨域與永續未來

CONTENTS 目錄

Worldwide Trends 國際動態

- Industrial Legacies and Cultural Landscapes in World Heritage Sites—Chun-His Wang (Assistant Professor, Graduate Institute of Folk Arts and Cultural Heritage, National Taipei University)

  世界遺產中的產業文化資產與文化景觀—國立臺北大學民俗藝術與文化資產研究所助理教授 王淳熙

Book Review 書評

- (Review) "*Theatres of History & Memory: Industrial Heritage of 20th Century Singapore*"—Szu-Ling Lin (Profess of the Department of Cultural and Creative Industries, National Pingtung University, Taiwan)

  （評）《記憶劇場：20 世紀新加坡的工業遺產》—國立屏東大學文化創意產業系教授 林思玲

Events 活動資訊

- The Sixth Fuel Documenta 2022:The Sixth Fuel Factory in Motion, TAIWAN

  2022 六燃文件展：移動的六燃

- The World of Railways: Ting-Wei Ku's Railway Photo Exhibition

  鐵道臺灣 · 火車世界－古庭維攝影展

- Industrial Heritage: Free Training And Summer School, ITALY

  產業文化資產：免費線上培訓與夏令營

- The 24th International Conference on Industrial Heritage -"Industrial Sites and Public Works. From local to universal", SPAIN

  西班牙第 24 屆產業文化資產國際研討會「工業遺址與公共工程 - 從在地到全球」

Contact Information 聯絡資訊

Asian Network of Industrial Heritage
亞洲產業文化資產平臺
No.362, Sec.3, Fuxing Rd., South Dist., Taichung City, 402, Taiwan (R.O.C.)
Cultural Heritage Park, Ministry of Culture, Ya-Tang Hall Building E
臺中市南區復興路三段 362 號
文化部文化資產園區雅堂館 E 棟
+886-965-569-680
anih.asia@gmail.com
Official Web: https://anih.culture.tw
Facebook: http://www.facebook.com/ANIH.ASIA/

Facebook 臉書專頁　Official Web 官方網站　Twitter

Editor's Preface 編者的話

— Fang-Jay Rong (Associate Professor of Department of Environmental and Cultural Resources, National Tsing Hua University, Taiwan)
國立清華大學環境與文化資源學系 榮芳杰

With many countries around the world vigorously promoting the UN Sustainable Development Goals (SDGs), Taiwan's public and private sectors have also hopped on the sustainable development bandwagon, producing various self-evaluation or sustainability reports in response to the SDGs. At first glance, Taiwan's cultural heritage community seems to be slow to react to these sustainability trends. However, it's not that the community has not done anything at all; it's that sometimes we don't realize that our everyday work can be further expanded and aligned with the SDGs. A good example is our efforts in cultural heritage education and interpretation. Echoing "SDG 4: Quality Education" and "SDG 11: Sustainable Cities and Communities," this issue focuses on how cultural heritage education can harness the knowledge embedded in industrial heritage sites to create interdisciplinary learning opportunities.

In the "Issue Reports" section, Ms. Pei-Syuan Yu and Prof. Jan-Yen Huang from the Taipei National University of the Arts present how private coal mining museums operate in Taiwan and use this as an example to discuss the relationship between the museums and the diverse narratives of cultural heritage, while Prof. Sin-Heng Wang from the National Yunlin University of Science and Technology shares his thoughts and experiences in implementing the coal mining heritage education programs at the New Pingxi Coal Mine. In addition, Ms. Xiao-Xuan Jiang from the Center for Environmental Education, NTHU, describes how industrial heritage sites can be transformed into educational venues, using a field study program at the Xihu Sugar Refinery in Changhua as an example, and Mr. Chun-Ta Huang, a researcher at the Institute for Historical Resources Management, illustrates how industrial history can be linked to science education in an interdisciplinary manner, with the science education programs developed from the Jianguo Brewery's existing resources as examples.

In this issue, a new section named "International Research" has been added. In this section, important papers from international journals will be presented in a bilingual format to help readers keep abreast of the latest academic progress on industrial heritage. This issue features an article entitled "The Sustainability of Industrial

隨著全世界許多國家大力推廣聯合國「永續發展目標」(SDGs) 的理念，臺灣公私部門也隨即搭上這班列車，提出各種自評報告或永續報告來回應聯合國永續發展的目標設定。臺灣的文化資產面對永續的議題似乎起步慢了一些，但也不是我們沒有作為，而是我們沒有意識到許多我們平常在做的事情，有些是可以深耕下去往永續發展的目標前進。其中，文化資產的「教育與詮釋」工作正是其中一個很好的切入點。本期的專題文章也順應著聯合國 SDGs 的目標 4 與目標 11 一起探究文化資產的教育內涵如何與產業文化資產場所隱藏的跨領域知識結合。

在專題文章的部分，本期邀請臺北藝術大學的余佩軒小姐與黃貞燕教授，從臺灣民間的煤礦博物館的經營面來看文化資產的多元敘事與博物館之間的關係。另外也請雲林科技大學的王新衡教授從他在新平溪煤礦場域中，如何執行他在煤礦產業文化資產教育的想法與經驗。清華大學環境教育中心的江篠萱小姐，則從彰化「溪湖糖廠」的現地教學課程經驗來分享產業文化資產的教育轉譯方法。最後，台灣歷史資源經理學會的黃俊達研究員，則從建國啤酒廠出發，分享他們如何結合科學教育館與建國啤酒廠，一起探索產業歷史與科學教育跨域連結的經驗。

本期新增了一個專欄—「國際研究」，希望未來可以即時的分享國際間重要的學術期刊論文，透過雙語呈現的方式讓更多讀者掌握目前關於產業文化資產的學術進展。本期專欄收錄的是 2021 年甫刊載在國際期刊《Sustainability》上的研究論文，題目為〈歐洲遠離經濟發展中心的工業遺產旅遊之永續性：以兩例個案研究為例〉。作者 Xosé Somoza-Medina 與 Obdulia Monteserín-Abella 分別是西班牙地理學領域相關的研究學者。該篇文章主

Heritage Tourism Far from the Axes of Economic Development in Europe, Two Case Studies." It's an article by Spanish geography researchers Xosé Somoza-Medina and Obdulia Monteserín-Abella, that was published in 2021 in the international journal Sustainability. Using questionnaires as the primary instrument, this study examines the challenges faced by Europe when attempting to operate industrial heritage sites as tourist attractions in a sustainable manner. Two ERIH anchor points in Spain, Almadén (a mercury mining site) and Sabero (a coal mining site), are used as case studies. Both mining sites are well suited for heritage education and are therefore popular in the tourist market. However, the two heritage sites are facing a situation in which the government has invested significant resources in the operations of the site, but has failed to revitalize the local economy. This article provides some insightful observations that Taiwan can draw from.

In the "Worldwide Trends" section, Prof. Chao-Shiang Li from the China University of Technology recapitulates "Linking: Exchange Forum for International Organizations of Cultural Preservation," an international conference organized by Bureau of Cultural Heritage, Ministry of Culture in April this year, with a special focus on the interdisciplinary exchanges between cultural heritage and museums in Taiwan. Mr. Doane Don, currently working at Stephen Levrant Heritage Architecture in the UK, introduces the CONSIDER project initiated by the European Union in 2020. This project, scheduled for implementation from 2021 to 2025, promotes the idea that sustainable management of industrial heritage can play a critical role in urban development, which is well worth learning more about. This section also includes an article by Prof. Jieh-Jiuh Wang from Ming Chuan University, who presents his observations on the latest worldwide trends in the relationship between industrial heritage and climate change, and an article by Prof. Chun-Hsi Wang from National Taipei University, who discusses the differences between "industrial heritage" and "cultural landscape" under UN's World Heritage framework.

Finally, this bulletin features a book review by Prof. Szu-Ling Lin from National Pingtung University. The review comments on the book *Theatres of History & Memory: Industrial Heritage of 20th Century Singapore*, written jointly by five experts from different fields, including Loh Kah Seng, Alex Tan Tiong Hee, Koh Keng We, Tan Teng Phee, and Juria Toramae. The book offers readers different perspectives on how Singapore's industrial heritage has evolved with the changing social context over time.

要是透過問卷調查探討歐洲的產業文化資產在推動觀光旅遊市場時，目前所遭遇到在營運策略方面不易達到永續發展的問題，並且藉由同屬歐洲工業遺產路徑 (ERIH) 中的兩個錨點—西班牙開採汞礦的 Almadén 與開採煤礦的 Sabero 兩個案例來剖析。這兩個西班牙的礦業文化資產都具有高度的產業文化資產教育特質，因此對於觀光旅遊市場有著一定程度的吸引力。但卻在經營策略上面臨到政府資源的投入甚鉅，而似乎無法帶動產業文化資產地點在地經濟發展的復甦，這篇文章提供了一些觀察重點可供臺灣借鏡思考。

在國際動態方面，中國科技大學的李兆翔教授介紹今年四月由文化部文化資產局舉辦的國際組織交流論壇活動，特別是針對臺灣的文化資產與博物館的跨領域交流成果。目前任職於英國 Stephen Levrant Heritage Architecture 事務所的董昱分享了歐盟於 2020 年推動的 CONSIDER 專案計畫，這個預計從 2021 年至 2025 年執行的專案計畫主要是在倡議產業文化資產的永續管理可以扮演都市發展中的重要角色，值得大家更進一步認識。銘傳大學的王价巨教授，則針對產業文化資產與氣候變遷的關係提出一些最新的國際趨勢觀察。臺北大學的王淳熙教授則是從世界遺產中的「產業文化資產」與「文化景觀」案例來談兩者之間的差異。

最後，本期也收錄了一篇《記憶劇場：20 世紀新加坡的工業遺產》一書的書評，由屏東大學林思玲教授針對 Loh Kah Seng、Alex Tan Tiong Hee、Koh Keng We、Tan Teng Phee，以及 Juria Toramae 等五位不同領域的專家學者，提出不同視角下新加坡產業文化資產在常民生活下的變遷過程。

The Diverse Narratives of Cultural Heritage and Museums: Inspiration from Private Coal Mine Museums in Taiwan

文化資產的多元敘事與博物館：臺灣民間煤礦博物館的啟發

Pei-Syuan Yu (M.A., Graduate Institute of Museum Studies, Taipei National University of the Arts), Jan-yen Huang(Associate Professor, Graduate Institute of Museum Studies, Taipei National University of the Arts)

國立臺北藝術大學博物館研究所碩士 余佩軒、國立臺北藝術大學博物館研究所副教授 黃貞燕

Keywords: Critical Cultural Heritage Theory, Museums, Coal-mining Industrial Heritage

關鍵字：批判文化資產理論、博物館、煤礦產業文化資產

Industrial Heritage and Local Societies

Industrial heritages are remnants of industrial civilization, and the content and categories within are diverse and complex - possessing historical, technological, scientific, social, and cultural value. The 2003 Nizhny Tagil Charter for the Industrial Heritage points out the importance of the value, identification, record, and research of industrial heritage and states that they should be protected by law. The charter also advocates for the education, exhibition, and interpretation of industrial heritage. In addition to the aforementioned aspects, the 2011 Dublin Principles also emphasized the importance of the techniques and memories – intangible cultural assets – held by workers themselves. These initiatives have extended the preservation and maintenance of industrial heritage from tangible infrastructures, such as venues, buildings, and facilities, to include laborers, immigration, and self-identity – even encompassing the generational memories of local societies and topics related to sustainable development.

Yet the preservation, education, and promotion of industrial heritage can be extremely difficult. First, the challenges encountered with preserving industrial heritages include the large scale of the sites themselves, high cost of maintenance, and difficulty with repurposing the space. Even if the space and buildings are preserved, the equipment, artifacts, and traces of laborer activity are often the first to be sacrificed when the heritage site is repurposed. As a result, the finer details of the industry - and of the life of the laborers - become difficult to understand. Also, society's recognition of the value of industrial heritage is influenced by a host of complicated factors, including structural changes in the economy, environmental problems associated with industrial heri-

產業文化資產與地方社會

產業文化資產是工業文明的遺存，其組成內容與類型是多元而複合的，具有歷史、科技、科學、社會與文化的價值。2003 年《下塔吉爾憲章》（*Nizhny Tagil Charter for the Industrial Heritage*）指出產業文化資產的價值、鑒定、記錄和研究的重要性，必須透過法令制度來保護，同時推動產業文化資產的教育、展示與詮釋。2011 年《都柏林原則》（*Dublin Principles*），在前述認知之外特別強調了工作者的技術與記憶等無形文化資產層面，具有相同的重要性。如此的主張讓產業文化資產保存維護的關懷，從原本硬體的場域、建築與設備，逐漸地擴大到與勞工移民、自我認同，甚至地方社會的世代記憶、永續發展有關的議題。

然而，產業文化資產的保存實務與教育推廣的難度很高。首先，產業文化資產本身具有規模龐大、維護資本高、再利用困難等問題，即使場域與建築被保存下來，機具文物與勞動者活動痕跡，常是再利用計畫下最早被清空處理的對象，如此一來，產業的內涵與勞工生活面貌都不易理解。此外，社會對產業文化資產價值的認知，更受到種種複雜因素的影響，例如，經濟結構的轉變、產業文化資產帶來的環境問題、勞資爭議等。產業文化資產的保存維護如何具有當代性與未來性，是個困難的課題。

臺灣的煤礦產業文化資產保存活用與博物館

煤礦產業文化資產的保存維護在臺灣，有一個很特別的現象：民間設立經營博物館是現階段保存推廣的主要模式，八座煤礦博物館中，六座由民間設立經營。民間館的設立者，如果不是自身有從事礦業經驗、就是有個從事礦業的父親，設立的動機包括感念父執輩辛勞付出、記錄家族史與礦業文化，或者為凸顯礦工勞動者的經歷、爭取礦工權利。

公立煤礦博物館委託專業公司規劃的保存內容與展覽，將重點放在地面上的、以政府機構或公司經營者為核

tages, labor disputes, etc. As such, the preservation and maintenance of industrial heritage for the modern day and the future remains a problem to be solved.

The Preservation and Use of Mining Industrial Heritage and Museums in Taiwan

The preservation and conservation of Taiwan's mining industrial heritage is characterized by a very interesting phenomenon: privately maintained museums are the primary mode of preservation and promotion, as six out of the eight of Taiwan's current mining museums are privately owned. The founders of these museums were either involved in the mining industry themselves, or descended from those who were, and established the museum to commemorate the labor and dedication of their forefathers, preserve the record of their family history and the mining culture, highlight the miners' hardship and contribution, and advocate for the rights of miners.

Public mining museums rely on professional exhibition companies to plan the preservation of the contents and exhibitions of the museum themselves. The emphasis is then placed on the history and technology of the coal mining industry "aboveground" – primarily on government institutions or business operators – as well as the preservation of information and static displays. In comparison, private museums focus on what lies "underground," such as the mining tunnels, the life experiences of the miners, as well as the dynamic preservation of mining technology. They place important value on bearing witness to the techniques, artifacts, and equipment used by laborers and often spare no expense to repair the main mining tunnels and restore the pneumatic devices and mining vehicles – all of which can be viewed as what mine owners and miners consider to be the "authentic" industrial heritage of the mining industry.

Yet why are the descendants of miners dedicating themselves to the preservation and record of the knowledge and memories once possessed by their mining ancestors? The answer can perhaps be found in the unique characteristics of Taiwan's mining industry. Unlike major coal-mining nations, Taiwan has mostly thin coal seams that are riddled with many fault lines, meaning that the seams are often not contiguous. This adds to the difficulty of mining, requiring extensive human labor to

心的煤礦工業與技術史，以及相關的資料保存與靜態展示，相較之下，民間煤礦博物館關注的重點是地面下的坑道知識、勞動者的生命經驗，以及動態的技術保存。民間館高度重視那些見證勞動技術與經歷的文物與設備，也不惜成本修築礦坑主坑道，讓氣動裝置、工作車輛動起來——這可以視為礦主礦工們所認同的煤礦產業文化資產「真實性」之內涵。

礦工後代為何積極投入心力保存紀錄礦工的知識與記憶？從臺灣煤礦產業特色可窺見端倪。不同於其他煤礦大國，臺灣大部分為薄層煤炭，加上位處於斷層帶，導致煤層欠缺延續性，因此開採不易，時常需要透過大量勞力，深入漆黑的礦坑內以手工具採掘，開採越深、風險越高。煤礦的開採，支持了臺灣近代化工業發展，也寫下一頁頁非尋常可以想像、又辛勞風險又高的礦業史。

由於臺灣各地煤礦地質各有特性，加上歷史背景與公司型態與產權各異等因素，煤鄉有各自的知識體系。此外，由於民間煤礦博物館經營者立場的多樣性，包括老礦工、礦主二代與礦工二代，各個館舍保存的文物、敘事觀點與經營方針皆不同。這使得每一座民間煤礦館都有自己的獨特性與生命力。

例如，礦主二代成立的新平溪煤礦博物館，由於經營者後代的自我意識，提出具有企圖心的願景，致力該礦區資料的收集、園區的整頓活化，讓有 80 年歷史的礦業小火車復駛等，參與文化部文化資產局國際礦業產業文化資產交流活動後，很快地意識到新平溪煤礦的保存在亞洲與世界的意義。

猴硐坑礦業休閒園區，由於父親交代要讓礦業文化發揚光大，礦工二代跳入經營，雖然有父親長期累積的大量文物，但由於園區經營的實務考量，在熟悉礦業的機電師協助下，以乘坐作業車與體驗氣動採礦工具，讓觀眾輕鬆地認識辛勞的礦工作業，成為園區經營的亮點。

老礦工手工打造的猴硐礦工文史館，最初是為了聯繫情感，而後漸漸成為自我發聲、爭取權益的交流平臺。由於文史館的文物緊緊扣合著老礦工們自身的生命經驗，老礦工們漸漸鬆口與昔日夥伴或者來訪者分享，長期來不太願意和家人訴說的礦業記憶，文史館也逐漸地變成一個具有高度敘事魅力的場域：文史館的文物與老礦工現身說法的導覽，讓歷史資料的文字或數字顯得立體而鮮明，揭露了在公立館中隱晦的負面礦業史，以及勞工階級的辛酸血淚。以文史館為平台，猴硐的老礦工們開始和各式各樣的人們交流，對礦業文化認同有了更多自信，同時也有了新的行動力量。

hand-mine coal reserves deep within pitch black tunnels - the deeper they go, the higher the risk. The coal mining industry supported Taiwan's modern industrial development, but also created unimaginable risk and harsh labor conditions for the miners – all of which are part and parcel of the extensive mining history.

The geology, historical background, type of company, and property rights differed across coal mines in Taiwan, and as such, each coal-mining town has its own system of knowledge. Additionally, the operators of privately owned mining museums are often diverse and include former miners and the descendants of mine owners or miners. Therefore, the artifacts, narratives, and operational model of each museum differ as well. This imbues each private museum with its own unique characteristics and vitality.

For example, the XPX Coal Mining Museum, founded by highly motivated, second-generation mine owners, has set ambitious visions. They have been dedicated to gathering information on the mine and revitalizing the area. Moreover, they have resumed operations of the eighty-year-old mining train and, after attending an international exchange event for international mining industry heritages by the Bureau of Culture Heritage of the Ministry of Culture, quickly realized the importance of preserving the coal mines in New Pingxi for Asia, as well as the entire world.

Houtong Leisure Park was established because the founder's father had asked that mining culture be preserved and promoted. The second generation of miners leapt to the task and although their father had accumulated a large number of artifacts throughout the years, they chose to focus on practical operations for the park. With the help of mining technicians, the highlight of the museum is now centered on attractions that allow visitors to ride in mining vehicles and try out pneumatic mining tools – allowing them to experience first-hand the intensity of mining operations.

The Houtong Coal Miner Culture & History Hall was founded by old miners who originally had intended it as a place for community members to meet and network. It eventually transformed into a platform for miners to speak out and advocate for their own rights. Because

Figure 1. Excavation and mining of underground tunnels is the highlight of the Houtong Coal Miner Culture & History Hall guided tours. (Photo credit: Jan-yen Huang)

圖 1：地下坑道如何開採挖掘，是猴硐礦工文史館導覽的重點。（圖片來源：黃貞燕）

Figure 2. The hands-on exhibition of pneumatic coal-mining devices is a highlight that the Houtong Leisure Park has been promoting. (Photo credit: Jan-yen Huang)

圖 2：氣動採煤裝置體驗，是猴硐坑礦業休閒園區經營的亮點。（圖片來源：黃貞燕）

Figure 3. An exhibit at the Houtong Coal Miner Culture & History Hall displays mining tools and scenes of miners working in tunnels. (Photo credit: Jan-yen Huang)

圖 3：猴硐礦工文史館展示一景，礦工採礦工具與坑道內工作景象。（圖片來源：黃貞燕）

artifacts in the hall carry the individual and life experiences of the old miners themselves, the miners have gradually loosened up and begun to share their old memories with former co-workers and visitors – experiences that they had long been reluctant to share with even their family. The hall has morphed into a space rife with alluring stories and narratives, and old miners give guided tours to explain the artifacts on display. Historical data and information are made vibrant with realism, revealing the darker side of mining history, as well as the adversities suffered by those of the labor class – history that is often glossed over in public museums. Old miners from Houtong use the hall as a platform to exchange and share with people from all walks of life and cultivate

文化資產的社群行動、多元詮釋與博物館

前述臺灣民間礦業博物館的行動與意義，呼應了批判文化資產理論的主張。Laurajane Smith（2003）指出，文化資產詮釋不能剝奪其本身在情感層面、歷史複雜層面的多元性。文化資產不應該僅是過去所認為的單純事物（thing），關注文化資產對話的過程（process）更為重要。Raphael Samuel（1994）提到，文化資產不僅僅是一項社會運動，也是關於身份、地方和記憶，帶有主觀性的政治協商。

David Uzzell（2008）則指出，文化資產之所以引起我們共鳴，是因為它不僅關係到我們的過去，而且是我們現在的重要組成部分和未來。這不是在「擁有（having）的意義上，而是在「存在（being）」的意義上。

Figure 4. Chao-nan Zhou, one of the founders of the Houtong Coal Miner Culture & History Hall gives a guided tour of the miners' footpaths. (Photo credit: Jan-yen Huang)

圖 4：猴硐礦工文史館發起人之一周朝南先生帶領礦業路徑走讀，運用老照片讓參與者想像過去場景。（圖片來源：黃貞燕）

Figure 6. Elderly miners work together to maintain the main tunnel of the Rui-san Mines. (Photo credit: Pei-syuan Yu)

圖 6：由老礦工一起維護，保持完好的瑞三礦坑之本坑道。（圖片來源：余佩軒）

Figure 5. The 2017 Taiwan Field School on Discovery and Curation of Industrial Culture was held at the Taiwan Coal Mine Museum. (Photo credit: Pei-syuan Yu)

圖 5：2017 年台灣產業文化探索與策展田野學校於新平溪煤礦博物園區舉行。（圖片來源：余佩軒）

Figure 7. An old lathe that has been around for more than seventy years. Qi-hui Wang, a mining technician, is explaining its operation to the author. (Photo credit: Pei-syuan Yu)

圖 7：存放超過七十年以上的車床，王啟輝師傅向筆者解說車床的使用原理。（圖片來源：余佩軒）

confidence and identity with the mining culture. They are also given new motivation to take action.

The Practices and Diverse Expressions of Cultural Heritages by Related Communities and Museums

The actions and importance of the aforementioned privately owned mining museums in Taiwan reflect the tenants of the critical cultural heritage theory. Laurajane Smith (2003) points out that the expression of heritage cannot be without the diverse emotions and history complexities inherent within. Heritage should not be limited to “things” as in the past, but must give recognition to the discursive process thereof. Raphael Samuel (1994) argues that heritage is not simply a social movement, but also a subjective political negotiation concerning identity, place, and memory. David Uzzell (2008) further points out that we resonate with heritage because it not only concerns our past but is also an instrumental component of our present and future. It is not predicated on the meaning of “having,” but rather that of “being.”

At the same time, we see that museums that act also as platforms - combining artifacts, display, hands-on experiences and other diverse narrative elements - are becoming an important medium for various related communities to speak out and develop their own culture. This in turn allows the meaning and identity of cultural heritage to gradually integrate into local society via different experiences and discourses.

同時，我們也看到，具有平臺特質，融合文物、展示、體驗等多元敘事型態的博物館，成為文化資產不同的關係社群自我發聲與自我文化實踐的重要媒介，也促使文化資產的意義與認同透過不斷的體驗與對話，逐漸地融入當代社會生活。

Figure 8. Elderly miner Dong-han Wu explains the various items that miners carried with them into the tunnels to students and teachers from the Graduate Institute of Museum Studies, Taipei National University of the Arts. (Photo credit: Pei-syuan Yu)

圖 8：老礦工吳東漢和北藝大博物館所師生解說礦工攜帶入坑的用品。（圖片來源：余佩軒）

Figure 9. The old mining facilities have been preserved in situ in the park. (Photo credit: Pei-Syuan Yu)

圖 9：園區內仍保留昔日的採礦設施。（圖片來源：余佩軒）

Reference 參考書目

Samuel, R. (1994). ***Theatres of Memory, Volume 1: Past and Present in Contemporary Culture.*** London, England: Verso.

Smith, L. (2003). Community-driven Research in Cultural Heritage Management: The Waanyi Women's History Project. ***International Journal of Heritage Studies***, 9(1):65-80.

Uzzell, D. (2008). Where is the discipline in heritage studies? A view from environmental psychology. ***Heritage Studies: methods and approaches***, Publisher: Routledge, Editors: Sorensen, MLS and Carman, J, pp.326-333.

Pedagogical Thinking and Practice in Coal Mining Industrial Heritage Education

煤礦產業文化資產的教學思維與實踐

Sin-Heng Wang (Assistant Professor, Department of Cultural Heritage Conservation, National Yunlin University of Science and Technology)

國立雲林科技大學文化資產維護系助理教授 王新衡

Keywords: Industrial Heritage Education, Coal Mining Culture, Shih-fen Elementary School, Jui-Fang Industrial High School, Taiwan Coal Mine Museum

關鍵字：產業文資教育、煤礦文化、十分國小、瑞芳高工、新平溪煤礦博物園區

1. Core Pedagogical Thinking in Coal Mining Industrial Heritage Education

Industrial heritage is a testimony to modern human civilization. Its industrial buildings and equipment should be systematically and holistically preserved to display industrial production lines and production processes. Related industrial activities, including the extraction of raw materials, the production of goods, the use of electricity and steam energy, as well as transportation and civil engineering facilities, should all be preserved. Also within the scope of preservation is intangible heritage such as craftsmanship, trade union organizations, folklore celebrations, oral records, know-how, and common practices. Industrial heritage education should not only focus on the systematic and multi-faceted introduction of heritage values, but also on the contributions of industrial innovations and the functions of industrial facilities, so that young students can deeply understand the core values of industrial heritage. As such, it is important to emphasize the following four points in industrial heritage education.

(1) On-Site Experience at Heritage Sites

On-site teaching is of great significance in industrial heritage education. On-site visits allow students to see and touch the heritage, get a closer look at the cultural context of the industry, and connect what they learn at the heritage site with what they learn from textbooks.

(2) Holistic Understanding of Heritage

In teaching, it is important to focus not on a single object, but on the overall development context of

一、產業文化資產教育的核心思維

產業文化資產是人類近代文明的見證，應以產業建築與機具設備整體系統性保存，並從中彰顯產業生產線的序列。其中必須包含原料取用、商品生產，以及電力、蒸氣能源與運輸土木設施等遺產，另外在非物質遺產部分，還包含工藝技術、工會組織、民俗慶典、口述傳統、知識與實踐等。為讓在校學生深切理解產業文化資產的核心價值，產業文化資產教學重點除了前述系統性與複合性價值，還必須聚焦於產業革新的開拓性及產業設施的機能性。鑑此，產業文化資產的教學上應重視以下四點。[1]

（1）遺址現場的體驗

產業文化資產首重遺址現場教學，透過現地參訪讓學員實地觀賞與接觸，近距離體驗產業文化脈絡下，讓學員可從遺產實體的認知扣合從教科書學習的知識。

（2）遺產全體的掌握

教學不能僅從單一物件考量，應強調產業文化資產整體發展的脈絡，以及與在地發展的關連性，例如：提供原料、搬運物資的鐵道與運河、水庫供應水源、發電廠供電等。

（3）與在地人們的交流

可透過在地訪談獲得民俗傳說或生活面上精采故事，得知過往名人事蹟的插曲與不為人知的祕密，從小歷史扣合教科書上的大歷史，充分溝通下還可建立師生與在地交流的橋樑。

[1] 寺本潔、田山修三 (2006) 近代の歴史遺産を活かした小学校社会科授業，東京 : 明治図書出版，20-30 頁。

industrial heritage and its connection with the local environment—the raw material sources, the railways and canals for transporting materials, the reservoirs for supplying water, the power plants for generating electricity, etc.

(3) Interactions with Local People

Through interviews with local people, one can learn many folk tales and fascinating life stories, as well as historical figures' biographies, other anecdotes, and unknown secrets. This helps students make connections between small pieces of history and major historical events learned from textbooks. In addition, with adequate communication, teachers and students conducting the interviews may also build a bond with the local people for future interaction.

(4) Contributions of Heritage to the Present and Future Generations

Many industrial heritage assets have been out of service for many years, but they are still entrusted with the important task of revitalizing the local community. Therefore, heritage-related courses should be designed in a way that not only helps students understand the impact of heritage on local development and its connection to local history and development visions, but also prompts them to think about how heritage can be revitalized and contribute to society in the future.

2. Inspiration for Future Generations from the Coal Mining Industry

Over the past two centuries, the coal industry has fueled the industrial revolution and revolutionized modern civilization. Most modern developments have their origins in the use of energy from coal mines. To this day, coal remains a vital energy source for a variety of industries and is essential to people's livelihoods and power generation. Whoever controls coal resources has a huge impact on industries and economies around the world. This shows how critical coal, as a solid fossil fuel, is to the development of world civilization.

What inspirations can the present and future generations draw from the history and culture of the coal mining industry? First and foremost, we can expand our thinking and imagination about energy development. In

（4）遺產對當代與後世的貢獻

許多產業文化資產雖然已停業多年，但仍被賦予活化地方的重要任務。因此，相關課程必須讓學員理解昔日遺產對地方發展地影響，並從歷史連接至在地發展願景，促使學員想像未來活用的可能性與社會貢獻。

二、煤礦產業可帶給後世的啟示

兩百年來煤礦產業驅動了產業革命，也促進了近代文明開拓性的變革，當代絕大部分現代性發展的起點皆來自於煤礦能源革命，至今煤礦仍是各類產業、生活與發電重要的能源。即便當下若能掌握煤礦資源即可撼動全球產業與經濟，可見煤礦作為固態石化燃料對世界文明史的關鍵影響。

那麼我們可從煤礦產業的歷史文化中帶給當代與後世什麼啟發呢？最重要的知識即是拓展對能源發展的思維與想像，特別於近年新能源議題已深入社會各層面，例如：電動汽機車快速普及化的趨勢下，對能源革新知能的掌握度越高，未來越能適應產業的快速變革。另外在礦村裡強調人與人互助，例如：鄰里養兒育女的協力或是礦災救助捐款，烏托邦社會所彰顯出煤礦文化的人本價值，可作為年輕學員健全人格養成的典範。由此可知，透過文化部與文化資產局支持下的煤礦產業文化資產教學，期待以人本教育為基礎探討人類首次能源革命下的地質、產業、社會等學理，並非僅停留於煤礦開採的工程技術之層面。

Figure 1. Children at the Shih-fen Elementary School learned a coal miner's dance.

圖 1：十分國小礦工舞體驗教學。

[2] 小笠原喜康等人 (2012) 博物館教育論，東京：ぎょうせい株式會社，54頁。

recent years, renewable energy has become a topic of interest for all sectors of society—for example, in the fast-growing electric vehicle industry. The deeper our understanding of energy innovation, the better we will be able to adapt to the rapid industrial changes of the future. Another inspiration is that the culture of "mutual aid" in mining villages, such as looking after neighborhood kids and donating money in the event of a mine disaster, embodies the spirit of a utopian society and humanism. It can also serve as a model to help young students develop a sound personality. Therefore, we hope that with the support of the Ministry of Culture and the Bureau of Cultural Heritage, that coal mining industrial heritage education can incorporate humanistic thinking and go beyond the technological aspects of coal mining to further explore the impact of coal mining on geology, industry, and society since the first industrial revolution.

Figure 2. Students from the Shih-fen Elementary School learned about coal mining through picture books at a former mining site.
圖 2：十分國小煤礦遺址現場煤礦繪本教學。

3. Using the Taiwan Coal Mine Museum as a Cultural Heritage Educational Venue: Shih-fen Elementary School

Shih-fen Elementary School in New Taipei City is a school that emerged from the coal mining industry in northern Taiwan. Currently, it has a small-group, mixed-age history course that introduces teachers and students to the coal mining culture in the area. Using teaching materials translated from mining heritage resources and related cultural and historical interpretive materials, the course emphasizes coal mining site exploration at the Taiwan Coal Mine Museum and the construction of coal mining knowledge through spatial identification. In 2021, when the Pingxi Line (a railroad originally built to transport coal) celebrated its 100th anniversary with a special exhibition, students were taken to the opening ceremony and the exhibition. This is where they gained a deeper understanding of the Pingxi Line. The course is also taught in the classroom, focusing mainly on coal mining and its related issues, using materials and teaching aids appropriate for elementary school children. These courses cover a variety of topics such as ores, geology, specific gravity, miners' lunches, and cultural exchanges between Taiwan and Japan.

The teaching strategy is to construct students' knowledge with cultural and historical materials and to take them to the heritage site for exploratory learning. While

三、煤礦遺址博物館作為文化資產教育現場：十分國小

十分國小是因煤礦產業而生的學校，其煤礦文化課程屬於小班制混齡教學，主要透過礦業遺址與文史詮釋資料轉譯為國小教育媒材，並提供十分國小教師與學生礦業文史教育課程之用。課程著重於新平溪煤礦博物園區的煤礦遺址現地探索，以空間指認方式建構煤礦知識。2021 年適逢平溪鐵道百年，透過特展舉辦讓十分國小共同參與開幕式，展覽內容則強化了學員對平溪鐵道的認知。室內課程則是從煤礦文化為主軸發展更多元主題，以符合國小孩童的教材與教具，從礦石、地質、比重、礦工便當、臺日煤礦文化交流…等議題深入淺出教導之。

教學策略則是兼顧文史資料的知識構成到遺址現地探索式學習，並且從導覽與課程解說融合學員在遺址現場的感受。課程已從煤礦知識的積累對學員產生更多內化的效益，另外也從煤礦遺址現場帶給學員直接性的刺激，[2] 透過課程設計轉譯為具邏輯性與系列性的探索式教學，讓礦村的在地國小得以認識自身家鄉特質及祖父母作為礦工的歷史，讓學員能從小建構礦業聚落長年來多元包容與友善平權的人格特質。

四、煤礦文化融入技職教育之策略：瑞芳高工

瑞芳高工因臺陽與瑞三鑛業的影響而設校，早年因礦冶科聞名全國，自在地煤礦廢坑三十餘年來，該校的經營即不再受煤礦業的支持。近年瑞芳高工企圖找回昔日的榮耀，積極與在地礦業博物館、礦工組織、大專院校合作，並以煤礦文化建立校外教學基地。本團隊以測量、土木、

there, they can learn from guided tours and on-site introductions and feel the atmosphere of the heritage site. With this exploratory, logical, and systematic approach to teaching, students can better internalize the wealth of coal mining knowledge that they have learned and feel the immediate sensations evoked by the heritage site. It is expected that elementary school students of this former mining village can learn about the uniqueness of their hometown, their grandparents' stories as miners, and grow up to develop a sense of tolerance, kindness, and equality towards others, just as the residents who lived here many years ago did.

4. Adopting Strategies to Integrate Coal Mining Culture into Technical and Vocational Education: Jui-Fang Industrial High School

The establishment of the New Taipei Municipal Jui-Fang Industrial High School was supported by the Taiyang Mining Company and Rueisan Mining Company. The high school's Mining and Metallurgy Department was famous throughout Taiwan in those days. However, after the local coal mines were abandoned some 30 years ago, the school no longer operated with the support of the coal mining companies and the Department lost its prominence. In recent years, an attempt has been made to regain that past glory. Jui-Fang Industrial High School has actively cooperated with local mining museums, miners' organizations, and tertiary institutions, while at the same time working to build off-campus bases for coal mining culture education. The school has worked with our team to develop courses that incorporate coal mining culture for disciplines such as surveying, civil engineering, foreign languages, and food and beverage preparation. Students from the Civil Engineering and Surveying program have learned about civil engineering-related coal mine culture and discussed mine surveying practices with former Taiyang Mining Company engineers. Students from the Applied Foreign Languages program have learned coal mining-related foreign terms and culture, and students from the Food and Beverage program sampled some mining village cuisine. By integrating coal mining culture into these various disciplines, we expect that the Jui-Fang Industrial High School can build its brand and equip its students with coal mining knowledge and competencies that will help refine their educational and professional pursuits in the future.

Figure 3. Students from Jui-Fang Industrial High School's Food and Beverage program sampled some mining village food.
圖 3：瑞芳高工餐飲科礦村美食體驗。

Figure 4. Students from Jui-Fang Industrial High School's Food and Beverage program sampled some mining village food.
圖 4：瑞芳高工應外科日本礦業文化教學。

外語、餐飲等專業科別，分別將煤礦文化導入專業課程，除了本團隊就土木遺產為題引導土木與測量科學生認識煤礦文化，還邀請前臺陽工程師探討坑內測量實務，另外在應用外語科教導煤礦相關外語及異國文化，以及在餐飲科品嘗礦村料理。本團隊企圖將煤礦文化課程配合瑞芳高工技職學校品牌的建構，期待從各科別將煤礦文化融入其專業，潛移默化地將轉譯煤礦相關知能，並挹注於當代與未來專業發展。

五、結論

本團隊近幾年在十分國小與瑞芳高工的煤礦文化課程，教材部分主要蒐集煤礦歷史檔案文獻以及口述歷史的補遺，並且以煤礦記憶典藏的思維進行煤礦人事地物的探究。透過本團隊所建構的「國家文化記憶庫」，抽絲剝繭

5. Conclusion

In recent years, Shih-fen Elementary School and Jui-Fang Industrial High School have collaborated with our team to develop various coal mining culture-based courses to encourage students to learn about the people, events, places, and objects related to the coal mining industry from valuable “coal memories” and “coal collections.” We also contributed to the Taiwan Cultural Memory Bank, a Ministry of Culture’s heritage archive project, and used it to determine the course content, translate coal mining historical documents and oral histories, and develop them into teaching materials. In addition, we set teaching objectives, planned teaching methods, and arranged pre- and post-tests to evaluate students’ learning outcomes.

Broadly speaking, the coal mining culture courses use narratives to describe and explain the vast and complex system of industrial heritage. Shih-fen Elementary School’s course features a museum as an educational venue and inspiring instruction that leads students to understand and love their hometown— a one-time mining village. As for the Jui-Fang Industrial High School’s courses, they feature dialogues with local mining engineers/miners, stories behind local monuments and bronze statues, and the biographies of renowned figures to guide students through the coal mining culture. We believe that this helps them understand the groundbreaking impact of mining technology innovations and their contributions to society, while increasing their sense of identity and enthusiasm for their professional disciplines. We will continue our commitment to coal mining culture education and celebrate the tangible and intangible cultural assets of the coal industry. In doing so, the local young people can learn about their hometowns and schools, strengthen their self-identity, and develop better personal qualities and professionalism.

地決定教材內容、教學目標設定、上課形式規劃，並以學生前後測檢討課程效益。

大抵而言，煤礦文化課程以敘事性來詮釋龐大且複雜的產業文化資產系統，十分國小課程以博物館為教育場域，從啟發式教學誘導學員認識並喜愛自身礦村。瑞芳高工則是透過在地礦業工程師與礦工的對話，再輔以礦村紀念碑、銅像等名人與典範案例，導引技高學生可從煤礦文化延伸至技術革新的開拓性與社會貢獻性思維，進而強化對自身專業科別的認同與學習上的熱忱。未來本團隊將持續投入煤礦文化教育，從煤礦有形與無形文化資產促進在校學生認識家鄉、學校與自我，強化學生人格養成與專業素養的提升。

Reference 參考文獻

寺本潔、田山修三 (2006) 近代の歴史遺産を活かした小学校社会科授業，東京 : 明治図書出版，20-30 頁。

小笠原喜康等人 (2012) 博物館教育論，東京 : ぎょうせい株式會社，54 頁。

Industrial Heritage Sites as Educational Venues: Xihu Sugar Refinery's Field Study Program as an Example

產業文化資產的教育轉譯：以「溪湖糖廠」現地教學課程為例

Hsiao-Hsuan Chiang (Project Manager of Center for Environmental Education, National Tsing Hua University)

國立清華大學環境教育中心專案經理 江篠萱

Keywords: Xihu Sugar Refinery, Field Study Program, Curriculum Transformation, Mathematical Calculations, Scientific Experiments

關鍵字：溪湖糖廠、現地教學課程、轉譯、數學計算、自然實驗

Preface

As time goes by, industrial structures gradually undergo transformation and closure, disappearing into history and forming industrial assets. Industrial heritage is a snapshot of a bygone era as it often showcases the most advanced machines and manufacturing processes of the past. However, how can we make the best use of the defunct facilities and their vast campuses while preserving their historical stories?

Article 12 of the Cultural Heritage Preservation Act states that: In order to undertake cultural heritage preservation education, the competent authority shall coordinate with education agencies of every level to ensure school curricula of every level cover cultural heritage preservation. This article indicates the importance of incorporating cultural heritage education into school curricula at all levels. Industrial activities, such as those in the sugar and brewing industries, encompass a great deal of expertise—from the processes of collecting raw materials to producing finished products. From this, it follows that industrial heritage, when properly transformed, can serve as a site for cultural heritage education.

In recent years, the research team at the Center for Environmental Education, NTHU, has been dedicated to developing and piloting cultural heritage education programs, attempting to turn industrial heritage sites into educational venues for school education. The team strives to transform the industrial manufacturing knowledge contained within industrial heritage into comprehensible content for students, and integrate it into

前言

產業文化資產代表產業因時代的變遷，逐漸轉型或停工並走入歷史的過程，產業文化資產往往使用當代社會最先進的機器及製程，甚至可說時代的縮影；然而當大型設備與廣大的園區停止運作，該如何善加使用這些已停止運作的設備，並保留時代的故事呢？

《文化資產保存法》第十二條提到：「為實施文化資產保存教育，主管機關應協調各級教育主管機關督導各級學校於相關課程中為之。」此條文說明文化資產教育應落實在各級學校課程之中。而產業文化資產從原料的採集到成品的生產，如糖、酒的製造過程等等，皆蘊含豐富的專業知識，經過適當的轉譯後，非常適合作為文化資產教育的實踐場域。

國立清華大學環境教育中心的研究團隊，近年來不斷進行文化資產現地教學課程的研擬與試教，嘗試將產業文化資產場域作為一般學校課程的教學現場，將產業文化資產所包含的產業製造知識，轉譯為學生可以理解內容，並將數學、自然等學校課程以輕鬆有趣的方式在場域中進行，讓學生將所學知識與產業文化資產連結，深度認識產業文化資產。

溪湖糖廠的教學素材

溪湖糖廠位於彰化縣溪湖鎮，前身是由辜顯榮先生在西元 1919 年所成立的「大和製糖株式會社」，並在 1920 年與日本明治製糖株式會社合併，更名為「溪湖製糖所」。民國時期台灣糖業公司成立後，於 1946 年更名為「台灣糖業公司溪湖糖廠」，接著在 2002 年停止製糖業務，結束 83 年的製糖生涯。之後糖廠立即轉為發展觀光休閒資源，開放民眾參觀，並復駛過往運送甘蔗及人員的五分車，2010 年溪湖糖廠園區中的五分車站「溪湖車站」登錄為歷史建築，目前是糖廠園區中唯一具有文化資產身分的建

various school disciplines like math, natural science, etc. They have designed on-site activities that allow students to acquire knowledge in a relaxed and enjoyable way. It is hoped that students will be able to relate what they have learned to the industrial heritage and gain a deeper understanding of it.

Educational Resources at the Xihu Sugar Refinery

The Xihu Sugar Refinery, located in Xihu Township, Changhua County, was formerly the Yamato Sugar Co., Ltd. founded by Mr. Xian-Rong Gu (Hsien-Jung Koo) in 1919. In 1920, it merged with Meiji Sugar Co., Ltd. and changed its name to Xihu Sugar Factory. In 1946, the Taiwan Sugar Corporation (TSC) was founded, and the Xihu Sugar Factory was renamed the Xihu Sugar Refinery. In 2002, the Xihu Sugar Refinery ceased operations, ending its 83-year history of sugar production. Soon, the sugar refinery turned into a tourism and recreational site open to the public, resuming the operation of the sugar train formerly used for transporting sugarcane and personnel. In 2010, the Xihu Station, a sugar train station, was registered as a historical building, becoming the only listed heritage building at the Xihu Sugar Refinery. Today, most people, including the general public and students on field trips, pay for a ride on the sugar train when visiting the site to see the area around the sugar refinery, which used to be sugarcane fields.

Also open to the public is the Xihu sugar refining facility itself. Visitors can find a variety of large machines inside the factory, including the equipment for squeezing, evaporating, cleaning, crystallizing, separating molasses, and packaging. Each machine represents a different sugar manufacturing process. To help the visitors understand the use of these machines during the tour, the sugar refinery features explanatory signs that introduce the sugar manufacturing processes in detail. The Center for Environmental Education, NTHU, hopes to change the traditional way of introducing these processes, so it seeks to integrate the knowledge of sugar production, such as the chemical changes throughout the processes—from the harvest of sugarcane to the production of granulated sugar—with the general school curriculum of math and science. The aim is to give students an understanding of the sugar manufacturing processes through mathematical calculations and scientific

築。如今大多數觀光客，無論是一般民眾或是學校團體的校外教學，皆會付費搭乘此五分車，一覽週邊曾經的甘蔗田風景。

原先製糖的主要場所「製糖工場」也同樣開放參觀，在裡面可以看到製糖流程使用的大型機具，如：壓榨機、蒸發罐，以及清淨、結晶、分蜜、包裝等機具，每個機具都代表不同的製糖步驟。為使民眾在參觀時能了解這些機具的用途，製糖工場裡的解說牌詳細介紹了製糖流程，而本中心團隊希望改變以往介紹製糖流程的方法，進一步運用甘蔗採收到生產顆粒糖之間的數據變化，結合一般學校的數理相關課程，嘗試以數學或自然的角度，了解糖的製造過程，帶領學生以數字感受溪湖糖廠過去的風華年代。

「戀煉甜蜜回憶」溪湖糖廠現地教學課程

為使學生對「糖產量」產生比較值，本次課程先回溯糖產業的發展史，從荷蘭時代及清代的舊式製糖，一直到日治時期開始引進機械化的新式製糖，讓學生瞭解舊式製糖與新式製糖的不同，接著帶學生到製糖工場參觀，以數學計算和自然實驗搭配現場機具的展示，讓學生理解從甘蔗汁的液體狀態變成結晶體狀的砂糖其製程經過哪些變化。試圖將原先抽象且陌生的製造過程轉譯為學生熟悉的數學或自然應用內容，進一步使學生對糖的製造過程產生量感。

我們藉由以下說明製程階段轉譯製糖流程為學校裡能連結的課程內容：

- **卸蔗剁碎：**在運送甘蔗的鐵軌旁計算五股鐵道同步運送甘蔗進來時，甘蔗的總重量是多少？
- **壓榨：**在壓榨機旁計算甘蔗的壓榨量，每根新鮮甘蔗包含 70% 的水份，那麼 4000 公噸的甘蔗可以壓榨出多少公噸的甘蔗汁？
- **清淨：**除了數學的計算之外也設計實驗性活動，在此階段需運用酸鹼中和的知識，我們便讓學生在現場進行簡單的實驗，準備三個裝有不同溶液的紙杯，讓他們加入試劑後判斷酸鹼性，這樣的實驗也讓學生更加理解酸鹼中和的特性在生活中的應用。
- **蒸發與結晶：**在工場數個大型蒸發罐旁，實際計算蔗汁經過此流程後，所產生的糖漿有多少，並運用尺規工具，畫出結晶糖的大小。
- **分蜜：**運用道具解說分蜜過程的離心力原理，並透過表格比較，讓學生判斷顆粒糖與糖蜜的含水量及含糖量。
- **包裝：**自此學生已計算出溪湖糖廠過去最大的日產量約為 386 公噸，再請他們計算若 25 公斤裝成一包，可以裝出幾包？

experiments while also giving them a glance at the past glory of the Xihu Sugar Refinery.

Here are some examples of how different sugar production processes can be linked to the school curriculum.

- **Sugar cane unloading and chopping:** Standing next to the tracks, teachers can ask students to calculate the total weight of sugarcane carried by the sugar train.
- **Squeezing:** Teachers can ask students to calculate the amount of sugarcane juice that can be squeezed out of the sugarcane next to the squeezer. For example: How many metric tons of sugarcane juice can be squeezed from 4000 metric tons of sugarcane if each fresh sugarcane stalk is 70% water?
- **Cleaning:** In addition to mathematical calculations, teachers can have students perform a simple acid-base neutralization experiment on the spot. Teachers can prepare three paper cups with different solutions and ask students to determine whether they are acidic or alkaline after adding reagents to them. This experiment helps students learn more about how to apply acid-base neutralization knowledge in their daily lives.
- **Crystallizing and evaporating:** Teachers can ask students questions about the evaporation tank. They can ask them to calculate the amount of syrup produced after the evaporation process and then draw pictures of sugar crystals with rulers and scale gauges.
- **Molasses separation:** Teachers can use props to explain the principle of centrifugal force involved in the molasses separation process and use comparison tables to guide students to determine how much water and sugar is contained in granulated sugar and molasses.
- **Packaging:** After students have calculated that the maximum daily sugar production of the Xihu Sugar Refinery is about 386 tons, teachers can further ask students to calculate how many bags will be packed if 25 kg of sugar is packed into each bag.

The field study program ends with teachers reintroducing the development of the sugar industry, but this time from the Japanese colonial period, when the sugar industry was at its peak, to the post-World War II era,

Figure 1. Standing next to the tracks, teachers from the Center for Environmental Education, NTHU, guided students to calculate the weight of sugarcane that the sugar train could carry.

圖 1：本中心團隊教師在五分車鐵軌旁，帶學生計算每一軌能夠運送的甘蔗重量。

Figure 2. Teachers from the Center for Environmental Education, NTHU, guided students through mathematical calculations and scientific experiments at the sugar refinery.

圖 2：本中心團隊教師製糖工場中，帶學生進行數學計算及自然實驗。

when the sugar industry went into decline. Meanwhile, teachers will bring up issues related to the sustainable development of sugar industrial heritage by raising such questions as: What caused the once-glorious sugar industry to end up with only two sugar refineries remaining in operation today? What are the most likely reasons for the decline of the sugar industry? What is the reason for keeping the large machinery and equipment in place after the Xihu Sugar Refinery ceased sugar production in 2002, when it became a recreational park? Most students' answers to the last question are to give future generations the opportunity to see how sugar is produced. It is expected that this field study program can not only raise the students' awareness of environmental sustainability, but also allow for the sustainable preservation and reuse of industrial heritage in more diverse ways.

Conclusion

Although this field study program is designed for the Xihu Sugar Refinery, other sugar refineries that retain sugar manufacturing equipment can also use the designs and activities to conduct their own education programs with simple modifications. This will give local students the opportunity to learn about sugar industrial heritage in a way that is different from traditional approaches. The knowledge contained in the sugar production industrial heritage, as well as in all other industries that include "manufacturing processes," can be incorporated into an educational curriculum to help students learn more about the local industries, their history, and their cultural context, while achieving the goal of sustainable heritage preservation. With proper educational transformations, the values and content of industrial heritage can be appropriately presented for all to see. We look forward to more education programs of this kind in the future.

課程的最後，再度把課程內容拉回製糖產業的發展史，從日治時代的鼎盛時期到二戰後的產業沒落，藉此與學生討論產業文化資產的永續發展議題，曾經風華一時的製糖產業，為何現今只剩下 2 間糖廠還在運作？最有可能造成糖產業沒落的原因是什麼？而溪湖糖廠自 2002 年停止製糖轉為觀光休閒園區之後，直到今日大型的機具設備依然留在原地，留下機具的原因又是什麼？多數學生回答為了讓後人有機會一睹製糖流程的操作過程，期待透過這次的課程在學生心中留下永續發展的種子，使得產業文化資產在未來能持續有更多保存與再利用的可能性。

結語

本次課程雖以溪湖糖廠為課程開發場域，其他地區的糖廠若同樣保留製糖的機具時，亦可直接使用此課程教案進行現地教學課程，僅需微幅調整題目即可進行，讓糖廠週邊的在地學子有機會以不同方式認識糖產業的產業文化資產。除了糖產業之外，任何包含「製造流程」的產業文化資產，皆可將其專業知識轉譯為相關的學校課程內容，讓學生更加認識在地的產業及歷史文化，以達到永續發展之目的。由此可見，產業文化資產的價值及內涵，透過適當的教育轉譯之後，都能找到適合呈現給世人的內容，期待日後有更多的產業文化資產嘗試進行類似的教育轉譯。

步驟2 壓榨

根據資料顯示，新鮮甘蔗能壓榨出70%的甘蔗汁，舉例來說：一支甘蔗約5公斤，約可壓榨出3.5公斤的蔗汁。請依據上面資訊回答問題。

- 若採收1000公斤的甘蔗，約可壓榨出多少公斤的蔗汁？
- 在過去製糖業的輝煌時期，每日最大壓榨量為4000公噸。算算看，若載送4000公噸的甘蔗進入壓榨流程，約可壓榨出多少公噸的蔗汁？
- (呈上題)甘蔗壓榨後剩下的30%是多少公噸？想一想，這些能作為哪些用途呢？

步驟3 清淨

甘蔗汁在熬煮、濃縮的過程中，糖廠會加入「X溶液」，幫助甘蔗汁中的雜質沉澱，且甘蔗汁熬煮時酸鹼值會越來越低，加入「X溶液」能讓甘蔗汁酸鹼中和，讓雜質凝聚沉澱的效果更好，最後清澈的甘蔗汁會在桶子上方，而雜質、蔗渣會沉到桶子下方。

- 根據上文，請問X溶液應該是酸性、鹼性還是中性？
- 糖廠員工不小心將X溶液和其他水溶液搞混了，請你使用現場的器材，試著判斷面前的三杯水溶液哪一杯才是X溶液，並口頭說明原因。

Figure 3. Students were asked to write down their calculations and ideas in the student handbook. This example page shows the exercises related to the sugar manufacturing processes of “squeezing” and “cleaning.”

圖 3：學生須將計算過程及想法記錄在學生手冊中，此為壓榨與清淨步驟的學生手冊內容。

糖廠的消逝

1940年左右，台灣地區就有42個製糖所或工廠在製糖，最高年產量層高達137萬公噸。1995年時還有17間糖廠在製糖，直至現在僅剩虎尾糖廠和善化糖廠仍在運作。

基隆 台北 新竹 月眉糖廠 溪湖糖廠 台中 虎尾糖廠 彰化 花蓮糖廠 北港糖廠 花蓮 嘉義 南靖糖廠 蒜頭糖廠 新營糖廠 佳里糖廠 善化糖廠 台南 旗山糖廠 台東糖廠 仁德糖廠 台東 高雄 高雄(橋頭)糖廠 小港加工廠 南州糖廠

1995年 全台糖廠分布圖

想一想

雖然溪湖糖廠已經不再製糖，你認為這些機具被留下來的意義/原因是什麼呢？

Figure 4. The exercise on this page begins with explaining that there were many sugar refineries in Taiwan during the Japanese colonial period, when sugar production peaked; only two refineries are still in operation today. The teacher will use the information on this page to lead students to discuss the sustainability issues of industrial heritage.

圖 4：說明日治時期糖產業的產能高峰時期，全臺灣有多少糖廠設施。而今只剩下 2 間工廠還在運作，藉此與學生討論產業文化資產的永續議題。

Cross-Disciplinary Connection between Industrial Heritage and Science Education: Jianguo Brewery as an Example

從建國啤酒廠出發：探索產業歷史與科學教育跨域連結

Chun-Ta Huang (Researcher and Vice Secretary-General of the Institute for Historical Resources Management)

台灣歷史資源經理學會研究員兼副秘書長 黃俊達

Industrial heritage and its preservation can be generally divided into different categories, based on the historical assets involved, such as buildings, machinery, and tools. These assets are related to the production technologies of different eras and reflect the history of industrial development. However, many industrial heritage sites in Taiwan began planning for site renovation and regeneration of idle spaces only after the industrial activities had ceased. In the process of shutting down an industrial site, the production spaces are often repurposed, the machines dismantled, and workers let go. This makes it difficult to recreate or dynamically preserve the industrial production techniques and processes that were once used on the site. As such, it is uncommon to see production activities being maintained in a manufacturing plant that has been turned into a heritage site. This is also because managing and operating a site that serves multiple purposes is relatively more difficult. One of the few successful cases in Taiwan is the Jianguo Brewery, originally built in 1919 and formerly known as the Takasago Brewery. The brewery, a former industrial site that has been transformed into a cultural and educational venue, is still making the well-known “Taiwan Beer” to this day.

To maintain beer production and preserve the brewery as a “living heritage,” the Institute for Historical Resources Management (hereafter “the Institute”), in cooperation with the Jianguo Brewery and the Jianguo Brewery Trade Union, has made efforts to link science education with the site’s industrial history through various educational programs, such as the Taiwan Science Festival and the various programs designed based on the brewery’s existing resources.

The brewing process of beer involves a series of biological reactions, from raw material processing and saccharification to fermentation. In addition, to ensure

產業文化資產保存涉及型態類別多元，但無論是建物、機具、工具，多半與不同時代生產技術有關，反映了產業發展進程。綜觀臺灣各地許多文化資產場域常因產業活動停止後，才逐步規劃轉型並進一步思考閒置空間再利用。過程中，空間整理、機具拆除或勞工離開了工作場域，生產行為也就在場域內消失，曾經應用的生產技術則難以重現或動態保存。反之，若生產活動能在空間中持續進行，從經營層面來說實屬難得。建國啤酒廠原是 1919 年開始興建的高砂麥酒株式會社工廠，至今仍在廠區內生產台灣啤酒，是少數能維持產業活動的其中一例。

為使啤酒生產「活保存」型態得以延續，台灣歷史資源經理學會（下稱本學會）與建國啤酒廠廠方、工會夥伴合作，在場域現地及「臺灣科學節」活動現場，陸續嘗試將科學教育與產業歷史產生課程設計的連結。

啤酒釀造從原料處理、糖化、醱酵，本身就是一連串微生物實驗，加上廠區為求生產運作順利融入各項物理應用，都十分適合成為科學教育學習項目之一。本篇以分享規劃執行產業技術歷史研究與科學教育結合實際經驗為主要內容。

108 課綱中的「探究與實作」課程帶來契機

教育部頒布的 108 學年度新課綱中，以素養導向脈絡下設計「探究與實作」（Inquiry & Practice）課程，鼓勵「問題導向教學」（Problem-Based Learning），藉老師引導學生從生活層面出發找出問題。這項課程內容啟動了更多跨領域學習的可能性，事實上同樣開啟了文化資產場域與正規教育產生交集的契機。本學會參與建國啤酒廠 2020 年科學教育就是如此開展。

先是建國高級中學自然領域物理、化學、生物老師們，希望設計一套「探究與實作」課程，引導學生探索如何製酒，學習當中對於酶反應作用、酵母菌醱酵、細菌酸敗等科學知識。在尋找合適學習場域過程中，找到了建國啤酒廠。相較其他製酒廠，建國啤酒廠既位在市中心、交通便利，且擁有超過百年歷史文化場域、不同年代生產線機具、

smooth beer production, the Jianguo Brewery employs a variety of physical adaptations of its manufacturing process. These are all suitable topics for science education. In this article, the author will mainly focus on sharing his practical experiences in planning and integrating production technologies and historical research into science education.

Educational Opportunities Arising with the "Inquiry & Practice Courses" under the 2019 Curriculum Guidelines

The new Curriculum Guidelines of the 12-Year Basic Education, promulgated by Taiwan's Ministry of Education and officially implemented in 2019, emphasizes cultivating students' competencies through courses such as "Inquiry & Practice," where teachers adopt the Problem-Based Learning (PBL) approach to guide students in identifying problems to solve in their daily lives. This allows for more cross-disciplinary learning opportunities and encourages students to learn about cultural heritage as an essential part of their formal education. Taking advantage of this educational reform, the Institute launched various science education programs in 2020 to introduce the Jianguo Brewery to the students.

Take the collaboration project with the Taipei Municipal Jianguo High School as an example. The science teachers at the Taipei Municipal Jianguo High School, who are in charge of teaching physics, chemistry, and biology, proposed that an inquiry and practice-based

收藏百年活酵母等特色，成為了建中師生學習釀酒的極佳地點。

經由本學會協助下，先安排學校老師到廠內空間走讀，參與啤酒釀造手作體驗。課程開始後，將近 500 位學生分成三梯次到啤酒廠內學習，由當時場主任楊祐銘先生親自解說啤酒釀造的原料種類、製作流程、大麥芽組成等科學知識，學會夥伴解說廠區歷史及保存價值後，安排第一線生產工人們帶領學生進入廠區，參觀不同時代生產線、飲用品嘗半成品麥汁。以實地體驗、勞工解說方式，充分認識啤酒生產流程與廠區設計。既符合了高中教師課程設計期待，同時開啟了產業文化資產空間未來經營管理的不同想像。

前進「臺灣科學節」現場

完成與建國中學合作課程後，2020 年底又有機會邀請臺灣科學教育館的跨域策展小組至建國啤酒廠參訪，也進一步獲科學教育館邀請前往 2021 年「臺灣科學節」。該系列活動於 2020 年舉辦首屆開始，每年由教育部所屬的臺灣科學教育館、自然科學博物館、科學工藝博物館、海洋科技博物館、海洋生物博物館五處單位共同承辦，以科學探究學習為目標，結合各級學校及民間企業，均獲各界歡迎。

本學會與建國啤酒廠工會夥伴合作，以展覽、互動遊戲、工作坊、演講形式於科學節結合。整體核心以文化資產價值展現為主，兼顧有趣、吸引力及互動性考量，透過照片布置還原廠區空間氛圍，同時將建國啤酒廠典藏日本時代文物，包括 1875 年成立日本京都的島津製造所製造產品—穀粒天平、比色計及燈源裝置帶至現場展示。

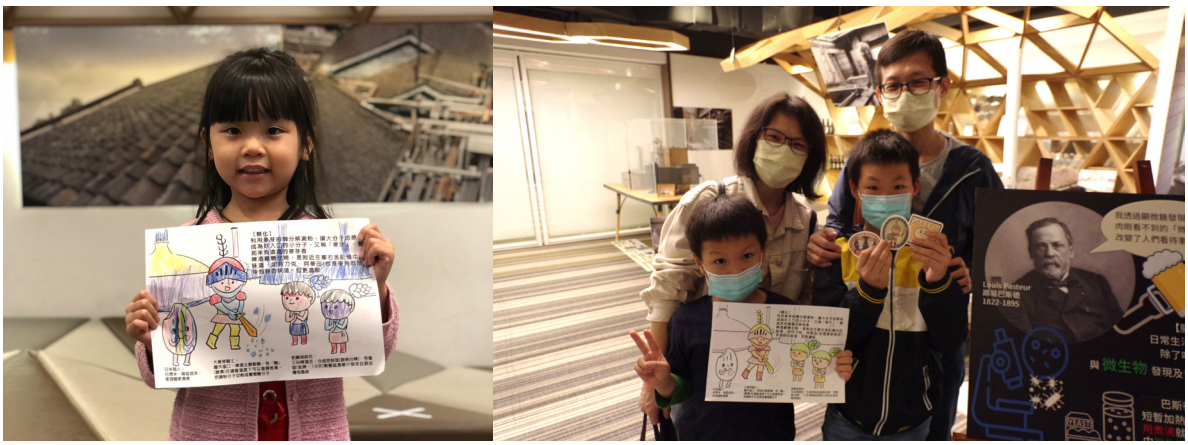


Figure 1. Visitors participated in a variety of interactive games at the Taiwan Science Festival. The game designers turned the science of brewing into fun, accessible educational content for different age groups, while highlighting the core values of cultural heritage preservation. (Photo credit: Institute for Historical Resources Management)

圖 1：「臺灣科學節」現場設計了多個互動遊戲項目，把釀造相關的知識拆解成不同年齡層可以遊玩的內容，並不時扣合文化資產保存核心價值。（圖片來源：台灣歷史資源經理學會）

course should be designed, one that would lead students to explore how beer is made, while learning about enzymatic reactions, yeast fermentation, and bacterial souring. In searching for a suitable learning site, they found the Jianguo Brewery. Compared to other breweries, the Jianguo Brewery is conveniently located in the center of Taipei City. With over 100 years of history, the Jianguo Brewery is home to production machinery from different eras and a collection of yeasts that have been passed down for over a century, making it a perfect venue for students and teachers to learn about the science of brewing.

With the assistance of the Institute, the teachers and students from the Taipei Municipal Jianguo High School came to the Jianguo Brewery for site visits and hands-on beer brewing experience. Around 500 students came to the brewery in three batches. During on-site learning, Mr. Yo-Ming Yang, the then Chief Director of the brewery, introduced the students to the scientific knowledge of beer brewing, including the different types of raw materials for making beer, the beer production process, and the compositional characteristics of barley malt. Researchers from the Institute were also on hand to explain the history and conservation value of the brewery. After the introduction courses, the front-line production workers took the students into the factory to learn about the production lines dating back to different eras and taste the semi-finished wort. Through the on-site learning experience and workers' sharing, students gained a deeper understanding of the beer production process and the factory design, which not only met the expectations of the high school teachers who designed this course, but also sparked various imaginations about how industrial heritage sites can be revitalized and managed in the future.

Jianguo Brewery & Taiwan Science Festival

After assisting the Taipei Municipal Jianguo High School with its Inquiry & Practice Courses, the Institute invited the cross-disciplinary curation team from the National Taiwan Science Education Center to visit the Jianguo Brewery in late 2020 for mutual exchange and discussion. Later, the Jianguo Brewery was invited by the science center to attend the 2021 Taiwan Science Festival. First held in 2020, the Taiwan Science Festival is an annual science event co-hosted by five institutions un-

Figure 2. Visitors learned about the Jianguo Brewery through picture books at the Taiwan Science Festival. (Photo credit: Institute for Historical Resources Management)

圖 2：「臺灣科學節」現場以繪本形式介紹建國啤酒廠。（圖片來源：台灣歷史資源經理學會）

同時，邀請插畫家一番茄繪製兩套短篇繪本：一套作品將釀造過程中使用的大麥芽、白米、水、啤酒花、酵母等原料擬人化為「原料者聯盟」，進入建國啤酒廠生產來場釀造大冒險；一套作品說明廠區文化價值及活保存的特色。並以此兩套繪本為基礎，融合法國「微生物學之父」巴斯德（Louis Pasteur）與啤酒生產相關發明，發展出六個互動遊戲項目，把釀造相關知識拆解成不同年齡層可以遊玩的內容，並扣合文化資產保存核心價值，如兒童著色插畫內容以「原料者聯盟」角色和經典銅製糖化釜場景，並展現高砂麥酒紅磚造工廠，以文字提示場區產業「活保存」、持續生產特色。

除了靜態展示、現場互動遊戲外，配合科學節整體活動設計，舉辦「成為釀造人」釀造科學體驗工作坊及「建啤開講」講座。各項活動報名踴躍，參與科學節過程中發現，雖然是科學教育學習，但對於大眾認識產業文化資產及其歷史價值一樣有很大的實質意義。

結語

產業文化資產與科學教育結合需透過持續研究累積才得以再現或轉化。拋出此文，希望能鼓勵更多人一同參與產業文資與科學教育結合的諸多嘗試。今日我們可見的文化資產場域經營方式多元，與文創、藝術、觀光、商業餐飲等結合均有可以發展之空間，但無論經營方式為何種樣態，均需與「教育」（正規或非正規）一定程度結合，才能順利分享保存價值予大眾，否則勢必無法符合原本保存之目的，甚難以稱為文資永續經營的好方式。科學教育不必然是文資教育唯一方式，但揉合文化歷史、科學學習，相信是豐富產業文資場域可努力進行的大方向。

Figure 3. In the brewing workshop, “Becoming a Brewer,” parents brewed beer with their children following the lecturer’s instructions. The lecturer also gave a short talk to introduce the brewing equipment and factory design at the Jianguo Brewery in different eras. (Photo credit: Institute for Historical Resources Management)

圖 3：「成為釀造人」釀造科學體驗工作坊中，經由解說，親子一同動手釀造的同時，也以剪報說明提及建國啤酒廠廠區實際使用的不同年代機具及廠區設計。（圖片來源：台灣歷史資源經理學會）

der the Ministry of Education: National Taiwan Science Education Center, National Museum of Natural Science, National Science and Technology Museum, National Museum of Marine Science and Technology, and National Museum of Marine Biology and Aquarium. Aiming to promote scientific inquiry and learning, the Taiwan Science Festival invites schools at all levels and private companies to participate and has been well received by various stakeholders.

In cooperation with the Jianguo Brewery Trade Union, the Institute introduced the Jianguo Brewery to visitors at the Taiwan Science Festival with exhibits, interactive games, workshops, and talks. The exhibits and the various activities were designed to showcase the value of the brewery as an industrial heritage site, while incorporating elements of fun, excitement, and interactivity. In addition to recreating an atmosphere similar to that of the Brewery by displaying old photographs, a number of Japanese era artifacts from the Jianguo Brewery collection, including the grain balance, colorimeter, and lighting device made by the Shimadzu Corporation in Kyoto, Japan, established in 1875, were also brought to the science festival for display.

Moreover, an illustrator who publishes under the pseudonym Fanchie (Tomato), was invited to create two picture books about the brewery. In the first book, the ingredients used in the brewing process, such as barley malt, rice, water, hops, and yeasts, are personalized as members of the “League of Ingredients” who go on a “brewing adventure” in the brewery. The second book illustrates the cultural value of the Brewery and its characteristics as a living heritage. Based on the two picture

books, six interactive games were developed to introduce French microbiologist Louis Pasteur, the "father of microbiology," and the various inventions related to beer production. These games turn the science of brewing into fun, accessible educational content for different age groups, while highlighting the core values of cultural heritage preservation. One of the games is a coloring activity, in which children are invited to color the "League of Ingredients" characters, the brass saccharification cauldron used in beer production, and the historical red-brick buildings at the brewery. The coloring pages also include texts explaining that the brewery is a living industrial heritage that continues to produce beer.

In addition to stationary exhibits and interactive games, in keeping with the overall theme of the science festival, a brewing workshop, "Becoming a Brewer," and a special talk on the Jianguo Brewery were held too. Both events draw a large attendance of local participants. By organizing these events, we discovered that, while these activities were originally designed for the purpose of science education, they have enabled participants to learn about the historical value of the Jianguo Brewery, which is equally important for the sustainable management of the industrial site.

Conclusion

Connecting industrial heritage resources and science education requires a focus on continuous research. This article is presented in the hope that more people will be inspired to explore the various possibilities of using heritage resources for educational purposes. Today, industrial heritage sites are being revitalized and operated in a myriad of creative ways; they have even become an integral part of the culture, art, tourism, and hospitality industries. However, the management strategies of a heritage site need to incorporate educational activities (formal or informal) if we are to succeed in preserving and sharing the value of the heritage with the public. This is one way to achieve the purpose of preserving heritage sites while operating them sustainably. Science education is only one of many educational fields that can be integrated with industrial heritage education. However, connecting an industrial site's culture and history with science education has proven to be one viable approach to enriching and promoting industrial heritage.

The Sustainability of Industrial Heritage Tourism Far from the Axes of Economic Development in Europe: Two Case Studies

歐洲遠離經濟發展中心的工業遺產旅遊之永續性：以兩例個案研究為例

Xosé Somoza-Medina(Department of Geography and Geology, University of León, Spain) and Obdulia Monteserín-Abella(Department of History, Geography and Art, University of Jaume I, Spain)

西班牙萊昂省萊昂大學地理與地質學系 修賽·索莫扎 - 麥地那 (Xosé Somoza-Medina)、西班牙卡斯特利翁 - 德拉普拉納漢姆一世大學歷史地理與藝術系 奧碧杜利亞·蒙特塞林 - 阿貝拉 (Obdulia Monteserín-Abella)

Abstract

The transformation of mining and industrial spaces into tourist spaces is part of the debate surrounding the profound changes in the contemporary economies of developed European countries. The loss of competitive power of their traditional companies, the obsolescence of many manufacturing facilities, and the take-off of other industrial economies in remote parts of the world have led to the closure of thousands of mines and factories, with the approval of environmental groups. In some privileged places, these ex-industrialized spaces have recovered environmentally, been allocated aid for socio-economic reconversion, and reoriented the old mines and factories (now converted into industrial heritage), towards cultural and tourist uses. The successful examples of Ironbridge, Zollverein or Wieliczka, have created the illusion to managers, owners, and local population of being able to turn almost any ruin of the industrial and mining past into a tourist attraction. Starting in the 1990s, many ex-industrial spaces, which were far from the main urban centres, opted for this tourist transformation as a lifeline to slow down the loss of population and economic activities. Sometime after these projects of industrial tourism, the result can be evaluated with objective data that question the sustainability of the model and the resilience of these places. This paper focuses on questioning the sustainability and resilience of the tourist transformation of two former mining areas located in Spain (Almadén and Sabero), far from the axes of economic development.

Keywords: industrial heritage tourism; European Route of Industrial Heritage; mining parks and museums; sustainability; ex-industrial spaces

摘要

將採礦及工業空間轉型為旅遊空間是圍繞歐洲發達國家當代經濟重大變革討論的一部分。歐洲傳統企業失去競爭力、製造設施荒廢以及其他工業經濟體起飛導致數千家礦場及工廠在環保團體的支持下關閉。在一些特別的地點，過去的工業空間經過環境復育、獲得社會經濟重建援助，將舊礦場及工廠 (現已轉型為工業遺產) 重新以文化旅遊導向定位。關稅同盟煤礦工業建築群 (Zollverein) 的鐵橋建築或維利奇卡鹽礦 (Wieliczka) 的成功案例讓管理人、業主和當地居民產生一種錯覺，以為任何過去的工業空間或礦場廢墟都能變身成為旅遊景點。自 1990 年代起，許多遠離市中心的前工業空間選擇旅遊轉型做為救命稻草，以減緩人口及經濟活動流失。在這些工業旅遊計畫完成後的一定時點，以客觀資料對該模型的永續性及這些地點的韌性提出質疑，並以此進行成效評估。本論文著重於對西班牙位於阿爾馬登 (Almadén) 及薩韋羅 (Sabero) 兩處遠離經濟發展中心的採礦區域旅遊轉型的永續性及韌性提出質疑。

關鍵字 : 工業遺產旅遊 ; 歐洲工業遺產路徑 ; 礦場與礦產博物館 ; 永續性 ; 前工業空間

1. Introduction

Modern society adheres to very different ethical values compared to those that influenced the social norms and customs of previous eras. Today, for example, sustainability is an ethical principal that connects generations and which we must always take into account in the evaluation of any activity that transforms the in which space we live. Many centuries ago, power was demonstrated by building monumental edifices in highly visible locations, such that the population, seeing the ziggurat, the castle, or the cathedral, would know that true power lay within its walls. Nowadays, most of us, when we see large construction projects taking shape on wasteland, the first thing we ask is whether this, whatever it is, is sustainable.

Sustainability embraces everything and allows us to establish a new value scale in which cost, aesthetics and originality are not the essential factors when judging a project, but rather its potential to survive through time, without altering the environment. Sustainability has gone viral, and its message resonates in every corner of the planet, even where the messenger is but a youngster whose only power is in their voice. Other changes that have come to characterise modern society, and contrast with the ways of life in bygone times, is the importance we give to our leisure time activities. Tourism continues to establish new records despite various crises in the economy, politics, and health. Although, regarding this last point, it is possibly still too early to evaluate the real consequences to tourism of the coronavirus disease 2019 (COVID-19) pandemic. Whatever the case, it must be supposed that, sooner or later, we will be looking at a figure for global travel due to tourism that is, once again, setting new records.

Tourism, as a global phenomenon, did not become relevant until the last decades of the 20th century, when the increase in recreational travel became sufficiently large that any location possessing any attraction might be turned into a potential tourist destination for at least one of the many segments of the tourism market. Since then, we have been able to talk about rural, urban or nature tourism; coastal or interior tourism; luxury tourism or backpacking; literary, architectural, war, dark or grief tourism; ornithological, religious, sex, gastronomic, heritage, conference, cultural, sports, magic, ethnographic, fashion, cinema, adventure, shopping, alcohol, cemetery, health, and events tourism; tourism for seniors, kids, teens, families, or the LGBT community; and also, industrial tourism.

1. 緒論

現代社會重視的倫理價值與影響過去時代的社會規範和習俗截然不同。例如，現在永續性是各世代共通的倫理準則，也是評估任何改變生活空間的活動時，都必須納入考量。幾世紀以前，人們在顯眼的地方建造巨大的宏偉建築物來展示權力，如此一來，民眾看到金字塔神塔、城堡或大教堂就會知道真正的權力就在圍牆內。如今，多數人看到在荒地上建設中的大型建設工程時，首先會問的是，不管要蓋什麼，那是否永續。

永續性包含萬物，並讓我們建立新的價值量表，在評斷一個計畫時，美感及原創性並非首要考量，而是它是否有潛力能在不改變環境的情況下，經得起時間的考驗。永續性已成為最熱門的討論，相關訊息迴盪在世界各個角落，儘管傳遞訊息的是年輕人，而他們唯一的力量就是為永續發聲。另外，現代社會與過去生活方式不同、具代表性的轉變是現代人更加重視休閒活動。儘管經濟、政治和健康出現各種危機，旅遊業仍持續締造新紀錄。不過，要評估最後一項新冠病毒 (COVID-19) 全球大流行對旅遊業造成的實際影響現在可能還為時過早。不論如何，遲早旅遊業帶動的全球旅行業績會再次刷新紀錄。

旅遊是一個全球現象，直到 20 世紀末才與永續連結，休閒旅遊的市場成長到一定規模，任何有一點吸引力的地點都可能成為旅遊市場上眾多旅遊類型之一的旅遊景點。自此，人們會討論鄉村城市或自然旅遊；沿海或內陸旅遊；豪華旅遊或背包旅行；文學、建築、戰爭、黑暗或悲傷旅遊；鳥類學、宗教、性、美食、遺產、會議、文化、體育、魔術、民族誌、時尚、電影、冒險、購物、酒精、墓地、健康和事件旅遊；針對年長者、兒童、青少年、家庭或 LGBT 團體的旅遊； 還有工業旅遊。

工業遺產旅遊是將特定地點的工業遺產作為吸引人的特色來呈現。工業遺產包含礦場、工廠、行政大樓、廠房、房屋、通訊基礎設施及重型機械。另外，除了商業產品以外，商業文件、

Industrial heritage tourism is characterised by presenting the industrial heritage of a certain location as an attractive feature. Industrial heritage includes mines, factories, administrative buildings, workshops, housing, communications infrastructure, and heavy machinery, in addition to commercial products, business documentation, tools, vehicles, clothing and even the everyday foods of that glorious past. A past which will have had huge value in terms of socioeconomics and identity, thereby justifying its resurrection and reinterpretation in the present.

After the successful examples of Ironbridge, Zollverein, New Lanark, Geselkirchen and Wieliczka in Europe or Lowell and Birmingham in the USA, hundreds of places have found new uses for old, disused mines and factories. All these projects have taken a similar model based on joint endeavours between a private industrial heritage preservation foundation, politicians, and local government. They used campaigns on various communication media platforms and public subsidies, with the end result being the creation of new eco-museums and heritage parks that have all contributed to an increased global offering in industrial heritage tourism.

The first step motivating the creation of industrial heritage is disuse. While factories and mines remain active, industrial complexes are not considered as heritage; they are fixed assets. In this way, due to the cycle of major industrial crises and restructuring, many manufacturing facilities are abandoned, creating huge land holdings that can be disposed of in several different ways. When obsolete factories or transport hubs are located within the urban core, what usually happen, especially in dynamic cities, is a process of clean up and the building of new, remodelled neighbourhoods with innovative architecture, leaving a few elements of industrial heritage as some form of memento of the past. Ex-industrial land on the edges of urban development, however, can often be left in disuse for many decades, waiting in the hope that housing demand and planning laws allow the recategorization of the land to the benefit of its owners. Lastly, when industrial spaces are very far from urban centres and through their operation over decades have caused irreversible changes to the landscape, they are permanently abandoned, re-purposed for tourism and recreation, or transformed into other uses (residential, commercial, public services).

According to the Spanish National Plan for Industrial Heritage, industrial heritage is defined as that collection of assets, both moveable and unmoveable, and the social systems related to working class culture which have been generated through activities of ex-

工具、車輛、服裝，甚至光輝往日的日常食品都包含在內。一段具重大社會經濟價值及特性的過往，值得於今日復興並重新詮釋。

歐洲關稅同盟煤礦工業建築群鐵橋建築、新拉納克 (New Lanark) 、蓋森基爾亨 (Geselkirchen) 及維利奇卡鹽礦或美國洛厄爾 (Lowell) 及伯明罕 (Birmingham) 的成功案例出現後，上百個地點都為老舊、廢棄的礦場和工廠找到了新用途。這些計畫都以類似的模式進行，由民間工業遺產保護基金會、政治人物以及當地政府共同推動。透過在各式傳播媒體平臺和公共補助上開展活動，最終創建了新的生態博物館和遺產公園，為增加全球工業遺產旅遊服務做出了貢獻。

閒置是促使工業遺產產生的第一步。工廠與礦場正常運作時，工業大樓不會被認定為遺產，而是固定資產。由於重大工業危機及重組的循環，許多生產設備遭棄置，造成大量土地得以以不同方式處置。特別在充滿活力的城市，通常位於都市中心的廢棄工廠或交通樞紐會經過整理，並以創新式建築及新建物改造附近街區，同時保留部分工業遺產元素作為過去的紀念。然而，即將進行都市開發的前工業用地往往會被閒置數十年，期盼住房需求和規劃法規能讓土地重新分類對地主有利。最後，遠離都市中心的工業空間，經過幾十年的營運，已經對地景造成不可逆的改變。這些已遭永久廢棄置的空間會重新定位為旅遊或休閒空間或轉型為其他用途 (住宅、商用及公共服務)。

根據西班牙國家工業遺產計畫 (Spanish National Plan for Industrial Heritage)，工業遺產的定義為流動和不動資產的集合，以及透過開採、改造、運輸、分銷和管理活動這些工業革命時期建立的經濟體系所產生的勞工階級文化相關的社會系統。該定義很廣泛，幾乎所有的廢棄礦場或製造中心都可以變成旅遊景點。

那麼，在此要提出的問題是，任何計畫的新生態博物館或工業遺產博物館是否具永續性，尤其在經濟和生態方面。換句話說，為了將任一特定的前工業用地轉換為旅遊休閒基礎設施並長久維護其未來使用所需的經濟和環境上

traction, transformation, transport, distribution, and management and which came into being as a result of the economic system founded in the Industrial Revolution. This definition is sufficiently broad that almost any disused mine or manufacturing centre that may be found can be converted into a tourist attraction.

The question that we need to pose is, then, whether any proposed new eco-museum or industrial heritage museum is sustainable, especially in economic and ecological terms. In other words, can the investment required to convert any given ex-industrial site into tourism-recreational infrastructure and maintain its future use over time be justified economically and environmentally? To answer this research question, we will take two case studies, both disused industrial mining sites that have been converted into heritage parks in areas far from major cities. These examples are at the periphery of European development and at the outer borders of Spain. However, these two case studies are both categorised as “Anchor Points” in the European Route of Industrial Heritage (ERIH), and as such they have been awarded quality certificates as industrial tourism destinations.

2. The Industrial Heritage Trail, ERIH, and Anchor Points

The regions of Europe that experienced the greatest economic and industrial development over the 19th and at the beginning of the 20th centuries are those that have accumulated the greatest number of industrial heritage sites: South Wales; the Black Country and Yorkshire, in England; Strathclyde in Scotland; the Ruhr and Saar in Germany; Alsace, Nord-Pas de Calais and Lorraine in France; Wallonia in Belgium; Veneto and Lombardy in Italy; Catalonia, Asturias and the Basque Country in Spain; Silesia and Lodz in Poland; and Karvina-Ostrava in the Czech Republic. All these territories have promoted the regeneration of their industrial heritage through museumization and the creation of visitor centres that, in due course, have begun to forge links with each other to set up so-called industrial tourism routes. The most important of these was established in the Ruhr, Germany, and many years later, it became the model for the European Route of Industrial Heritage.

The Industrial Heritage Trail (Route der Industriekultur) in the Ruhr region was established as the result of a process, initiated in 1988, through a regional government initiative in North Rhine Westphalia, whereby abandoned industrial spaces were regenerated and reused. The 1980s was a watershed decade for many traditionally industrial regions, immersed in a wide-reaching modernisation cri-

的投資是否合理？為了回答這個研究問題，我們將進行兩個案例研究，這兩個案例都是遠離主要城市的廢棄工業礦區被改造成遺產公園。兩個個案位於歐洲發展的邊緣和西班牙的外圍。不過，這兩個個案都被列入歐洲工業遺產路徑 (ERIH) 的重要工業遺產點，因此也獲得工業旅遊目的地的品質證書。

2. 歐洲工業遺產路徑 (ERIH) 與重要工業遺產點

在 19 世紀及 20 世紀初，經濟和工業發展最為迅速的歐洲地區積累了最多的工業遺產：南威爾斯 (South Wales)；英格蘭的黑鄉 (Black Country) 和約克郡 (Yorkshire)；蘇格蘭的斯特拉斯克萊德 (Strathclyde)；德國的魯爾區 (Ruhr) 和薩爾蘭 (Saar)；法國的阿爾薩斯 (Alsace)、北加萊海峽 (Nord-Pas de Calais) 和洛林 (Lorraine)；比利時瓦隆 (Wallonia)；意大利的威內托 (Veneto) 和倫巴底 (Lombardy)；西班牙的加泰隆尼亞 (Catalonia)、阿斯圖里亞斯 (Asturias) 和巴斯克自治區 (Basque Country)；波蘭的西里西亞 (Silesia) 和羅茲 (Lodz)；以及捷克共和國的卡爾維納 - 奧斯特拉瓦 (Karvina-Ostrava)。這些地區透過博物館化和建立遊客中心促進了工業遺產的再生，之後，這些遊客中心開始相互建立聯繫，建立所謂的工業旅遊路線。 其中最重要的是建立在德國魯爾區的工業旅遊路線。多年後，它成為歐洲工業遺產路徑的典範。

魯爾區的工業遺產路徑 (Route der Industriekultur) 得以建立是因 1988 年北萊茵 - 威斯伐倫 (North Rhine Westphalia) 地區政府倡議發起的一項進程，讓廢棄的工業空間得到再生和再利用。1980 年代是一個分水嶺，許多傳統工業區在這 10 年陷入廣泛的現代化危機，對第二級產業的就業產生了巨大影響，造成大量企業倒閉。為了解決問題，許多地區的人們尋求與文化及第三級產業相關的替代方案，特別是休閒產業。如此一來，過去以長時間工作為特徵的空間現在變成為潛在用戶提供數小時休閒時光的空間。由於服務業成長，整個地區的土地驅動力發生了變化。工廠和廠房被改造成博物館、藝廊或音樂廳；礦場變成公園和大會堂；運輸幹道變成綠色走廊；這一切都是歷經開放

sis that had a huge impact on employment in the secondary sector with the closing of a large number of businesses. As a solution, in many regions, alternatives were sought connected with culture and the tertiary sector, specifically the leisure industry. In this way, spaces that were previously characterised by long working hours were now converted to offer hours of leisure time to their potential users. Due to this growth in the service sector, the territorial dynamics of whole regions were altered. Factories and workshops were transformed into museums, art galleries or concert halls; mines into parks and auditoriums; transport arteries into green corridors; and all this after an open process of ideas exchange to find the best solution. In Germany, this model came about through the experience of the Emscher Park IBA (Internationale Bauaustellung) project, a ten-year programme (1989–1999), financed through local, regional and national governments, with additional European grants, and in consultation with architectural and planning working parties to assist in plotting the way forward for these historic industrial zones. In this way, an extensive area in the centre of the Ruhr region was regenerated according to a common set of guiding principles: ecological restoration of rivers and spoil heaps, reduction in environmental impact, consideration of the landscape, restoration of industrial heritage as a symbol of territorial identity, and the social reintegration of the long term unemployed. The Ruhr region, with a population density of 2800 inhabitants/km^2, is a polycentric and dynamic urban area, well connected with other important and developed European regions. The objective was to regenerate the area such that it could be, once again, a centre for new industrial initiatives based on design and innovation. Throughout the last decade of the 20th century, Germany saw the number of regeneration projects increase; this was especially so in Ruhrgebiet, where the Regionalverband Ruhr association of 53 cities, became a major instigator.

The Industrial Heritage Trail itself was commissioned by the Regionalverband Ruhr and set up in 1999, as a direct result of the Emscher Park IBA initiative. Connecting the major tourist attractions within this region of Germany, the trail comprises a circular route of 400 km, passing through 52 different locations of interest: 25 emblematic attractions, termed Anchor Points; 14 industrial landscape parks; and 13 workers' settlements (see Figure 1). Amongst these places, we find, Zeche Zollverein, a heritage park on the site of a disused coal mine and Landschaftspark Duisburg-Nord, the indus-

的思想交流過程以尋求最佳解方。在德國，這種模式源於德國國際建築博覽會 (Internationale Bauaustellung) 一個為期十年的計畫 (1989-1999) 的經驗。該計畫由當地、地區和國家政府資助，並獲得額外的歐洲補助金，在建築規劃工作小組協助下規劃這些具歷史意義的工業區未來的方向。魯爾區中心大範圍的區域按照共同的指導原則進行了再生：河流和廢土堆的生態修復、減少環境影響、考慮景觀、以工業遺產修復做為土地認同的象徵，以及讓長期失業者重新融入社會。魯爾區人口密度為 2800 人 / 平方公里，是一個多中心、充滿活力的城市地區，與其他重要和發達的歐洲地區緊密相連。計畫目標是重建該地區，讓其再次成為設計和創新的新工業倡議中心。在 20 世紀的最後 10 年，德國的再生項目不斷增加，特別是在魯爾區，由 53 個城市組成的魯爾區域聯盟成為主要的領頭羊。

工業遺產路徑由魯爾區域聯盟於 1999 年設立，是德國國際建築博覽會倡議的直接成果。這條路徑連接德國該地區的主要旅遊景點，包括一條 400 公里的環狀路線，途經 52 個不同的景點：25 個招牌景點，稱為重要工業遺產點；14 個工業地景公園以及 13 個工人定居地 (見圖 1)。 在這些地方，我們發現了位於廢棄煤礦遺址的遺產公園關稅同盟煤礦工業建築群，以及位於杜伊斯堡工業景觀公園 (Duisburg) 的北杜伊斯堡景觀公園 (Landschaftspark Duisburg-Nord)。路徑統一標示，提供所有重要工業遺產點的旅遊資訊。在標有資訊牌的公園景點附近

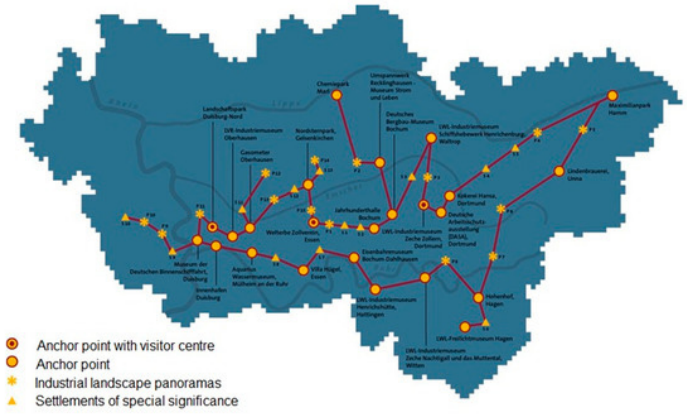


Figure 1. The Industrial Heritage Trail. Source: http://www.route-industriekultur.ruhr/.

圖 1：歐洲工業遺產路徑來源：http://www.route-industriekultur.ruhr/。

trial landscape park at Duisburg. The trail is signposted uniformly, offering tourist information about all the Anchor Points; walks around attraction parks marked with information panels; sculptures and other artistic installations; a coordinated calendar of cultural events; and a series of offers and benefits as part of a comprehensive tourist package. The trail can be followed in full or following a specific themed route: visiting all the industrial attractions in a particular city; or those associated with the different branches of industry or mining; or only principal eco-museums and heritage parks.

The Emscher Park IBA project received some criticism concerning the limited number of new jobs it created, contrary to initial goals, and the emphasis given to elitist, symbolic projects that did not offer real solutions to the severe social problems experienced by the region. Since the inception of the Emscher Park IBA project in 1989, the region has experienced two distinct phases of recovery–regeneration. The first two decades were characterised by measures aimed at the reuse of industrial heritage for tourism and cultural purposes funded by public money, while more recently, projects involving reindustrialisation and property development have been prioritised. Although the region's population has decreased since the 1960s (from 5.7 million to 5.1 million), statistics have shown a slight growth since 2016.

Whatever the case, the tourist-recreational Industrial Heritage Trail promptly became an example of success. Other European regions attempted to repeat the model in their own former industrial areas, with projects appearing in Flemish regions of Belgium, in Alsace and northern France; Asturias in Spain; Silesia in Poland; the Saar-Lor-Lux Euregios between Germany, France and Luxembourg; in Maas-Rhine between the Netherlands, Belgium and Germany; and in other more far-flung regions such as the Czech Republic and Norway.

The universalization of industrial heritage restoration projects in Europe allowed the promotion of a European-wide heritage route, taking the German trail as its model. Between 2002 and 2007, the German state (or Länder) of Rennania in North Rhine-Westphalia, the most densely populated, led the project whose objective, as part of the Interreg II programme, was the creation of a European industrial heritage tourist information network. This network was designed to show off the diversity of European industrial history and its common roots, and initially counted on the involvement of regions of the United Kingdom and the Netherlands, with regions

散步；雕塑和其他藝術裝置；文化活動日曆；以及套裝旅遊行程的折扣和優惠。可以選擇完整路徑或特定的主題路線：參觀特定城市的所有工業景點；或與工業或採礦不同面相有關的景點；或只參觀重要的生態博物館和遺產公園。

德國國際建築博覽會的計畫受到了一些批評，認為它所創造的新工作機會有限，與最初設定的目標相反，並且重點放在精英、具代表性的計畫上，並未真正解決該地區所經歷的嚴重社會問題。自 1989 年德國國際建築博覽會項目啟動以來，該地區經歷了兩個不同的階段恢復與再生。前 20 年主要透過公共資金資助，將工業遺產再利用於旅遊和文化用途。而最近，再工業化及房地產開發的項目已成為優先事項。儘管該地區的人口自 1960 年代起有所減少（從 570 萬減少到 510 萬），但統計數據顯示自 2016 年以來略有成長。

無論如何，旅遊休閒工業遺產路徑迅速成為成功的典範。其他歐洲地區試圖在過去的工業區複製這種模式，在比利時的佛拉蒙大區 (Flemish)、阿爾薩斯 (Alsace) 和法國北部展開計畫；西班牙的阿斯圖里亞斯；波蘭的西里西亞 (Silesia)；德國、法國和盧森堡之間的薩洛盧 (Saar-Lor-Lux Euregios)；在荷蘭、比利時和德國之間的默茲 - 萊茵 (Maas-Rhine)；以及其他更偏遠的地區，如捷克和挪威展開計畫。

歐洲工業遺產修復計畫的普遍化促進了全歐洲推廣以德國路徑為範本的遺產路線。在 2002 年至 2007 年間，德國北萊茵 - 威斯伐倫人口最稠密的州萊茵蘭 - 伐爾茲州帶領這項計畫，該計畫是跨區域合作計畫 Interreg II 的一部分，目標是建立歐洲工業遺產旅遊資訊網。該資訊網旨在展示歐洲工業歷史的多樣性及共通根源，最初依靠英國和荷蘭地區的參與，後來其他國家的地區也紛紛加入。與魯爾區的路徑一樣，歐洲工業遺產路徑 (ERIH) 圍繞重要工業遺產點、主題路線和包含豐富地理特定訊息、支援多語言的入口網站所建立。現在 (2020 年)，這條路線包含 50 個歐洲國家的 2000 個工業遺產地點；其中 113 個被命名為重要工業遺產點，共計 20 條區域路線及 16 條跨國路線。ERIH 背後的基本理念是，在魯爾區進行大片前工業用地

from other countries joining in later. As with the trail in Ruhr, the European Route of Industrial Heritage (ERIH) is structured around Anchor Points, themed routes, and a multilingual web-portal containing abundant geo-specific information. Today (2020), the route boasts 2000 industrial heritage sites in 50 different European countries; 113 of these are denominated as Anchor Points and there are 20 regional routes plus 16 transnational routes. The underlying idea behind the ERIH is that some of the experiments in regenerating huge swathes of ex-industrial land tested out in Ruhr might also be successful in other parts of Europe.

The selection of points of interest for the ERIH is related to the facilities and services available in those places and their ability to attract tourists. Moreover, those locations considered to be Anchor Points must comply with a specific set of requirements. According to the ERIH website (www.erih.net), an Anchor Point must be an authentic site of historic interest with a symbolic value and importance in European industrial history. It must also display an imaginative interpretation of its history through its exhibitions; offer its visitors modern and attractive facilities; use other nearby locations for cultural events and other attractions; and meet the expectations of its visitors in terms of infrastructure and innovative tourist services. The Anchor Points are considered the most high-profile attractions on the route, the standard bearers for the ERIH brand, and as such, they have a responsibility not to disappoint their visitors.

3. Theoretical Framework

Sustainability and resilience are terms taken from the study of nature but can also serve to explain processes of social change. Both terms are used to describe the conditions under which a place—an environment—can remain in a specific state (sustainable and/or resilient). The first of these terms, sustainability, from its roots as a term associated with ecology, came to be widely used in the 1970s at international conventions promoted by public bodies (the United Nations—Stockholm, 1972; the European Community—Paris, 1972). It established itself in the new world paradigm of “sustainable development” after the United Nations report “Our Common Future” in 1987 (the Brundtland Report) and later the Rio Summit in 1992, also promoted by the UN. Since then, sustainable development has been seen as an ideal to which to aspire, providing for the needs of the present generation without compromising the ability of future generations to provide for themselves. This concept is

再生的試驗，測試是否能在歐洲其他地區取得成功。

ERIH的景點選擇與地點的設施和服務以及對遊客的吸引力有關。此外，被視為重要工業遺產點的地點必須符合一些特定的門檻。根據 ERIH 的網站 (www.erih.net)，重要工業遺產點必須具有代表性價值並在歐洲工業史上佔重要地位的歷史名勝。重要工業遺產點也必須透過展覽對外展示其歷史的獨到詮釋；為遊客提供現代化及有吸引力的設施；將附近的其他地點用於文化活動和其他景點；並在基礎設施和創新旅遊服務方面滿足遊客的期望。重要工業遺產點是路線上最受矚目的景點，引領 ERIH 品牌，因此，有責任不能讓遊客失望。

3. 理論架構

永續性和韌性是從自然研究中提取的術語，但也可以用來解釋社會變革的過程。這兩個術語都可以用於描述一個地方、環境保持在特定狀態 (永續和具韌性) 的條件。第一個術語，永續性，字源是與生態學相關的術語，在 1970 年代在公共機構推動的國際公約中廣泛使用 (聯合國 - 斯德哥爾摩，1972 年；歐洲共同體 - 巴黎，1972 年)。繼 1987 年聯合國報告《我們共同的未來》(Our Common Future)(布倫特蘭報告)(Brundtland Report) 及後來同樣由聯合國推動的 1992 年里約峰會之後，永續性確立了「永續發展」的新世界典範。從那時起，永續發展就被視為一種理想的追求，既滿足現代人的需求，又不損害未來世代人自給自足的能力。這個概念圍繞三個支柱：經濟發展、社會發展及保護環境。

在物理學中，韌性是材料、機製或系統在受到某種擾動後恢復其初始狀態的能力。最早將韌性和永續性聯結的科學家之一是加拿大的生態學家 C·S·霍林 (C. S. Holling) ，他確定了社會生態系統的韌性是其容忍擾動和抵消由此所產生的混亂的能力，以這種方式，經歷干擾後，可以從初始狀態演變為多個新的平衡狀態之一，而不會遇到危機關頭。

structured around three pillars: economic development, social development, and protecting the environment.

Resilience, in physics, is the capacity for a material, mechanism or system to recover its initial state after being subjected to some perturbation. One of the first scientists to relate resilience and sustainability was the Canadian ecologist, C. S. Holling, who established that the resilience of a socio-ecological system was its capacity to tolerate perturbation and counteract the resulting entropy, in such a way that, after experiencing a disturbance, it could evolve from its initial state towards one of multiple new equilibrium states without encountering a crisis point.

There are several obvious links between sustainable development and resilience. To achieve one, we must base our actions on the other. The most resilient environments are those that display the capacity to adapt to circumstances and as yet unknown risks, therefore ensuring sustainability.

The crisis in traditional industry saw numerous regions suffering severe restructuring processes, with the loss of thousands of jobs, and the abandonment of hundreds of mining and other industrial facilities. These regions experienced ongoing economic deterioration due to the collapse of the industrial activity upon which millions of people depended. In this context, the regeneration of these regions began, with the injection of massive public funds to finance restoration projects where ecology, culture and social regeneration all played key roles. These projects gave birth to another novel concept, that of industrial heritage. In this way, abandoned buildings, mines, canals, facilities, and worker's housing were converted into historic monuments, the symbols of a lost regional economy that needed to be preserved for the edification and enjoyment of future generations.

In Spain, the development of industrial heritage as part of the new tourism and leisure industry has been a focus of analysis for some time. This analysis has tended to highlight the positive elements that have resulted from regeneration where such processes have taken place.

On the other hand, the European Charter for Sustainable Tourism, considers as fundamental both the conservation and improvement of heritage, either natural, historic, or cultural, and indeed the promotion of activities related to local identity and history—the latter being highlighted when due attention is paid to the important role

永續發展和韌性之間有明顯的聯結。要實現其中之一，必須將行動建立在另一個之上。最具韌性的環境能夠適應情勢及未知風險，因此可以確保永續性。

傳統工業的危機讓許多地區經歷了艱困的重組過程，造成成千上萬的工作流失，數百個採礦及其他工業設施遭廢棄。由於數百萬人賴以生存的工業活動崩潰，這些地區的經濟持續惡化。在此背景下，大量的公共資金挹注於在生態、文化和社會再生上扮演關鍵角色的修復計畫，推動這些地區開始再生。這些計畫催生了另一個嶄新概念，即工業遺產。透過這種方式，廢棄的建築物、礦場、運河、設施和工人宿舍被改造成歷史古蹟，象徵失落的區域經濟，值得保存起來，供未來世代學習欣賞。

在西班牙，工業遺產發展作為新旅遊和休閒產業的一部分一直都是分析的焦點。這種分析傾向於強調再生過程所產生的積極要素。

另一方面，歐洲保護區永續旅遊憑證認為保護和改善自然或歷史文化遺產，以及促進與地方認同和歷史相關的活動是兩大基本要點——人們關注人口及地方倡議在永續旅遊模式中扮演的重要角色時，會強調後者。在這方面，帕爾多 (Pardo) 堅持認為，工業遺產領域的永續旅遊目的在於確保將這一遺產作為文化資源使用及保護，並獲得遊客和當在社區的支持和參與，其目標是將任何不利影響降到最低，同時最大限度地提高旅遊業的社會、經濟、文化和環境效益。

詹森 - 韋爾貝克 (Jansen-Verbeke) 在探索永續工業旅遊的發展應如何達到平衡遊客與所參觀地區的需求時，提出了更嚴格的條件，既保護遺產地點，同時促進未來發展的機會。 該領域的旅遊資源管理不應局限於單純的休閒考量，而是為創新和發展創造環境。

其他作者強調工業遺產旅遊的永續性較弱，原因在於當地人口在將生產空間轉變為文化空間方面缺乏投入，或者因為其經濟收益低。在丹妮絲·柯爾 (Denise Cole) 於 2002 年對英國 45 個採礦遺產景點進行的調查中，只有 7.5%

of the population and local initiatives in models of sustainable tourism. In this vein, Pardo maintains that sustainable tourism in the field of industrial heritage is that directed at guaranteeing the use and conservation of this heritage as a cultural resource, with the support and participation of visitors and the local community, and whose aim is to minimise any adverse impacts while maximising the social, economic, cultural, and environmental benefits from tourism.

Jansen-Verbeke proposes even more stringent conditions when exploring how the development of sustainable industrial tourism should aim to balance the needs of tourists against those of the regions being visited, protecting both heritage sites and also promoting the opportunities for future development. The management of tourist resources in this field should not be constrained to mere recreational contemplation, but also generate an environment for innovation and progress.

Other authors highlight the weak sustainability of industrial heritage tourism, due to the lack of commitment of the local population in the transformation of a productive space into a cultural space, or because of its low economic profitability. In the survey conducted by Denise Cole in 2002 in 45 U.K. mining heritage attractions, only 7.5% declared “comfortable profit”, while 37.5% depended on public subsidies and 55% were “breaking even”.

With the worldwide changes that have occurred as a result of the COVID-19 pandemic, the fact that we live in a society full of risks is more clearly demonstrated than ever. As a result, the conceptual framework to which we should orient ourselves is defined by the search for sustainable development as a way of constantly improving society through the fostering of a local resilience that promotes innovation and progress in the context of ongoing risk and unforeseen circumstances. In this sense, questioning the sustainability and resilience of a tourism transformation process in rural areas will allow offering relevant information for future developments.

4. Methodology

As a result of the industrial decline associated with the extractive activity of coal and cinnabar due to the level of contamination of the activity and the loss of competitiveness in the international market, a debate has arisen around the resilience capacity of peripheral territories searching alternatives for development.

的人宣稱「利潤不錯」，而 37.5% 的人仰賴公共補貼，而 55% 的人僅達到「收支平衡」。

因新冠疫情大流行，世界發生的變化，清楚地證明了我們生活在一個充滿風險的社會中。因此，應該定位的概念框架定義是將永續發展作為一種透過培養當地因應持續的風險和意外情況的韌性，並促進創新和進步來持續改善社會的方式。從這個意義上說，質疑鄉村地區旅遊轉型過程的永續性和韌性將為未來的發展提供相關資訊。

4. 研究方法

由於開採煤炭和硃砂造成污染，加上喪失國際市場競爭力，導致工業衰退，大家開始討論周邊地區尋找發展替代方案的韌性。

儘管經濟危機影響全球眾多工業領域，但本研究專注於西班牙的案例。西班牙已經記錄到工業佔經濟的比重大幅下降。工業 GDP 的比重從 1980 年的 25.9% 下降到 2020 年的 14.02%。這些數據低於歐洲其他地區的 GDP。

雖然工業活動在國家 GDP 中的比重下降，但直到 2020 年，旅遊業的 GDP 產值持續攀升，2019 年達到 12.4%。考慮旅遊業與經濟成長之間的關係，如一些研究所示，研究的目標是分析周邊是傳統工業地區的區域功能動態。

基於不同遺產保護圖表中的文字及旅遊功能水平的遺產價值增值過程是旅遊活動永續性研究的變數。工業旅遊的永續性在此理解為經濟層面。這與 ERIH 在本地區域及國際層面推動綜效的能力有關。

並非所有旅遊目的地及產品都會對經濟或遊客行為產生相同的影響，但可以觀察到通常與工業遺產相關的地方文化增加是上述旅遊體系的基本要素。

本研究著重於文化工業旅遊模式的工業旅遊。根據旅遊人流的動機來定義：阿爾馬登及薩韋羅的案例，目前不存在工業活動，因此採用

Although the economic crisis that affects many industrial areas occurs on an international scale, this research focuses on the Spanish case. Spain has registered a strong loss of the weight of the industry in the economy. The value of GDP in industry has decreased, from representing 25.9% in 1980 to 14.02% in 2020. These data are below the GDP of the rest of Europe.

While industrial activity has lost weight in national GDP, the value of GDP in tourism has been on the rise until 2020, reaching 12.4% in 2019. Taking into account the relationship between tourism and economic growth in general terms as shown by some studies, the general objective of the research is to analyse the functional dynamics of two territories with an industrial tradition in peripheral areas.

The heritage valorisation process, based on the inscriptions in the different heritage protection figures, and the level of tourism functionality, constitute variables for the study of the sustainability of tourism activity. The sustainability of industrial tourism is understood here in its economic dimension. This is related to the ERIH's ability to promote synergies at a local–regional and international level.

Not all tourist destinations and products have the same impact on the economy or on the behaviour of visitors, but it has been possible to observe the increase in the local cultural often associated with industrial heritage as a basic element of the tourism system in question.

The research focuses on industrial tourism associated with the cultural–industrial tourism modality. It will be defined by the motivation of the tourist flows: motivated by tourist resources related to the visit to mining industrial facilities related to both the Living Industry included in the UNE 302001: 2016 Standard, as well as historical, because in the case of Almadén and Sabero, the industrial activity is non-existent at present.

Among the various conceptual meanings of industrial tourism and industrial heritage tourism, we take as a reference the notion of industrial heritage tourism, consisting of museums and eco-museums, factories and industrial facilities, industrial routes, and interpretation centres; the real, movable and intangible industrial assets included in the National Plan for Industrial Heritage, and the notion of industrial tourism understood as that which offers experiences related to the knowledge of making a product, the history or tradition, and industrial heritage.

UNE 302001：2016 標準中提到的生活產業及歷史相關的採礦工業設施參觀的旅遊資源。

在工業旅遊和工業遺產旅遊的各種概念含義中，我們參考工業遺產旅遊的觀念，包括博物館及生態博物館、工廠及工業設施、工業路徑和解說中心；國家工業遺產計畫中包含的真實、可移動和無形的工業資產，工業旅遊的概念可以理解為提供製造產品的知識、歷史或傳統以及工業遺產相關的經驗。

該研究專注於進行工業建築群管理能力的估算，並試圖在歐洲可供參觀的旅遊活動空間下解釋結果，未區分仍進行工業活動的空間。

旅遊人流的分析作為估算自我管理能力的指標，而不是試圖評價不同組織對有些遺產價值評估的事件。

該分析的範圍在歐洲，針對 ERIH 的領域，因為阿爾馬登及薩韋羅都屬於該路徑。

這項工作共分成三個部分。第一部分包含當前工業旅遊文獻的回顧，以及對歐洲成功經驗的調查，這些經驗成功示範了將前工業空間整合、再利用應用在與文化休閒相關的新的、富有成效的活動。許多空間作為旅遊景點再生可以視為應用韌性和永續性原則來對抗衰退。

第二部分解釋研究背後的理論框架。該框架主要由工業旅遊業發展的背景及其與中長期韌性和永續性的關係來定義。

第三部分包含兩個重要工業遺產點的案例研究，將討論阿爾馬登和薩韋羅周邊工業旅遊的可行性和永續性 (圖 2)。這兩個地方被選為代表遠離城市和經濟發展中心的農村空間的重要工業遺產點。

除了參考文獻和文件紀錄來源外，本案例研究的資料來源更具焦於整個 ERIH 地區 2018 年及 2019 年 ERIH 綜合評量表 (Barometer) 的全球結果，不過只有阿爾馬登的案例得以取得分類數據，薩韋羅案例則從瑪雅莎 (MAYASA) 及卡斯提亞 - 里昂自治區主管機關 (Junta de Castilla y León) 獲取數據。ERIH 綜合評量表的

The study focuses on carrying out an approximation on the management capacity of industrial complexes, trying to interpret the results in the European context of tourist activity in spaces equipped for visits, without differentiating those that still register industrial activity.

The analysis of tourist flows constitutes an indicator of approximation to the capacity for self-management, rather than trying to assess the incidence of the patrimonial valuation of the elements by the different organizations.

The analysis is based on the European scale, and specifically the ERIH territory, because Almadén and Sabero are part of this route.

This work is divided into three parts. The first part contains a review of the current literature on industrial tourism and an examination of successful experiences in Europe that constitute examples of good practice for the integration and reuse of ex-industrial space for new, productive activities related to culture and leisure. The regeneration of many of these spaces as tourist attractions can be profiled as the application of the principles of resilience and sustainability to combat their decline.

Figure 2. European Route of Industrial Heritage (ERIH) Anchor Points located in Spain.
圖 2：西班牙的歐洲工業遺產路徑 (ERIH)。

In the second part, the theoretical framework underlying the investigation is explained. This framework is defined principally by the context in which industrial tourism develops, and its relationship to medium- and long-term resilience and sustainability.

The third section, containing case studies of two Anchor Points, will enable a discussion of the viability and sustainability of industrial tourism in the environs of Almadén and Sabero (Figure 2). These two places were chosen as Anchor Points representative of rural spaces far from the axes of urban and economic development.

In addition to bibliographic and documentary sources, the sources used for the case study focused on the global results of the ERIH Barometer for 2018 and 2019 for the entire ERIH territory, although it was possible to have disaggregated data only in the case of Almadén, and data available from MAYASA and the Junta de Castilla y León in the case of Sabero. The results of the ERIH Barometer, disaggregated in the case of Almadén, were compared with those

結果（阿爾馬登案例取得分類數據）與瑪雅莎訪遊客研究的結果進行比較，討論使用一般結果，將案例與歐洲 ERIH 背景進行比較。

2019 年 ERIH 工業遺產綜合評量表顯示了 2018 年及 2019 年間一些方法上的差異；但結果已調整為概括結果。該調查涵蓋與工業遺產相關的各種主題的問題，並針對工業遺產地點負責人進行。註冊於德國的 ERIH 協會與魯爾區域聯盟共同合作於線上進行調查。調查問卷共有 12 個問題，關注場地的管理和資金特性、訪客概況、管理者滿意度以及中期目標及策略。

瑪雅莎及卡斯提亞 - 里昂自治區的案例研究使用案例地點的公司及管理機構的資料。

這兩個案例研究有一系列共同特點：地理範圍；工業對環境的巨大影響尚未復原；人口密度的變化及下降；工業衰退；遠離其他經濟發展中心。用於分析的資料及這些地點旅遊業再開發的討論來自每個地點的工業遺產管理機構，以及從自 2018 年以來由魯爾區域聯盟製作的 ERIH 工業遺產綜合評量表中所擷取。

provided by the MAYASA visitor study and the general results were used for the discussion where a comparison of the cases with the European ERIH context could be made.

The ERIH Industrial Heritage Barometer in 2019 shows some methodological differences between 2018 and 2019; however, the results have been generalized. The survey covers questions on a variety of topics related to industrial heritage and is directed at those responsible for industrial heritage sites. It is carried out online by ERIH, an association registered in Germany, in cooperation with Regionalverband Ruhr. There are a total of 12 questions, which focus on the management and financing characteristics of the site, the profile of the visitor, manager satisfaction, and on the medium-term objectives and strategies.

For the case study, sources from the companies and managing bodies of the site have been used. This is the case of MAYASA and the Junta de Castilla y León.

The two case studies have a series of common characteristics: geographic extent; considerable environmental impact of the industry that has not been restored; changing and declining population density; industrial decline; and a significant level of isolation from other centres of economic development. Data for the analysis and discussion of the tourism strand of redevelopment in these locations were provided by the industrial heritage management bodies of each location and extracted from the ERIH Industrial Heritage Barometer, a statistical metric produced by the Regionalverband Ruhr since 2018.

The case studies give rise to many questions for discussion, concerning themes surrounding the sustainability of industrial tourism in outlying regions. These are brought together in the conclusion.

5. Case Studies

• *5.1. Almadén*

The municipality of Almadén is located in the Alcudia valley, and forms part of the eight municipalities comprising the Montesur Association. This association was constituted in 1996 to enable the management of rural development programmes. This group of municipalities in Montesur is a non-administrative district on the peripheries of the Iberian Peninsula and has a population of 11,142. At the district level, the population density has seen a steady and ongoing decline for more than thirty years. The population density currently stands at around 8.51 inhabitants/km^2, and in the case of

案例研究引發許多需要討論的問題，涉及周邊偏遠地區工業旅遊的永續性議題。這些都在結論中整合。

5．個案研究

• *5.1．阿爾馬登*

阿爾馬登市位於阿爾庫迪亞 (Alcudia) 山谷，是蒙特蘇爾協會 (Montesur Association) 中八個市鎮之一。蒙特蘇爾協會成立於 1996 年，旨在管理鄉村發展計畫。這些在蒙特蘇爾的市鎮是伊比利亞半島外圍的一個非行政區，人口為 11,142 人。以地區層面而言，此區三十多年來，人口密度持續穩定下降，目前人口密度約為每平方公里 8.51 人，而阿爾馬登的人口密度為每平方公里 22.16 人。人口密度之所以較高，是因為阿爾馬登是許多基本服務的中心，且為該地區總人口最高之市鎮，2019 年有 5,312 位居民登記於此。根據國家統計研究所 (INE)（西班牙國家選舉登記單位）的數據，該地區出現人口流失，相較於 2018 年，年際變化為 -2.73%。

阿爾馬登位在雷亞爾城 (Ciudad Real) 省西南部，座落於西班牙梅塞塔高原和瓜達爾基維爾河谷間。該區位於三個自治區中，三個省份的邊界：雷亞爾城（卡斯提亞 - 拉曼查 (Castilla-La Mancha)）、巴達霍斯 (Badajoz)（埃斯特雷馬杜拉 (Extremadura)）與科爾多瓦 (Córdoba)（安達魯西亞 (Andalucía)）。

阿爾馬登一詞源於阿拉伯語 (al-ma’din)，意思為「礦山」，亦代表阿拉伯人佔領該區。阿拉伯人在礦山周圍定居，建造礦山堡壘 (hins al-ma'din)。在 1151 年阿方索七世 (Alfonso VII) 征戰後，這座堡壘仍受穆斯林影響，並在 1168 年成為卡拉特拉瓦騎士團 (Order of Calatrava) 遺產的一部分。

• 5.1.1．汞礦的起源與發展

阿爾馬登的經濟發展與當地辰砂儲量有關，辰砂是提煉汞的礦物原料，很稀少但卻集中出現在阿爾馬登，這裡的礦床已經被開採兩千多年。雖然也有鉛鋅礦，但最重要的是，與汞提取行業相關的礦物儲量，主要是在阿爾馬登、恩特雷迪喬 (El Entredicho) 和拉維耶哈康塞普西翁

Almadén specifically, it is 22.16 inhabitants/km^2. The greater population density in Almadén is due to the fact that it is a centre for many basic services and has the highest overall population in the area, with 5312 registered inhabitants in 2019. The area's demographic changes follow a pattern of population loss with an interannual variation of −2.73% with respect to 2018, according to data from INE (Spain's National Electoral Registry).

Almadén lies within a district in the southwest of the Ciudad Real province, in between Spain's Meseta Central plateau and the Guadalquivir river valley. The territory is on the borders of three provinces in three autonomous communities: Ciudad Real (Castilla-La Mancha), Badajoz (Extremadura), and Córdoba (Andalucía).

The word Almadén has Arabic origin (al-ma'din), whose meaning is "the mine", and refers to the Arab occupation in the area. The Arabs settled around the mine and built the hins al-ma'din, the mine fort. After the conquest of Alfonso VII in 1151 the fort remained under Muslim influence, and in 1168 this territory became part of the heritage of the Order of Calatrava.

• 5.1.1. Origin and Development of Mercury Mines

The economic development of Almadén is associated with the local reserves of cinnabar, from which mercury is extracted. This metal is rare, but in Almadén, appears in extraordinary concentrations and these deposits have been mined for more than 2000 years. Although there are also deposits of lead and zinc, the most important reserves are those associated with the mercury extraction industry, most prominently those at Almadén, El Entredicho and La Vieja Concepción, and of secondary importance, those at Las Cuevas, Nuevo Entredicho and Nueva Concepción. The area around Almadén has the largest reserves of mercury in the world. Palero puts a figure of 270,000 tonnes on the amount of cinnabar extracted from the Almadén mining region, a quantity that represents a third of global production. The magnitude of production on this site hints at the incredible changes to the landscape that must have taken place and how deeply the cultural landscape would have reflected that economic foundation and mining culture.

The interest in mercury throughout history places Almadén in a strategic position on multiple fronts. From the geological perspective, its cinnabar reserves are unique in the world with the highest levels of productivity. Of particular importance are the macrostructure known as the Almadén syncline, 25 by 10 km in extent, and the bodies known as roca frailesca (friar's rock).

(La Vieja Concepción)，其次是在拉斯庫埃瓦斯 (Las Cuevas)、新恩特雷迪喬 (Nuevo Entredicho) 和新康塞普西翁 (Nueva Concepción)。阿爾馬登周邊地區擁有世界最多的汞儲量。帕萊羅 (Palero) 估計從阿爾馬登礦區提取的辰砂量為 270,000 噸，佔全球產量的三分之一。該區的生產規模反映了當地景觀必經的劇變，以及經濟基礎和採礦文化如何深刻反映在其文化景觀。

歷史上由於對汞的關注，讓阿爾馬登在許多個方面都處於重要策略地位。從地質角度而言，其辰砂儲量在世界上絕無僅有，擁有最高生產力。特別重要的是被稱為阿爾馬登向斜的巨觀結構，其範圍為 25x10 公里，以及被稱為修士岩 (friar' s rock) 的岩體。

阿爾馬登向斜的特徵是沉積岩露頭，其年代可追溯至古生代，介於早奧陶紀和晚泥盆紀間。於此發現主正石英岩的岩層單位，即是擁有最高礦化汞濃度的克里亞德羅石英岩 (Criadero Quartzite)，儘管在恩特雷迪喬等其他地點亦有發現，主要還是出現在阿爾馬登的聖佩德羅 (San Pedro)、聖法蘭西斯科 (San Francisco) 及聖尼古拉斯 (San Nicolás) 岩層。向斜內發現的修士岩屬火成岩類，是阿爾馬登地區特有的爆發凝灰岩。

從歷史角度來看，由於對礦產的高需求，阿爾馬登扮演重要角色。在鄰近阿爾庫迪亞山谷和馬德羅納山脈 (Sierra Madrona) 發現的鉛和含銀方鉛礦，早在前羅馬時代就已被開採。然而，辰砂開採才增加礦場的重要性，羅馬人使用辰砂製作朱紅染料。西哥德人離開後，摩爾人從 8 世紀重啟採礦活動，生產朱紅與汞，汞受到煉金術士和醫學的高度重視。在 13 世紀阿爾馬登礦場由卡拉特拉瓦騎士團掌控，直到 16 世紀才成為王室財產。然而，在發現美洲之後，由於新大陸使用汞齊法提取金銀，這些礦場當時經歷了輝煌歲月，即便如此，直到西班牙內戰後，才達到礦場產量的高峰。

汞的重要性讓阿爾馬登出現在有影響力地區的貿易路線上。這些路線包含羅馬托萊多 - 科爾多瓦 (Toledo–Córdoba) 路線、塞維利亞和馬德里間從 1775 年左右啟用的皇家大道 (Royal Route) 以及皇家銀色大道 (Royal Silver Route)，

A particular feature of the Almadén syncline are the outcrops of sedimentary rock dating from the Palaeozoic era, between the Early Ordovician and Late Devonian periods. This is where the principal orthoquartzite lithostratigraphic unit Criadero Quartzite is found, which hosts the largest concentrations of mineralised mercury. This is located most specifically at the San Pedro, San Francisco, and San Nicolás beds in Almadén, although it appears at other sites such as El Entredicho. The roca frailesca found within the syncline are explosive tuffs, of igneous origin, peculiar to the Almadén region.

From the historical viewpoint, Almadén has had a significant role due to the high demand for its mineral wealth. Both lead and argentiferous galena, found in the nearby Valle de Alcudia and Sierra Madrona, were already being extracted in the pre-Roman era. However, it was the exploitation of cinnabar, which the Romans used make the dye vermillion, that increased the mine's importance. After the Visigoths came the Moors and restarted mining activities from the 8th century to produce vermillion, and, in addition, mercury itself, a substance highly valued by alchemists and in medicine. In the 13th century, the Almadén mines passed into the hands of the Order of Calatrava until the 16th century, when it became the property of the Crown. However, it was after the discovery of the Americas that the mines experienced their glory days due to the use of mercury amalgamation for gold and silver mining in the New World. Even so, it was only after the Spanish Civil War that the mines reached their maximum levels of production.

The importance of mercury places Almadén on the path of several historical trade routes between several influential areas. These routes include the Roman Toledo–Córdoba route, the Camino Real (Royal Route) between Seville and Madrid that was in use from around 1775, and the Camino Real de La Plata (Royal Silver Route) which passed through Seville's shipyards and thence, by river, to San Lúcar de Barrameda, from where fleets would depart for the New World. For many centuries, Almadén was obligated to Seville because this was where all mercury trade was directed, almost always destined to enable the silver industry of the Americas. The transport of mercury, commonly known as azogue, connected an extensive area and, from the 15th through to the 19th century, gave the region significant economic power.

The economic activity associated with mineral exploitation, over a time span of 2000 years, has left important archaeological remains from different eras and cultures, both in terms of architecture and technical artefacts. For example, there are the Arabic furnaces

皇家銀色大道穿越塞維利亞造船廠，之後沿著河流即可抵達桑盧卡爾 - 德巴拉梅達 (San Lúcar de Barrameda)，艦隊可從此啟程前往新世界。幾個世紀以來，阿爾馬登對塞維利亞負有責任，因為所有的汞貿易於此進行，幾乎注定促成美洲銀產業的發展。從 15 到 19 世紀汞的運輸，通常稱為水銀運輸 (azogue)，連接廣大區域，賦予該地強大經濟實力。

歷經兩千年的採礦經濟活動，留下來自不同時代和文化的重要考古遺跡，其中包括建築和技術文物，如可追溯回八世紀的阿拉伯冶爐以及礦業學院 (Academy of Mines) 和聖拉斐爾皇家礦工醫院 (San Rafael Royal Hospital for Miners) 的巴洛克式建築。這就是大家說的「19 世紀中葉的建設和建築革命」。

全球汞需求的減少以及採汞礦市場出現新的參與者，如中國、吉爾吉斯和阿爾及利亞等，讓阿爾馬登的汞產量下降。然而，阿爾馬登活動完全終止的原因在於環境問題。

汞礦開採的式微始於 1970 年代，各組織和利益團體的國際反採礦抗議活動，如世界衛生組織 (World Health Organisation)、聯合國環境規劃署 (United Nations Environmental Programme)、行動生態學家 (Ecologists in Action)、歐洲環境局 (European Bureau for the Environment)，乃至在 2005 年實施汞策略 (Community Strategy Concerning Mercury) 的歐盟。汞礦開採的作業限制引發 1979 年和 1984 年礦工的反抗議活動。礦工舉行的地下靜坐活動再次澄清採礦文化，這是 2019 年禁閉 (El Encierro) 紀錄片的主題，該紀錄片的發佈是為了紀念第一次靜坐抗議的四十週年。紀錄片的拍攝重振採礦文化，重新檢視許多過往需求，進而提升阿爾馬登區的能見度，並對當地採礦業的沒落，採取更明確的行動。

2019 年阿爾馬登民眾象徵性重演抗議活動，強調該區仍面臨的問題。該區被歸類為「荒蕪西班牙 (deserted Spain)」的其中一區，被迫平臺 (Plataforma Forzados) 成立於 2019 年，讓當地民眾得以提出他們的訴求。對於可能透過阿爾馬登工業遺產重振當地經濟，民眾藉由表演表達疑慮。民眾的訴求包含推動再工業化計畫，提

dating from the 8th century through to the baroque edifices of the Academy of Mines and the San Rafael Royal Hospital for Miners. Indeed, people speak of a "revolution in construction and architecture in the middle of the 19th century".

The reduction in global demand for mercury and the appearance of new players in the mercury extraction market, such as China, Kyrgyzstan, and Algeria, contributed to Almaden's decreasing mercury production. However, the reasons for the complete shutdown in activity at Almadén lay in environmental concerns.

The decline in mercury mining began in the 1970s after international anti-mining protests on the part of various organisations and interest groups: the WHO (World Health Organisation), UNEP (United Nations Environmental Programme), Ecologistas en Acción (Ecologists in Action), Bureau Européen de l'Environnement (European Bureau for the Environment) and even the European Union, through its Community Strategy Concerning Mercury adopted in 2005. Restrictions on mercury extraction processes gave rise to counter-protests by mine workers in 1979 and 1984. The underground sit-ins staged by the miners constitute a revindication of mining culture and were the subject of a 2019 documentary (El Encierro), released to mark the fortieth anniversary of the first sit-in protest. The filming of this documentary has reanimated mining culture and renewed many old demands to increase the visibility of the Almadén district and to take more incisive action over the demise of its mining industry.

In 2019, the protests were re-enacted symbolically by the people of Almadén to highlight the problems that the region still faces. This district has been categorised as an area within "deserted Spain", and Plataforma Forzados was created in 2019 to enable local people to channel their demands. The demonstrations reflect the disquiet surrounding the potential that Almadén's industrial heritage may have to re-energise the local economy. Amongst the demands of the population are, for instance, taking forward plans to re-industrialise, making industrial land available at low cost, the A-43 motorway route, connecting the district's towns by rail-links, and putting into operation a Strategic Plan for Industrial Tourism in Almadén. At the same time, they have requested that the Autonomous Administration make comparative improvements with respect to other sites declared as part of the World Heritage in Castille-La Mancha, the creation of a business advisory office, more access to funds from the European Liaison Entre Actions de Développement de l'Economie Rurale (LEADER) project, handing over manage-

供低成本的工業用地，A-43 高速公路路線，透過鐵路連接該區城鎮以及實施阿爾馬登工業旅遊策略計畫 (Strategic Plan for Industrial Tourism in Almadén)。同時，他們要求自治政府改善下列事項：將其他地點視為卡斯提亞 - 拉曼查世界遺產的一部分，設立商業諮詢辦公室，取得更多鄉村經濟發展行動連結 (European Liaison Entre Actions de Développement de l' Economie Rurale, LEADER) 計畫的資金，將管理權移交給蒙特蘇爾協會以及改善飲用水基礎設施。

所有礦物開採於 2001 年終止，不過與剩餘庫存相關的工業活動一直持續到 2003 年。歐洲氯工業最大協會歐氯 (Euro Chlor) 同意出售所有阿爾馬登的汞庫存，條件是減少直接開採。儘管公部門嘗試實施不同策略，讓地方經濟多元化發展，例如：隸屬於國營工業控股公司 (State Society for Industrial Participation) 的國營企業瑪雅莎 (MAYASA S.A)，藉由 2007 年到 2013 年阿爾馬登區經濟復興計畫 (Almadén District Economic Reconversion Plan 2007–2013)， 將開採活動重新導向紅色氧化汞和鹼性汞鹽的生產，以及地質工程的諮詢和承包，然而這些計畫實際上沒有成功。目前瑪雅莎負責管理阿爾馬登礦業園區 (Almadén Mining Park)。

• 5.1.2. 轉型成果：阿爾馬登礦場及其作為旅遊景點功能的評估過程

自 1998 年以來，南區 (Southern District) 的在地行動團體 (Local Action Group, LAG) 依據不同框架，推行多項鄉村發展計畫，如鄉村發展業務計畫 PRODER 1 (1998-2002)、PRODER 2 (2002-2007)、LEADER (2007-2013) 和當前卡斯提亞 - 拉曼查鄉村發展計畫 (Rural Development Programme in Castilla-La Mancha) 的 LEADER 2 第 19 軸 (2014-2020)。 阿爾馬登區發展的隱憂是缺乏就業機會，以及基本公共服務的低投資水準。這些問題導致該區成為西班牙國家人口挑戰 (National Demographic Challenge) 的目標之一。

除了這些鄉村發展計畫的行動外，阿爾馬登開始整修礦區。此行動獲得文化部支持，旨在重整及提升礦業遺產的價值。其中最重要的目

ment to the Montesur Association, and improvements in the drinking water infrastructure.

All mining extraction was stopped in 2001, although industrial activity, exploiting the residual stockpile, continued until 2003. Euro Chlor, the largest association of the European Chlorine industry, agreed the sale of all Almadén's stockpiled mercury on condition that direct extraction be reduced. Although public administration has attempted strategies for local economic diversification, such as PRECA (Almadén District Economic Reconversion Plan 2007–2013) through which the state-owned company MAYASA S.A, part of SEPI (State Society for Industrial Participation), redirected extraction activities towards the production of red mercury oxide and basic mercury salts; consultation and contracting of geological works, these projects have not actually been successful. Currently, MAYASA focuses its efforts on the management of the Almadén Mining Park.

• 5.1.2. Results of the Transformation: The Process of Evaluating the Almadén Mines and Their Functionality as Tourist Attractions

Since 1998, the Local Action Group (LAG) for the Southern District has taken forward several projects for rural development within the framework of the Operational Programme for Rural Development PRODER 1 (1998–2002), PRODER 2 (2002–2007), LEADER (2007–2013) and currently, LEADER 2 Axis 19 of the Rural Development Programme in Castilla-La Mancha (2014–2020). Amongst the concerns surrounding the development of the Almadén district are the lack of job opportunities and low levels of investment in basic public services. Due to these problems, the region is a target of Spain's National Demographic Challenge.

Besides the actions taken within these rural development programmes, Almadén is starting a process of renovating its mining complex. This action is supported by the Ministry of Culture, and has the aim of renovating and enhancing the value of their mining heritage. One of the most important goals, and an emblem of industrial heritage, is the creation of the Almadén Mining Park. It involves the reuse of mining spaces for the purposes of culture and tourism. The refurbishment of the mines as the Almadén Mining Park, and their reuse as a sociocultural space, was enabled through the Almadén Mining Park Management Plan.

Industrial spaces, which have been somewhat invisible from the heritage perspective, are beginning to be re-evaluated with the

標之一，是成立阿爾馬登礦業園區，作為工業遺產的象徵。阿爾馬登礦業園區以文化和旅遊為目的，重新利用礦場。依據阿爾馬登礦業園區管理計畫 (Almadén Mining Park Management Plan)，將礦場整修成阿爾馬登礦業園區，重新運用舊礦場，作為社會文化空間。

從遺產的角度來看，工業空間在某種程度上容易被埋沒，但隨著新千禧年的到來，看待和詮釋遺產和土地的新方式出現，開始重新評估工業空間。在西班牙有幾個因素，促成對工業遺產的全面重新評估：2012 年阿爾馬登的採礦遺產列為世界遺產文化景觀 (World Heritage Cultural Landscape)；2008 年歐洲景觀公約 (European Landscape Convention)；根據遺產新概念，依法推動發展，落實相關保護；2008 年比爾佐礦業遺產保護憲章 (Bierzo Charter for the Conservation of Mining Heritage)；2002 年國家工業遺產計畫 (National Plan for Industrial Heritage) 以及 1999 年國際文化紀念物與歷史場所委員會 (ICOMOS) 的國際文化旅遊憲章 (International Charter on Cultural Tourism)，其中涉及工業遺產民主化，亦擴大「遺產」一詞之解釋，涵蓋世界各區域。在學術領域，對遺產的關注更聚焦在地域特徵，且最終依循教規，如由西班牙地理學家學院 (College of Geographers) 和西班牙地理協會 (Spanish Association of Geography) 提倡《新地域文化宣言》(Manifesto for a New Territorial Culture)（2006 年）中訂定的教規。

綜合來看，地域性遺產可作為加強潛在旅遊景點的新資源。換言之，可重新利用採礦設備，作為工業旅遊的新商品。阿爾馬登旅遊業的發展與賦予遺產價值息息相關，而遺產價值源自各種法律保障與承認其重要性。阿爾馬登是西班牙的參考經驗之一，不過其旅遊活動量適中，以教育參訪為主。圖 3 顯示自興建以來，遊客人數的逐年變化，礦業園區每年接待 10,000 至 15,000 名遊客。

1992 年有些工業遺址被列為西班牙國家文物古蹟 (Bienes de Interés Cultural, BIC)，其中包含：阿爾馬登和阿瑞尼亞斯礦場的歷史檔案館 (Historic Archive of the Almadén and Arrayanes Mines)、聖拉斐爾皇家礦工醫院和布斯塔曼特

appearance, in this new millennium, of new ways of looking at and interpreting heritage and land. In Spain, several factors have contributed to the comprehensive re-assessment of industrial heritage: world recognition of Almadén's mining heritage as a World Heritage Cultural Landscape (2012); the European Landscape Convention (2008); regulated development to ensure conservation based on new conceptualisations of heritage; the Bierzo Charter for the Conservation of Mining Heritage (2008); the National Plan for Industrial Heritage (2002), and the ICOMOS International Charter on Cultural Tourism in 1999, which involves the democratisation of industrial heritage and a broadening of the term, heritage, to include territorial regions at the world level. Within the academic field, concerns about heritage have a more territorial character and are ultimately based on precepts such as those laid out in the Manifesto for a New Territorial Culture (2006), which is promoted by Spain's College of Geographers and the Spanish Association of Geography (AGE).

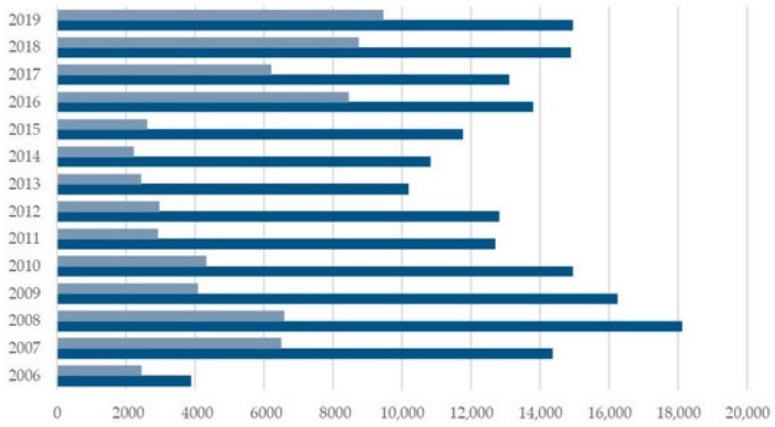


Figure 3. Number of visitors (source: adapted from).
圖 3：遊客人數。

Taking an integrated view of territorial heritage, it can be a way of enhancing a new set of resources as potential tourist attractions. In other words, it is one way in which mining installations can be re-purposed as new products for industrial tourism. The development of tourism in Almadén is related to giving a value to heritage through various legal protections and recognition of their significance. Although it is one of the reference experiences in Spain, tourist activity in Almadén is moderate and is mostly linked to educational visits. Figure 3 shows how visitor numbers have changed year by year since its opening, with the Mining Park receiving between 10,000 and 15,000 visitors annually.

In 1992, several industrial heritage sites were declared Cultural Interest Assets (BIC: Bienes de Interés Cultural), these included: the Historic Archive of the Almadén and Arrayanes Mines, the San Rafael Royal Hospital for Miners, and the Bustamante Furnace. In 2008, taking a wider approach, the Governing Council of the autonomous community of Castille-La Mancha declared that the entire mining complex at Almadén should be classed as a BIC, categorising it as a Historic Complex, with legal protection being extended in 2016 to include further fixed assets. Having previously presented a case for consideration as a UNESCO World Heritage Site, in 2012, Almadén and its mine were accepted onto the list of sites jointly with the Slovenian city of Idrija under the title of "Heritage

冶爐 (Bustamante Furnace)。2008 年卡斯提亞 - 拉曼查自治區管理委員會 (Governing Council) 採取更廣泛的做法，宣布阿爾馬登整個礦區都應屬於西班牙國家文物古蹟，且歸類為歷史建築群 (Historic Complex)，並於 2016 年將法律保護範圍進一步擴大到包含固定資產。經過先前的申請，2012 年阿爾馬登及其礦場，一起與斯洛維尼亞的伊德里亞市以「水銀的遺產：阿爾馬登和伊德里亞」的名義，列入聯合國教科文組織世界遺產名錄。對阿爾馬登來說，這意味著整個區域的保護，其中涵蓋下列地點：阿爾馬登舊城區、卡斯蒂略礦業建築 (Castillo Mining Buildings)、皇家強迫勞動監獄 (Royal Forced Labour Gaol)、聖拉斐爾皇家礦工醫院和鬥牛場。覆蓋面積為 49.66 公頃，包含緩衝區則為 1117.25 公頃（圖 4）。

自 2019 年以來，阿爾馬登已被認證為歐洲理事會 38 條文化之路 (38 Cultural Routes of the Council of Europe)，其中一條的一部分。由於其工業遺產的特殊歷史意義，阿爾馬登亦為歐洲工業遺產路徑的重要工業遺產點。這除了代表對其遺產價值之認可外，對遊客來說也是個指標，凸顯阿爾馬登是個特別亦適合參訪的旅遊景點。

阿爾馬登工業遺產的再生促成新旅遊產品的開發。在歐洲鄉村發展計畫的框架下，當地已成立幾項計畫，旨在定義阿爾馬登的未來。工業旅遊是鼓勵推動的旅遊類型之一。在這種模式下，正如《阿爾馬登及周邊地區的工業旅遊策略計畫》(Strategic Plan for Industrial Tourism in

of Mercury. Almadén and Idrija". For Almadén, this meant protection for a whole area including the following sites: Almadén—Old Town, Castillo Mining Buildings, Royal Forced Labour Gaol, San Rafael Royal Hospital for Miners, and the Bullring. The area covered is 49.66 Ha with an additional buffer zone of 1117.25 Ha (Figure 4).

Since 2019, Almadén has been certified as part of one of the 38 Cultural Routes of the Council of Europe. Almadén is also an Anchor Point on the ERIH because it is considered of particular historical importance with regard to industrial heritage. This fact, apart from meaning the recognition of its heritage value, acts as an indicator to visitors, highlighting it as a tourist attraction of special interest and suitable for visiting.

Figure 4. The different features around Almadén protected by the area's designation as a UNESCO "Heritage of Mercury" site. Source: https://whc.unesco.org (accessed on 18 July 2020).

圖 4：阿爾馬登被列為聯合國教科文組織「水銀遺產」，當地不同特色因而受到保護。資料來源： https://whc.unesco.org（於 2020 年 7 月 18 日參訪）。

Almadén's regeneration as industrial heritage has promoted the development of new tourism products. Within the framework of the European programmes for rural development, several local projects have been set up with the objective of defining Almadén's future. Industrial tourism was addressed as one of the types of tourism that could be encouraged. Within this model, the Mining Park constitutes a strategic development zone, as reflected in the Strategic Plan for Industrial Tourism in Almadén and Surrounding Area (2015–2016).

The Almadén Mining Park project was conceived through a body known as MAYASA and developed with the help of the Almadén–Francisco Javier de Villegas Foundation as a museum-based enterprise in 1999. In 2002, in collaboration with the Spanish Institute for Historic Patrimony, the management plan for the Almadén Mining Park was drawn up. The aim of this was to "alleviate the decline due to the economic non-viability of mining activities and to show visitors about the mining and metallurgic processes associated with mercury production with tours of the interior of the mines". Quality System was the company responsible for developing this project between 2004 and 2007. The Mining Park proved to be a highly effective means of restoring Almadén's heritage and environment, and it has become something of a tourism nerve-centre.

Among other elements, the project encompassed a study of museums and museum design, studies of viability, finance, and econom-

Almadén and Surrounding Area)（2015-2016 年）中所述，礦業園區成為策略發展區。

阿爾馬登礦業園區計畫最初是由瑪雅莎構思而成，並在阿爾馬登 - 法蘭西斯科·澤維爾·德·維勒加斯基金會 (Almadén–Francisco Javier de Villegas Foundation) 的協助下，於 1999 年成立一家博物館企業。之後在 2002 年與西班牙歷史遺產研究所 (Spanish Institute for Historic Patrimony) 合作，擬定阿爾馬登礦業園區的管理計畫，旨在「減輕由於採礦活動在經濟上不可行而導致的衰退，並藉由參觀礦場，向遊客展示與汞生產相關的採礦和冶金過程」。品質系統公司 (Quality System) 於 2004 年至 2007 年負責開發此計畫。事實證明，礦業園區有效恢復阿爾馬登的遺產和環境，園區已成為旅遊神經中樞。

除了其他要素外，該計畫涵蓋博物館和博物館設計研究，亦執行可行性、財務和經濟管理（包括溝通計畫）研究，計畫資金來自歐洲補助以及與其他機構之合作。礦業園區是礦業遺產改造和再利用的標杆，因此，除了贏得多項地區性獎項外，礦業園區還入選歐盟第六屆區域之星獎 (Regiostars Awards) 的決選名單，作為創新、品質和優良實務的典範。

ic management (including a communications plan), and was funded through European grants and with the collaboration of several other entities. The mining park is a benchmark for the renovation and reuse of mining heritage, and as a result, apart from winning several regional prizes, it was a finalist in the sixth Regiostars Awards, organised by the European Union as an example of innovation, quality, and good practice.

A visit to the park includes a trip to the San Rafael Royal Hospital for Miners. Tours begin at the visitor's centre and continue to the old workshops, the winding towers at the San Aquilino and San Teodoro mine shafts, and the Mining Exhibition Centre. At the exhibition centre, visitors can access the underground part of the tour and see the interior of the mine. Visitors end the subterranean section of the tour by taking a wagon train, renovated for tourists, back to the surface where it continues with a visit to the Alúdeles furnaces, which date from the 17th century, the Carlos IV and Carros Gates and paved road and the brick furnaces, continuing to the Mercury Museum, and finishing at its starting point, the visitor's centre.

According to data provided by the park, concerning their visitor satisfaction questionnaire which has been in use since 2013, out of a total of 1075 responses, 59.44% evaluated their experience as very good, 12.47% as good, and 28.09% as acceptable. The interior of the mine is rated as very good by 42.24% followed by the visitor's centre rated as very good by 24.93%. The exhibits at the Mercury Museum are rated as very good by 53.91% of visitors. In general terms, visits to the park are evaluated positively, especially the visitor's centre, which has adapted well to the needs of its visitors. These data agree with results from other studies which, as can be seen in Figure 5, show the park's attractions as being the most highly evaluated resources, and amongst these the visitor's centre stands out. On the scale from 0 to 5, where 0 is the lowest valuation and 5 the best valuation of the attractions of Almadén, in the upper graph it is observed that the vertices of the lines furthest from the inside and, therefore, the best valued, are the Mining Hospital, Mining Park, and Bullring, rated better than the Palaces, Parish church or Archeological Museum, which approximate values between 0 and 1. In the lower graph, there is greater equity. Only the workshops obtain a lower score, close to 1.

In conclusion, we can extract that after the preparation of the Special Protection Plan and Catalogue of the Almadén Historical Mining Complex prepared by the City Council and the Heritage and Archaeology Service of the General Directorate of Culture as

去園區一定會參訪聖拉斐爾皇家礦工醫院。導覽從旅客中心開始，再到舊工作間、聖阿奎利諾 (San Aquilino) 和聖特奧多羅 (San Teodoro) 礦井塔及礦業展覽中心。在展覽中心遊客可進到地底下參觀礦場內部，遊客接著乘坐為旅客翻修過的搬運車結束地下導覽，返回地面繼續參觀可追溯回 17 世紀的阿盧德萊斯 (Alúdeles) 冶爐、卡洛斯四世和卡羅斯大門 (Carlos IV and Carros Gates) 和鋪面道路及磚爐，接著前往水銀博物館，最後則回到起點旅客中心。

根據園區提供的數據，園區自 2013 年開始進行旅客滿意度調查，總共 1075 份問卷中，59.44% 的旅客認為體驗「非常好」，12.47% 認為體驗「好」，28.09% 認為體驗「尚可」。42.24% 的旅客認為礦場內部非常好，旅客中心則以 24.93% 緊接在後。53.91% 的旅客認為水銀博物館的展示品非常好。總體而言，旅客給予園區參訪正面評價，尤其是依遊客需求改造的旅客中心。這些數據與其他研究的結果一致，如圖

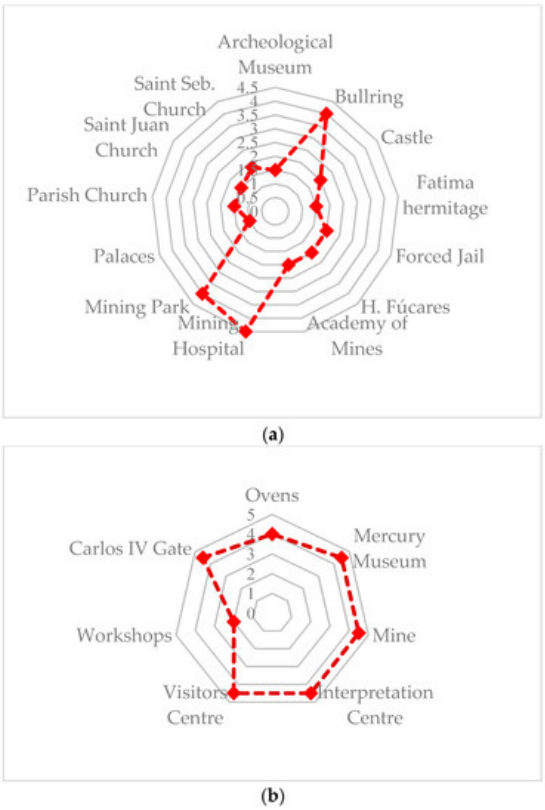


Figure 5. Evaluation of the principal tourism attractions in Almadén (**a**) and in the Mining Park (**b**)

圖 5：阿爾馬登 (**a**) 與礦業園區 (**b**) 主要旅遊景點之評分。

instruments for the protection of heritage, as a consequence of the declared World Heritage by UNESCO in 2012, visits did not increase in the following years, but it was from 2015 when there was a notable increase. Despite the recognition of the heritage value of the mines, the population has mobilized against the closure of the mines after 2000, in favour of local employment and defending the mining tradition and culture, apart from the environmental debate. The consequence of the closure of the mines in 2011 led to a decline in economic activity and population in the region. This rejection is on the fringes of the debate surrounding the environmental contamination of mercury and in the absence of expectations, at least in the short term.

Regarding the management of the site, there are important differences with respect to the entrance fees of Sabero. In the case of Almadén, its price increased considerably after being included in the list of World Heritage, only offering discounts for school groups, which are the dominant groups among the visitor profile.

The individual visit costs EUR 14 for adults over 15, EUR 12 for the over-65s, and EUR 11 for children. Group visits are made with a minimum of 12 people, preferably from Wednesday to Friday. The group visit costs EUR 12 for general admission and EUR 10 for the over-65s and students. The entrance fee includes, in addition to the mine, a visit to the San Rafael Mining Hospital if both visits are made on the same day or the day after. The visit to the mine lasts approximately 2.5 h and two visiting shifts are guaranteed (morning and early afternoon).

- ***5.2. Sabero***

The municipality of Sabero is in the northeast of the Iberian Peninsula, in the mountainous region that separates the provinces of León, Asturias and Palencia, in the valley of the river Esla, close the Picos de Europa National Park. It is part of ADSACIER (Association for Development in Sabero, Cistierna and La Ercina), a body that brings together these three municipalities with the aim of promoting employment generation projects through the management of public aid and private investment. It is also part of the Local Action Group of Montaña de Riaño, an association initially formed of 21 municipalities that has, since 1996, been charged with managing European rural development funds. At the time, this group of 21 Montaña de Riaño municipalities had a joint population of 19,622 inhabitants. By 2019, this figure had dropped to 12,606 inhabitants, with a population density of 6 inhabitants/km2.

5 所示，旅客給予園區景點最高的評價，其中旅客中心的評價最為突出。以 0 到 5 評分阿爾馬登景點，0 為最低分，5 為最高分，可從上圖觀察距離內部最遠的頂點（也就是最高分）是礦工醫院、礦業園區和鬥牛場，其評分高於分數介於 0 到 1 之間的宮殿、教區教堂或考古博物館。下圖的分數分布較為平均，只有工作間的分數較低，趨近於 1。

綜上所述，由於 2012 年被聯合國教科文組織列為世界遺產，為了保護遺產，市議會和文化總局遺產和考古學服務處 (Heritage and Archaeology Service of the General Directorate of Culture) 編制阿爾馬登歷史礦區特別保護計畫和目錄 (Special Protection Plan and Catalogue of the Almadén Historical Mining Complex)，但隨後幾年的造訪人數沒有增加，直到 2015 年才出現顯著成長。儘管礦場遺產價值得到認可，但民眾在 2000 年後反對關閉礦場，在不考慮環境議題下，民眾支持當地就業，捍衛採礦傳統和文化。2011 年礦場關閉後，導致當地經濟活動和人口下滑。這種排斥至少短期內，在沒有預期的情況下，處於汞污染環境辯論的邊緣。

就場區管理而言，阿爾馬登與薩韋羅的入場費有很大的差異。以阿爾馬登為例，在被列入世界遺產名錄後，價格大幅上漲，僅對學校團體提供折扣，學校團體是阿爾馬登的主要客源。

散客的收費如下：15 歲以上成人 14 歐元，65 歲以上 12 歐元，兒童 11 歐元。團客至少需有 12 人，以週三到週五的時段為主。團客一般入場費為 12 歐元，65 歲以上和學生則為 10 歐元。入場費除了包含礦場外，還可在同一天或隔天參觀聖拉斐爾礦業醫院 (San Rafael Mining Hospital)。礦場參訪大約需花 2.5 小時，保證有兩個參訪時段（早上和中午過後）。

- ***5.2. 薩韋羅***

薩韋羅 (Sabero) 市位於伊比利亞半島東北部的山區，座落於埃斯拉 (Esla) 河谷，鄰近歐羅巴山國家公園 (Picos de Europa National Park)，劃分了萊昂、阿斯圖里亞斯和帕倫西亞 (Palencia) 三省。薩韋羅市屬薩韋羅、錫斯

• 5.2.1. History, Development, and Crisis in the Mining and Industrial Sectors

The district of Sabero is rich in mineral reserves, and due to the unique quality of its coal, these resources have been exploited over the decades. At the end of the Hercynic orogeny, several different coal basins developed in the Cantabrian mountain range along its principal structural axes. The extent of the Sabero basin is small—14 km long by 2.6 km across at its widest point—and follows the east–west axis of the Sabero–Gordón fracture zone. In 1841, the anthracite coal field in the Sabero valley became the first to be mined in the province of León. The properties of its coal, specifically the high sulphur and oil content, generating a short flame when burned, made it particularly good for coke production.

These conditions, combined with the existence of iron reserves in the same district (La Imponderable and La Salud mines) saw Sabero become the first Spanish iron foundry to use mineral coal; in 1847, long before other industrial centres in Asturias, the Basque Country or Catalonia. This was in large part due to the impetus of a group of engineers and liberal capitalists, including such names as Miguel Iglesias Botías, Casiano de Prado, Santiago Alonso Cordero, Ramón de la Sagra and the French engineer Philippe Paret. Sabero's advantage was, however, only maintained for 16 years (1847 to 1862) after which use of its blast furnaces ceased. The severe difficulties of production and transport meant that Sabero's iron industry was as short-lived as it was revolutionary. During this time, the French engineer Paret, contracted by the Palentino-Leonesa Mining Society, erected the complex of buildings

Figure 6. Interior of the lamination hall at the San Blas Ironworks. © David Pérez (DPC), Wikimedia Commons, License cc-by-sa-4.0.

圖 6：聖巴勒斯煉鐵廠片狀構造大廳內部。© 大衛佩雷斯 (David Pérez, DPC)，維基共享資源，使用許可 cc-by-sa-4.0。

鐵爾納和萊爾西納發展協會 (Association for Development in Sabero, Cistierna and La Ercina, ADSACIER) 的一員，三個市鎮透過協會合作，旨在藉由管理公費補助和私人投資，創造就業機會。薩韋羅市亦參與蒙大拿德里亞諾 (Montaña de Riaño) 在地行動團體，該團體最初由 21 個市鎮組成，自 1996 年以來負責管理歐洲鄉村發展基金。當時這 21 個市鎮共有 19,622 名居民，到了 2019 年數字已降至 12,606，人口密度為每平方公里 6 人。

• 5.2.1. 礦業、工業的歷史、發展和危機

薩韋羅區蘊含豐富礦產，由於其煤炭之獨特品質，這些資源已被開採數十年。海西造山運動 (Hercynic orogeny) 結束時，沿著坎塔布連 (Cantabrian) 山脈主脊形成幾個不同的煤盆地。薩韋羅盆地面積不大—長 14 公里，最寬處 2.6 公里—位於薩韋羅 - 戈登 (Sabero–Gordón) 破裂帶的東西軸。1841 年薩韋羅河谷的無煙煤田，成為萊昂省第一個開採的煤田。由於其煤高硫和高油之特性，燃燒時會產生短焰，特別適合焦炭生產。

這些條件再加上同一區（拉茵朋布拉布列 (La Imponderable) 和拉薩路 (La Salud) 礦田）的鐵儲量，讓薩韋羅在 1847 年出現西班牙第一家使用石炭的鑄鐵廠，遠早於阿斯圖里亞斯、巴斯克自治區或加泰羅尼亞等其他工業中心。這很大程度上，歸功於一群工程師和自由資本家帶來的刺激，其中包括米格爾·伊格萊西亞斯·博蒂亞斯 (Miguel Iglesias Botías) 、卡西亞諾·德·普拉多 (Casiano de Prado)、聖地亞哥·阿隆索·科爾德羅 (Santiago Alonso Cordero)、拉蒙·德·拉·薩格拉 (Ramón de la Sagra) 及法國工程師菲利普·帕雷特 (Philippe Paret)。然而，薩韋羅的優勢僅維持了 16 年（1847 年至 1862 年），之後即停止使用高爐。由於生產和運輸的嚴重窘境，讓革命性的薩韋羅煉鐵業曇花一現。當時法國工程師帕雷特，受帕倫蒂諾 - 萊昂礦業協會 (Palentino-Leonesa Mining Society) 的委託，建造如今象徵西班牙工業遺產的建築群，其中包含管理大樓、工人宿舍、教師宿舍、倉庫、高爐和片狀構造大廳，亦稱為聖巴勒斯 (San Blas) 煉鐵廠（圖 6），這是一座仿照法國阿萊斯 (Ales) 煉鋼廠的新哥德式建築。當時從英國進口最先進的機具，

now emblematic of Spanish industrial heritage. Amongst these was a management building, workers quarters, homes for teachers, warehouses, blast furnaces, and the lamination hall, also known as the San Blas ironworks (Figure 6), a neogothic building modelled on the steelworks at Ales, France. The most advanced machinery of the time was imported from England, and after arrival at the port of Gijón, was transported to Sabero on ox carts. The first blast furnace began work in 1847, shortly before those at Trubia and Mieres in Asturias went into production.

The first stone of the building that was to become the Sabero ironworks was laid on 14 March 1846. The novelty of these facilities with respect to existing works in Malaga was that while those works used charcoal, Sabero pioneered the use of mineral coal (coke). This new process enabled increased yields, to the extent that, at times of maximum production, Sabero's furnaces could produce more than nine tonnes of iron per day.

The Sabero ironworks had a short history, plagued with problems. While the Palentino-Leonesa Mining Society was proactive in its attempts to raise capital and improve the installation (a second blast furnace began work on 21 January 1860), these efforts were counteracted by difficulties of transporting their product to market in addition to direct competition from other coal mines (Orbó in Palencia) and ironworks in more favourable locations. The major markets for Sabero's cast and forged iron were León, Palencia, Valladolid, and Madrid. From Sabero, iron would be transported in ox carts to Sahagún over a distance of 50 km on unmetalled tracks at a cost of 4 reales per hundredweight and from there, a further 350 km to Madrid at a cost of 8.7 reales per hundredweight. Apart from the obvious transport difficulties and competition from other businesses, the Palentino-Leonesa Mining Society was faced with numerous surcharges and penalty tariffs which, due to the impossibility of obtaining any new injections of capital, placed the business into a deep financial crisis and the blast furnaces stopped work in 1862. With societal change and the lifting of certain embargoes, the Sabero works eked out an existence from sales of coal extracted from its mines for three more decades, before the business was finally liquidated in 1892. The mining rights were bought by the Basque investment capital company, Hulleras de Sabero and Anexas S.A., initiating a new chapter in the history of the town. Henceforth, the focus became solely the extraction of coal and its transport to steelworks in the Basque Country via a new railway, finished in 1894, between La Robla (León) and Valmaseda (Bilbao).

機具抵達希洪 (Gijón) 港後，再用牛車運到薩韋羅。第一座高爐於 1847 年啟用，比阿斯圖里亞斯的特魯比亞 (Trubia) 和米耶雷斯 (Mieres) 高爐早些啟用。

薩韋羅煉鐵廠的第一塊石材於 1846 年 3 月 14 日鋪設。相較於馬拉加 (Malaga) 既有工程，這些設施的新穎之處在於，雖然使用木炭，但薩韋羅率先使用石炭（焦炭），這項新技術提高產量，其增加幅度，讓薩韋羅冶爐每天最多可生產超過 9 噸的鐵。

薩韋羅煉鐵廠的歷史很短，卻問題重重。雖然帕倫蒂諾 - 萊昂礦業協會積極嘗試籌集資金和改善設施（第二座高爐於 1860 年 1 月 21 日啟用），不過因為難以將商品運送到市場，以及來自其他煤礦場（帕倫西亞的奧寶 (Orbó)）與位於更有利位置煉鐵廠的直接競爭，這些努力未能見效。薩韋羅鑄鐵和鍛鐵的主要市場為萊昂、帕倫西亞、瓦雅多利德 (Valladolid) 和馬德里。就運輸而言，先需以每英擔 4 里爾的成本，透過牛車在無鋪面道路，從薩韋羅運送 50 公里到薩哈貢 (Sahagún)，接著再以每英擔 8.7 里爾的成本，運送 350 公里到馬德里。除了顯而易見的運輸困難以及來自其他工廠的競爭外，帕倫蒂諾 - 萊昂礦業協會還需支付眾多附加費用和懲罰性關稅，由於沒有挹注任何新資金，煉鐵廠陷入嚴重財務危機，高爐最終於 1862 年終止運作。由於社會變革和特定禁運的解除，讓薩韋羅煉鐵廠在 1892 年清算之前，藉由出售其礦場開採的煤炭，勉強存活了 30 多年。採礦權由一間巴斯克資本投資公司，烏拉葉斯·德·薩韋羅與阿內薩斯 (Hulleras de Sabero and Anexas S.A.) 收購，開啟該鎮歷史新篇章。此後重點變成將開採的煤炭，透過新鐵路運輸到巴斯克自治區的煉鋼廠，鐵路於 1894 年完工，串連拉羅夫拉 (La Robla)（萊昂）與巴爾馬塞達 (Valmaseda)（畢爾包 (Bilbao)）。

烏拉葉斯公司在薩韋羅盆地（包含奎馬杜拉斯 (Quemaduras)、索堤尤斯 (Sotillos) 的埃雷拉一號 (Herrera I) 和奧列羅斯 (Olleros) 的埃雷拉二號 (Herrera II)）的礦田開採煤炭，並沿著自己的鐵路，將煤炭運輸到其於 1899 年在韋加

The Hulleras company extracted coal from mines in the Sabero basin (including Quemaduras, Herrera I in Sotillos, and Herrera II in Olleros), and transported the coal along its own railway track to the industrial complex it built in 1899 in Vegamediana on the banks of the river Esla. Here, the coke was washed and prepared before being transported on, again using Hulleras' own rail link, to the terminus at Cistierna where the coal wagons would be coupled to locomotives running on the Robla–Valmaseda line. For many decades, the Hulleras mine train transported millions of tonnes of coal from the coalfields of León and Palencia to fuel the Basque steel industry. These years saw the greatest population growth in the area, with five localities being taken out of the control of the Cistierna town council in 1927 to form the new council area of Sabero, which, in the 1930 census, recorded 2580 inhabitants. In 1960, the population reached its maximum, with 5016 inhabitants, and from that point economic slow-down in the mining basin meant that the population declined rapidly—today reaching little more than 1000 people (1140 inhabitants in 2019). In 2019, Sabero, the centre of Hulleras' operations with a workforce that, at one point, reached up to 2000, had only 533 inhabitants.

These figures expose the magnitude of the disaster, of the crisis that engulfed this region of the province of León, and other Spanish mining districts. In this particular case, decline began in the 1960s, when the era of self-sufficiency imposed by the Francoist regime began to be relaxed and the country began to import large quantities of oil, meaning that local coal lost its traditional markets. Despite the opening of several power stations (including one located 30 km from Sabero), which from then on absorbed the majority of regional coal production, a large number of mining companies ceased trading towards the end of the 1960s. According to the census taken in 1970, the municipality of Sabero, which, as mentioned, had a population of 5016 inhabitants in 1960, had only 3413 inhabitants. This amounts to a population reduction of 32%. The end of this decade saw the closure of the majority of the small mining businesses that had once thrived in the Sabero valley to leave essentially only one survivor: Hulleras, although with a much-reduced workforce.

Throughout the following decade, the 1980s, Spain began a process of industrial restructuring. A large number of companies from various branches of industry were compelled to close due to their inability to compete on the international market, adjust to Europe-

梅迪納 (Vegamediana) 埃斯拉河岸建立的工業園區。焦炭於此進行洗淨和處理，然後再次透過烏拉葉斯自己的鐵路，運送到錫斯鐵爾納終點站，煤炭貨車在此接上於羅夫拉 - 巴爾馬塞達 (Robla–Valmaseda) 路線往返的火車頭。數十年來，為了替巴斯克鋼鐵業提供燃料，烏拉葉斯礦車從萊昂和帕倫西亞的煤田，運送數百萬噸的煤炭。此時是該地人口成長最快的時期，1927 年五個地方脫離錫斯鐵爾納鎮議會的管轄，為薩韋羅區組成新議會。在 1930 年的人口普查中，該區有 2580 名居民。1960 年人口達到高峰，有 5016 名居民，從那時起，採礦盆地的經濟放緩，人口迅速下降—今日人口略高於 1000 人（2019 年有 1140 名居民）。薩韋羅（烏拉葉斯的運營中心）勞動力曾一度達 2000 人，到 2019 年卻僅剩 533 名居民。

這些數字暴露這場災難的嚴重性，以及席捲萊昂省此區和其他西班牙礦區的危機。此案例之衰退始於 1960 年代，當時佛朗哥政權開始鬆綁自給自足政策，西班牙開始大量進口石油，這代表當地煤炭失去其傳統市場。儘管開設幾間發電站（其中一間距離薩韋羅 30 公里），吸收該區大部分的煤炭產量，但多數採礦公司於 1960 年代末停止交易。如前所述，薩韋羅市在 1960 年有 5016 名居民，但根據 1970 年進行的人口普查，當時僅剩 3413 名居民，相當於減少 32% 的人口。在這十年的最後，多數曾經在薩韋羅河谷蓬勃發展的小型採礦公司皆關門大吉，基本上僅剩下一間倖存者：烏拉葉斯，不過其人力亦大幅減少。

整個 1980 年代，西班牙開始了產業轉型過程。由於缺乏與國際市場競爭的能力、無法調適歐洲法規和負擔調薪，更在終究會被淘汰的老舊工廠設施中生產產品，許多不同產業的公司被迫倒閉。當時是產業紛亂的年代，不論製船廠、大城市的工業廊道、或是因為礦工獲得直接援助和開採補助，倒閉日期大幅延後的礦區都是如此。儘管有著為了逼迫這些高汙染產業和與其相連的電廠關閉的國際條約，基於實際面，包括薩韋羅在內的採礦社區仍頑強抵抗關閉當地主要且唯一的就業來源。

an regulations and sustain wage increases, while working in what were, ultimately, antiquated facilities, making outdated products. These were years of industrial unrest in shipbuilding yards, in the big city industrial belts, and also in mining districts, where pressure from miners was rewarded with direct aid and extraction subsidies that significantly postponed their closure. Mining communities, such as that of Sabero, resisted the closure of the principal, indeed practically, the only source of local employment, regardless of international treaties aimed at forcing the closure of this highly contaminating industry and associated power stations.

Since the 1990s, there has been an incentivised and progressive shutting down of all coal mining activity. This has involved retraining programmes and economic stimulus packages for affected areas; measures that were repeatedly extended due to public pressure until, on 1 January 2019, the few mines that remained open—26 compared to 270 registered in 1988—were finally closed for good.

In 1990, Hulleras presented a plan for the closure of the mine in Sabero, an act that provoked protests from the workers at the beginning of 1991. The owners alleged that the complex was completely economically unviable and offered to hand on all installations and machinery should another business come up with an alternative proposal to maintain operations. After a long process of negotiation, Hulleras stopped all coal production on 31 December 1991. However, it did subcontract the operations at the open cast mines, Sabero 6 and 8, near to Sotillos, until 1993. From 1992, several economic redevelopment plans were put in place, subsidised by the Sabero Zone Reindustrialisation Board, in relation to cattle ranching, industry, or advanced services. However, these have not been successful. Finally, the San Blas ironworks were promoted as a cultural package to attract tourism as the last opportunity to this valley, a project backed by the Sabero Mining Museum Friends Association.

The Friends Association was the real impetus behind the industrial heritage museum initiative. Indeed, the project had precedents: in 1973, the Sabero Town Council had set up the Mining Museum in the municipal House of Culture which was remodelled in 1993; and in 1989 it had made a petition to the Castilla-León Regional Council to recognise the San Blas ironworks as an official monument with the status of BIC. The Friends Association requested that Hulleras transfer ownership of its installations to the municipality for cultural purposes. The transfer went ahead in May 1993, and in

1990 年代起，所有煤礦開採活動無非因為鼓勵或改革措施而關閉。這些措施包括提供受影響地區再訓練計畫與振興經濟方案，更因公眾壓力不斷延期，直到 2019 年 1 月 1 日，於 1988 年登記的 270 座礦坑之中僅存的 26 座，終於全數關閉。

1990 年，烏葉拉斯公司提出關閉薩韋羅礦坑的計畫，引發 1991 年初的礦工抗議。業主表示礦區已經完全失去產值，若有其他公司提出能夠維持營運的替代方案，他們願意拱手交付所有設施和機器。烏葉拉斯公司經歷長時間協商後，最終於 1991 年 12 月 31 日全面停止產煤。然而，截至 1993 年，該公司仍將索堤尤斯（Sotillos）附近的薩韋羅 6 號及 8 號露天開採區外包營運。1992 年起，薩韋羅區域工業轉型委員會開始推行許多經濟重建計畫，包含牛隻放牧、工業、或進階服務，但這些計畫並未成功。最終，在薩韋羅採礦博物館盟友協會的支持下，聖巴勒斯（San Blas）鐵廠被包裝成文化專案，這是山谷區吸引遊客的最後機會。

盟友協會是工業遺產博物館計畫的真正推手。這項計畫確實有其前身：1973 年，薩韋羅鎮議會在市立的文化之家設立了採礦博物館，該館於 1993 年重建，博物館於 1989 年向卡斯提亞 - 里昂省自治區議會請願，欲將聖巴勒斯鐵廠列為具西班牙國家文物古蹟地位的官方古蹟。以文化用途為前提，盟友協會要求烏拉葉斯公司（Hulleras）將該廠所有權轉移給市府。所有權於 1993 年 5 月進行轉移，1994 年里昂自治區政府申請補助以執行該專案。一年後，1995 年 8 月，區政府宣布自治區將接下於薩韋羅設立採礦博物館的任務。

鐵廠的修復和博物館建館過程緩慢，也遭遇許多阻礙。專家和當地政客的爭論不休，原計畫先後遭到多次調整，更有讓計畫窒礙難行的法律問題。其中最關鍵的是將該地鐵工歷史公諸於世的考古遺址挖掘問題，博物館計畫卻幾乎沒有考慮到這一點。因此專家和政治人物必須決定是否將博物館的範圍侷限在探索該區的挖礦歷史，或是重拾涵蓋鐵工史的原始想法，以提供令人難忘的獨特旅遊體驗。 幸好，最後第二個選項勝出。

1994 a grant was requested from the León Provincial Government to take the project forward. A year later, in August 1995, the regional government announced that the Autonomous Administration would take charge of creating a mining museum in Sabero.

The process of restoration and museumization of the ironworks was slow and beset by problems. There were numerous arguments between experts and local politicians and successive changes to the plans involving modifications to the original project, in addition to legal issues which paralysed the execution of the project. The most significant of these issues concerned the archaeological excavations, which brought to light important findings about the site's iron-working history, and which had barely been considered in the museum project. Experts and politicians needed to decide, therefore, whether the museum should be confined to an exploration of the district's mining history alone or whether to revive the original idea of including the iron-working history too in order to provide a unique and wholly memorable tourist experience. Fortunately, the second option won out.

• 5.2.2. Results of the Transformation: The Iron-Working and Mining Museum in Castilla and Leon

The Iron-working and Mining Museum (MSM; Museo de la Siderurgia y la Minería) was opened officially on 3 July 2008, and since then it has become the cultural centre for the district, hosting numerous activities to fill the region's cultural calendar. The MSM has a permanent exhibition which, for the most part, deals with Sabero's iron-working history, and to a lesser extent with its coal mining activities. In theory, a second phase in the museumization of this old industrial complex will allow the transfer of mining artefacts, including many items currently stored away in other locations, to a second exhibition building. Thus, there will eventually be two separate spaces, one dedicated to iron-working and another to mining. It must be said, however, that the second phase has yet to begin.

One of the side galleries off the central nave of the museum's neogothic building is used to host temporary exhibitions on themes related to industrial production and mining. Outside is a reconstruction of the Sabero pharmacy, which served the ironworks since it opened, and the tavern.

• 5.2.2. 轉型結果：卡斯提亞 - 里昂的鐵工暨採礦博物館

鐵工暨採礦博物館（MSM; Museo de la Siderurgia y la Minería）最後於 2008 年 7 月 3 日正式開幕，就此成為該區的文化中心，多項文化活動都在博物館內舉辦，豐富了日常。MSM 內的常設展區陳列的大多是薩韋羅的鐵工歷史，以及少數採礦相關的活動。理論上來說，在這棟老舊工業場地轉型成為博物館的第二階段，挖礦相關文物可以移轉至第二棟展館，包括許多當時存放於其他地點的挖礦器物。這樣一來鐵工和挖礦最後會各有一個獨立空間使用。不過這裡我們必須指出第二階段尚未開始。

新歌德式的博物館建築中堂兩側各有一間展示廳，其中一側被用來舉辦與工業生產和採礦相關的主題特展。館外是薩韋羅藥局的改造建築，自開幕起便販售鐵製品，還附設一家小酒館。

那年，不論是博物館本館內的展覽空間，或是博物館周圍的新舊場域都舉辦了許多不同文化活動。這些所謂的周邊活動包括音樂會、兒童和青年工作坊、讀書會、課程、會議、紀錄片放映、露天電影院、現場表演等等。

如圖 7 所示，博物館開幕後至今的訪客流量不定。整體看來，2008 至 2019 年間共有 250,000 參觀人次，和 2012 年低點的不到 20,000 人次相比，2018 年的參觀人次攀升至

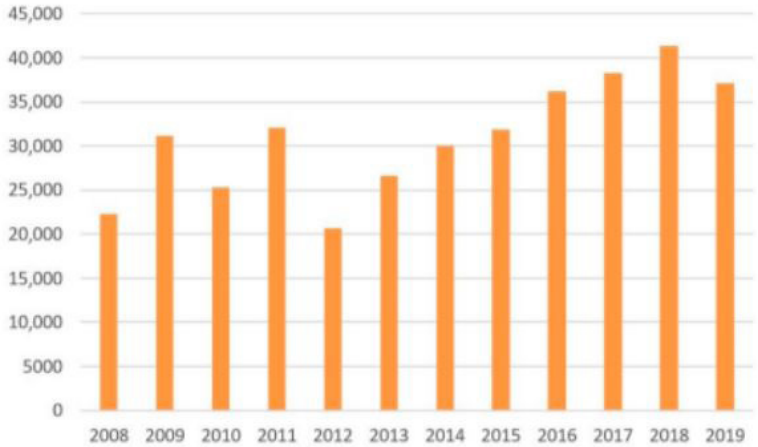


Figure 7. Visitors to the Iron-working and Mining Museum (MSM) (source: Junta de Castilla y León).

圖 7：鐵工暨採礦博物館（MSM）。（資料來源：卡斯提亞 - 里昂自治區主管機關 Junta de Castilla y León）

Lastly, throughout the year, many different cultural activities are held either within the museum's main exhibition space, in the landscaped surrounds or in the new annexes. These so-called parallel activities include concerts; workshops for children and youngsters; book readings; courses; conferences; screening documentary films; open air cinema shows; and live performances, amongst many others.

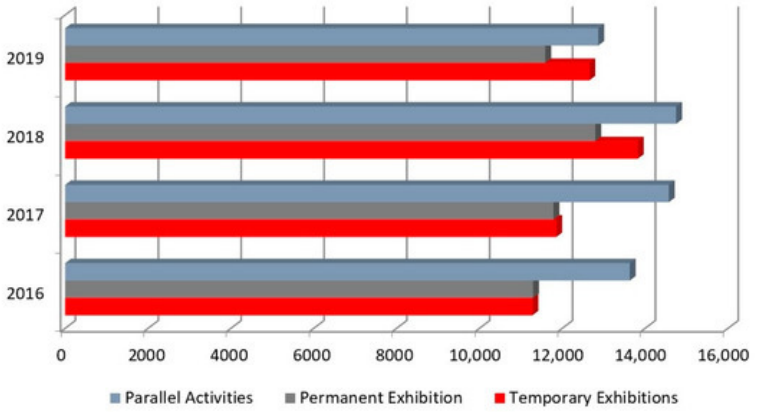


Figure 8. Detailed breakdown of visits to MSM attractions between 2016 and 2019 (source: MSM).

圖 8：2016 至 2019 年間參觀 MSM 周邊設施的詳細分布表（資料來源：MSM）。

As shown in Figure 7, since the museum opened the trend in visitor numbers has been irregular. Overall, it has recorded more than 250,000 visits between 2008 and 2019, with a peak in 2018 when visitor numbers exceeded 41,000, which contrasts with a low point in 2012 when barely 20,000 visitors were recorded. Of the four regional museums in Castilla and León (the other three being the Museum of Human Evolution, Burgos; the Contemporary Art Museum, León; and the Ethnographic Museum, Zamora), the MSM has received the least number of visitors. However, it must be said that the other three museums are all sited in provincial capitals with sizeable populations in contrast to Sabero, which had only 533 inhabitants in 2019.

If we look at the details of visitor surveys from the last four years (Figure 8), the museum's importance as a cultural dynamo becomes apparent with visitor numbers being equally distributed between its permanent exhibition, temporary exhibitions, and parallel activities. Now, it is true that a visitor entering the museum complex may well visit both the permanent exhibition and any temporary exhibits, because they are in the same building. However, it is less likely that this visitor will, on the same day, also be able to take part in one of the parallel activities, some of which take place outside the museum's normal opening hours. In fact, there are some months in which the number of people attending these parallel cultural activities equals that attending the exhibitions. Whatever the case, it is certainly true that visitor numbers calculated according to the number of entrance tickets sold is not a true representation of attendance at the various attractions. For example, according to MSM statistics, in January 2016, 643 entrance tickets were sold for the main exhibition. The same number of people, 643, visited the temporary exhibition, and 688 participated in parallel activities, the

超過 41,000。在卡斯堤亞和里昂區的四大博物館中（另外三館為布爾戈斯的人類演化博物館（Human Evolution Museum, Burgos）、里昂的當代藝術博物館（Contemporary Art Museum, León）、薩莫拉的人種博物館（Ethnographic Museum, Zamora）），MSM 的訪客數量最低。然而，這裡也必須指出其他三座博物館都位於自治區人口較多的市區，相較之下薩韋羅在 2019 年的居住人數只有 533 人。

若我們詳閱過去四年的訪客問卷回覆（圖 8），隨著常設展、特展、周邊活動的參觀人數變得更平均分布，博物館作為文化動能的重要性愈趨明顯。如今訪客參觀博物館時，除了參觀常設展覽以外，的確也會觀賞當下的任何特展，因為兩項展覽位於同一棟建築。不過參觀的同日，訪客並不見得會參與博物館的周邊活動，即便部分活動時間和博物館的一般開放時間相同。事實上，有幾個月份周邊文化活動的參與人數和參觀展覽的人數相同。不論如何，依據門票統計的訪客人數確實無法全然反映周邊各項活動的參與人數。舉例來說，根據 MSM 統計，2016 年 1 月主展場共售出 643 張門票。這 643 人也確實參觀了特展。但同樣在開放時間主展場內部舉辦的多數周邊活動參與人數卻有 688 人。因此，當月博物館的參觀人次統計數為 1974 人次，即便實際的數字可能遠低於此。

majority of which took place within the opening hours of the main exhibition halls. Thus, the total number of visitors counted in the museum's statistics for that month is 1974, although it is possible that the real number is considerably lower.

As Figure 8 demonstrates, in the last four years, the parallel cultural activities have attracted the most visitors, followed, at some distance, by the temporary exhibitions. Visits to the permanent exhibition, which might be expected to be the principal draw, show that it is the least popular attraction of the three.

Figure 9 helps explain the structure of visits to the MSM with greater clarity. What we see is a month-by-month break-down of visitor numbers recorded in the 2017 and 2019 surveys. As can be seen in the figure, the lines representing visitor numbers to the permanent and temporary exhibitions follow trajectories that are almost parallel, and indeed, superimposed. There are very few fluctuations except for two periods where visitor numbers increase over the summer and during the Easter holidays, and where they dip over the winter. In contrast, the line showing attendance at parallel activities shows far more variation, reaching its highest points during the summer months (when there are internationally recognised musical concerts) and in December (when there are festivities in honour of Santa Bárbara, including concerts, film screenings, and workshops).

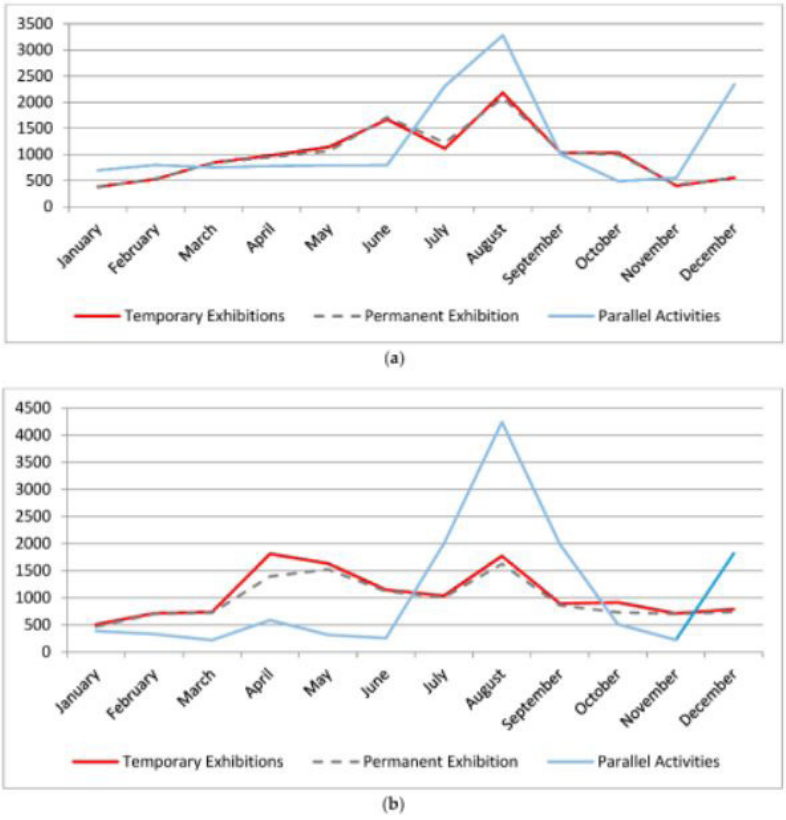


Figure 9. Month-by-month number of visitors to MSM in 2017 (**a**) and 2019 (**b**) (source: MSM).

圖 9：2017 (**a**) 及 2019 年 (**b**) MSM 每月訪客人數（圖片來源： MSM）。

Visitor numbers are a key performance indicator for the MSM, especially in terms of justifying the funding it has received from the Castilla and León Regional Government to restore the ironworks, build the controversial annexes, and indeed, maintain a set of attractions that barely generate any income. In 2006, the investment required to create the MSM's basic infrastructure was estimated to be in the order of EUR 11 million, although later this was adjusted upwards to around EUR 30 million. However, the cost of entrance fees is symbolic and often free, with the aim of increasing visits, despite the fact that since 2012, a regional regulation was put in place obliging all museums in Castilla and León to charge admission fees. At the MSM, entrance to the temporary exhibitions,

如圖 8 所示，過去四年周邊的文化活動吸引到最多的訪客，接著是與前者參觀人次有些差距的特展。如數據顯示，可能被視為主要參觀原因的常設展實際參觀人數為三者中最低。

圖 9 更明確地呈現了 MSM 的訪客結構。這裡看到的是 2017 和 2019 年問卷統計的每月訪客人數。如圖可見，分別代表常設展和特展參觀人數的兩條線幾乎是平行而且重疊的。除了夏季和復活節假期這兩波訪客人數增長以外，參觀人數的波動非常罕見，更在冬季開始下跌。相較之下，參加周邊活動人數的曲線變化就大多了，更在夏季月份（當時舉辦了有國際認知度的音樂會）和 12 月來到高點（當時舉辦了向聖塔巴巴拉合唱團（Santa Bárbara）致敬的相關慶典，包括音樂會、電影放映、工作坊。）

訪客人數是 MSM 營運表現的關鍵指標，卡斯提亞 - 里昂區政府挹注在修復鐵製品、興建引起爭論的附屬建築、以及經營幾乎沒有利潤

housed in the side galleries of the building's main nave, is free. Admission to the permanent exhibition is EUR 2, with a concessionary entry fee of EUR 1 for children, students and large families. Free entry is granted to persons under 8 or over 65, to members of the MSM's Friends Association, and additionally, to teachers and journalists. Of the 11,592 admissions to the permanent exhibition in 2019, 7240 (62.4%) were free entrances, 2930 (25.2%) were concessions, and only 1422 (12.2%) were at full price. These figures are not dissimilar to those seen in other years, according to the MSM's own statistics.

The Siglo Foundation is a public body set up under the auspices of the Autonomous Administration of Castilla and León and charged with administrating the region's museums, including the MSM. According to a report by the auditing committee of the autonomous community of Castilla and León, which inspected the Siglo Foundation accounts for 2016 and 2017, the MSM uses both estimated and real visitor numbers for its exhibitions, workshops and other activities as its principal performance indicators. In this way, in 2016 the museum had a figure of 31,000 for the estimated number of visitors, and that of 36,211 for the real number of visitors; in 2017 the estimated number of visitors was 37,000 and the real number was 38,189. The report also includes details of the museum's income, showing that in 2016 they reached EUR 26,163, a value that rose to EUR 34,463 in 2017. Nevertheless, the museum's running costs are far greater than this income and in 2016, the Fundación Siglo assigned funds to the MSM of EUR 525,000, and in 2017 funds of EUR 522,000.

6. Results and Discussion

In 2018 and 2019, in cooperation with the Regionalverband Ruhr, the organisation in charge of the ERIH conducted a barometer, or survey, of industrial heritage through a series of questions directed at the museums and recreational parks that form part the network. In 2019, the questionnaire was sent to 325 tourism operators from which they received 113 replies from 16 different countries. The questionnaires and data can all be found on the ERIH website (https://www.erih.net/projects/erih-industrial-heritage-barometer/). A brief analysis of the results allows us to contextualise our two case studies, Almadén and Sabero, within the framework of industrial tourism in Europe.

According to the data uncovered by the barometer, 7 out of every 10 sites are in public ownership, managed by government or

的設施的資金必須藉此才能合理化。2006 年預估打造 MSM 基礎建設所需的資金約為 1100 萬歐元，但後來調高至 3000 萬歐元左右。不過，為了提升參觀人次，門票價格的設定只是個形式，博物館通常都是免費入場。雖然 2012 年起卡斯提亞 - 里昂區頒布了要求該區所有博物館酌收入場費的規定。MSM 本館兩側展廳所舉辦的特展免入場費。常設展的門票為 2 歐元，兒童、學生、大家庭的優惠票為 1 歐元。8 歲以下 65 歲以上訪客、MSM 盟友協會會員、教師和記者皆可免費入場。 2019 年參觀常設展的 11,592 名訪客中，7240 名為免費入場（62.4%）、2930 名持優惠票入場（25.2%）、1422 名購買全票入場（12.2%）。根據 MSM 自身的統計，這些數字和其他年份的出入不大。

席格羅基金會（The Siglo Foundation）是在卡斯提亞 - 里昂自治區政府支持下設立的一個公共機關，負責管理該區的博物館，包括 MSM。 根據卡斯提亞 - 里昂自治區稽核委員會查核席格羅基金會的報告，MSM 在 2016 和 2017 年以其展覽、工作坊與其他活動訪客人數的預估值及實際值作為營運表現指標。2016 年博物館的參訪人數預估值為 31,000，實際值為 36,211。而 2017 年的參訪人數預估值為 37,000，實際值為 38,189。報告也詳載了博物館的收入，2016 年的營收為 26,163 歐元，2017 年的營收則上升至 34,463 歐元。不過，博物館的營運成本遠高於其收入，席格羅基金會也分別於 2016 和 2017 年提撥 525,000 和 522,000 歐元給 MSM 做為資金。

6．結論與討論

歐洲工業遺產路徑的主責單位於 2018 和 2019 年與德國盧爾區域聯盟合作執行了一項調查，針對部分構成路徑的博物館和休閒園區擬定一套工業遺產相關問卷。這份問卷在 2019 年傳送至 325 個旅遊相關業主，最終收到了來自 16 個不同國家的 113 則回覆。問卷內容和數據詳見 ERIH 官網 (https://www.erih.net/projects/erih-industrial-heritage-barometer/)。 簡單分析問卷結果讓我們能夠以歐洲工業旅遊的框架，並釐清阿爾馬登和薩韋羅這兩個案例的脈絡。

Figure 10. Number of visits to industrial tourist attractions according to the 2018 (**a**) and 2019 (**b**) ERIH barometers (source: www.erih.net).

圖 10：2018 年（**a**） 及 2019 年（**b**） ERIH 調查的工業旅遊景點訪客人數。（圖片來源：www.erih.net）

through foundations, while only 27% are in private hands. This has repercussions for the economic sustainability of these sites, since in 2019, one in three covered less than 20% of their operating costs through their income. Nor are these sites major sources of employment. The figures suggest that 60% of sites have fewer than 10 employees, while 40% have fewer than 5. Moreover, issues relating to employment and finance, are, in fact, the major concerns outlined by the sites surveyed.

For the most part, the sites surveyed are open throughout the year (97%), and the majority of their visitors are school groups (90%), followed by families and the over-50s. Although there was a great deal of optimism for the future from respondents to the questionnaire with respect to potential visitor numbers, what is apparent from Figure 10 is that there is a great deal of difference between those sites that have high visitor numbers—which possibly comprise the rare 16% that cover more than 80% of operating costs from their entrance fees—and those museums and eco-parks that see less than 10,000 visitors each year (23% of all the sites surveyed).

The 2018 barometer obtained responses from 80 tourism operators in 12 countries, amongst which two were in Spain (2.5%), compared to 59 in Germany (73.7%). The 2019 barometer obtained responses from 113 tourism operators in 16 countries, where 18 were in Spain (16%), compared to 65 in Germany (57.5%). In this way, sites are more widely dispersed and include more peripheral locations in the 2019 barometer compared to that conducted

根據調查揭露的數據，這些場域大約七成屬於由政府或基金會管理的公共財產，只有約三成屬於私人財產。這些場域的經濟永續性因此受到負面影響，自 2019 年起，能以收入支付營運成本兩成的場域只有 1/3 。這些場域也不是主要的就業來源。統計顯示這些場域當中有六成聘請不到 10 位員工，四成不到 5 位員工。其實場域調查結果突顯出的幾個重點正和就業及財務議題相關。

參與調查的場域多數全年無休（97%），訪客以學校團體為大宗（90%），其次為家庭及年過 50 歲的民眾。雖然根據問卷回覆內容，調查對象對於未來潛在的訪客人數抱持相當樂觀的態度，但如圖 10 所示，參觀人數高的場域—能靠門票收入支應超過八成營運成本，約莫只佔整體的 16%—和每年訪客不到 10,000 名的博物館和生態園區（23% 的調查對象）相比，兩者態度差異甚巨。

2018 年該調查取得來自 12 個不同國家的 80 組旅遊業主答覆，其中 2 組位於西班牙（佔整體 2.5%），59 組位於德國（佔整體 73.7%）。2019 年調查則取得來自 16 國共 113 組旅遊業主的答覆，其中位於西班牙的有 18 組（佔整體 16%），並有 65 組位於德國（佔整體 57.5%）。如此看來，與 2018 年相較之下，2019 年的調查對象範圍分布的更廣，也納入了更多周邊地點。

in 2018. This small detail is reflected in a reduction in the mean number of recorded visitors overall: in 2018, 29% of sites surveyed said that they had received more than 100,000 visitors; while in 2019, only 21% said that they had seen this number.

Finally, the barometer also provided information about the origin of visitors, showing that 60% were regional, 30% national, and the remaining 10% were international tourists. These figures were unchanged between the two years surveyed.

Comparing these data with those from Almadén and Sabero, and considering those questions raised in the previous sections of this report, there are several points to discuss:

- Almadén and Sabero are both categorised as Anchor Points; however, according to their operational structure, they represent the smaller types of tourist attraction. In both cases, the workforce is fewer than 10 employees, and “real” visitor numbers are less than 15,000 per year.

- Almadén and Sabero both depend more heavily on public finance than other European industrial heritage attractions. In Almadén, 92% of operating costs are met by public funds. In Sabero, the figure is 95% due to the discrepancy between the site’s income and funds allocated by the regional administration.

- Where visitors come from also reflects their low impact index. More than 50% of visitors to Sabero were from the province of León itself, and in the case of Almadén, 40% were from Ciudad Real. For both sites, the number of international visitors was less than 1%.

- Schools are an important target audience for both sites. Sabero organises numerous teaching activities to enrich visits and there is a programme of events directed at children. Almadén, meanwhile, has set itself up as the prime visitor site for all educational centres in Castilla-La Mancha, and states that educational visits are the principal motivation of 88% of all visits to its site.

- Both Almadén and Sabero are under constant pressure to increase visitor numbers. In Sabero, this metric is used as the only valid indicator of the site’s success or failure, according to the public audits carried out. When speaking to the media,

這個微小的差異反映出整體統計訪客數量的減少：2018 年，29% 的受訪對象表示他們的訪客人數大於 100,000；而 2019 年只有 21% 的受訪對象回覆達到去年的訪客人數。

最後，問卷結果也提供了訪客的部分背景資料，其中六成為該區域住戶、三成來自西班牙其他城市、剩下的一成是國際旅客。兩個年度問卷結果顯示這些數值沒有變動。

考量本報告前一章節提出的幾個問題，再比對阿爾馬登與薩韋羅的統計數字，提出以下探討項目：

- 阿爾馬登和薩韋羅的所在位置都被歸類為重要工業遺產點；但就兩者的營運架構而言，他們屬於較小型的旅遊景點。兩個案例牽涉的雇員人數皆不超過 10 人，而每年的「實質」訪客人數皆低於 15,000。

- 與其他歐洲工業遺產景點相比，阿爾馬登和薩韋羅對公共資金的依賴性皆更高。就阿爾馬登的案例來看，其 92% 的營運成本皆源自公共資金。而薩韋羅的這項數字是 95%，兩者差異在於場域的收入和區政府分配的資金。

- 兩處訪客所來自的地點反映出了其低影響指數。薩韋羅有一半以上的訪客來自里昂，至於阿爾馬登，四成訪客來自雷阿爾城。兩者的國際訪客人數都低於 1%。

- 兩個景點的重要受眾都是學校。薩韋羅籌辦許多教學活動來充實參觀量，還有專為兒童設計的節目。而阿爾馬登則是把自己定位為卡斯提亞 - 拉曼查地區教育中心之中最主要的參觀景點，並聲明其 88% 的訪客參訪動機為教育性質。

- 阿爾馬登和薩韋羅兩者皆長期面臨提高參觀者數量的壓力。根據公開稽核調查，薩韋羅將參觀人數視為博物館成敗與否的唯一有效指標。每當媒體問起，這些場域的負責人最先提起的就是訪客人數，至於像是環境再生、因工業旅遊連帶設立起的旅遊基礎設

those in charge of these sites always give highest priority to visitor numbers, rather than mentioning other issues such as environmental regeneration; the parallel tourism infrastructure brought into being as a consequence of industrial tourism; employment generation, both direct and indirect; or the promotion of the image of local areas, and improvement to the quality of life of local people. It seems that the only important thing is to count (and recount) how many visitors have come to their museums.

- In both Sabero and Almadén, according to the opinions of the local society published in the media, and in demonstrations on the streets, the population has moved from an initial feeling of joy over investments and international awards to a general apathy, due to the low impact of industrial heritage tourism on the local economy. Former mine workers do not identify with the proposals for cultural transformation imposed by the public administration.

- The project that began with the creation of Ruhr's Industrial Heritage Trail in Germany had environmental renewal as one of its central aims, as well as cultural development and social rehabilitation. It was initially about the recovery of polluted rivers; the environmental clean-up of mines and spoil heaps; and regenerating landscapes. It was an effort to regenerate the land so that it could, once again, be the site of new development. In our two case studies, this initial lever does not seem to have been put in place.

- Furthermore, following from the definition of sustainability with regards to industrial tourism given by Myriam Jansen-Verbeke, the needs of tourists need to be balanced against those of the regions visited, to protect the local heritage while also providing opportunities for future development based on innovation and progress. This is exactly what has happened in the case of Ruhr's Industrial Heritage Trail, where, after years of decline, the region has found new energy and economic productivity. In contrast, while Almadén and Sabero provide protection for the region's industrial heritage there is no trace of any activities promoting progress and innovation in these areas that have suffered both population decline and weak economic activity over many decades.

施、直接或間接的就業機會創造、當地區域形象的推廣、以及對於當地人民生活品質的提升等議題卻不會被提及。看起來唯一重要的只有計算（並須重覆計算）多少訪客參觀了他們的博物館。

- 就媒體刊登的社論和街上遊行來看，不論是薩韋羅或阿爾馬登，由於工業遺產旅遊對當地經濟影響力小，民眾對投資和榮獲國際獎項的觀感已從最初的樂見轉為一概無感。前礦工對政府單位推動的文化轉型也不買單。

- 德國盧爾工業遺產路徑開創的計畫將環境重建設定為主要目標之一，文化發展和社會復歸也都是重點。最初設立的目的是為了恢復受汙染的河流、以環保的方式清理礦坑和棄土堆、並重整景觀。重整土地的用意是讓該地點能夠獲得新的發展機會。本文中的兩個案例都沒有把這點設為初始目標。

- 此外，根據米麗安．詹森．韋爾貝克對工業旅遊永續性的定義，遊客的需要和受訪地區的需要應該相互平衡，在保護當地遺產的同時，應以創新和進步為前提，提供未來發展的機會。盧爾區工業遺產路徑的際遇正是如此，經過幾年的衰退，盧爾區終於找到了新的能量和經濟生產力。相較之下，即便阿爾馬登和薩韋羅當地的工業遺產皆受到保護，但這兩個數十年來因人口下滑和經濟活動疲弱而飽受困難的地區，卻沒有任何推廣進步和創新的活動。

7. 結論

本文的開端提到將永續概念套用到我們生活周遭一切的道德及社會必要性。 任何得以永續的事物都應加以推廣和讚頌，而任何無法永續的事物則應立即屏棄或盡速轉換為永續的存在。如開頭幾頁所述，本文旨在分析歐洲經濟發展中心以外偏遠地區做為工業遺產旅遊的永續性。希望藉此得出結論，了解這種形式的旅遊，即純粹出於對該工作文化或特定地點遺產興趣的旅遊，在經濟成長的邊陲地帶是否具永續性。

7. Conclusions

This article began by referring to the ethical and social necessity of applying the criteria of sustainability to everything around us. That which is sustainable should be promoted and celebrated, while anything unsustainable should be disposed of forthwith or transformed into something that is sustainable as quickly as possible. The aim of this article, as laid out on its first pages, was to analyse the sustainability of industrial heritage tourism in isolated locations far from centres of economic development in Europe. The hope was to draw conclusions about whether this form of tourism, where visits are motivated mainly by interest in heritage related to the working culture of a particular place, was sustainable in locations that are peripheral to economic growth.

The theoretical framework of this study is linked to two concepts: sustainability and territorial resilience. Sustainability must be supported by three pillars: society, economics, and the environment; while the territorial resilience of the ex-industrial spaces studied must be assessed in terms of their capacity to recover from their crises and regenerate, thus reaching a new state of equilibrium.

As has been explained in this article, the development of industrial tourism in Europe was set in motion after the closure of numerous industrial complexes during the economic crisis of the 1970s. After several decades of disuse, these ex-industrial sites were then successfully rehabilitated as centres for cultural and recreational activities. This positive dynamic can be explained by several factors on both the supply and the demand side of the equation. Another consideration that needs to be taken into account here is that a prime motivation in those European countries, where this kind of thematic-recreational park has been pioneered, was the environmental, social, and cultural recovery of these densely populated areas where the generation of new employment and new economic activity can be planned for the short and long term. Furthermore, ex-industrial areas contain an abundance of assets that, with the “intervention” of industrial heritage tourism, can be transformed into valuable resources for tourism. These areas often lack any other features that might attract tourists or other recreational visitors, and as a result, without the kind of industrial heritage tourism described, they would otherwise be net losers of tourists to other regions. This is precisely the case exemplified by the Cultural Heritage Trail connecting numerous German cities in the Ruhr Valley.

本研究的理論架構貫穿以下兩個概念：永續及地域韌性。永續必須由三大主軸支撐：社會、經濟、環境；研究提到的前工業空間的地域韌性必須以其自危機中復原、再生、進而達到新平衡階段的能力評估。

如文中解釋，1970 年代的歐洲經濟危機導致諸多工業設施倒閉後，引發了歐洲工業旅遊發展的開端。經過數十年的閒置停用，這些前工業空間成功被改造為文化及休閒活動的中心。這項正面動能可以由供給和需求端的多種面向解釋。 歐洲國家是推動此類型主題休閒園區的先驅，應將他們的主要動機納入考量，在曾經人口密集的地區達到環境、社會、文化的復甦，創造短期和長期的新就業機會並規劃新的經濟活動。此外，前工業地區擁有豐富的資產，只要透過工業遺產旅遊的「介入」便能轉化為高價值的旅遊資源。這些地區通常缺乏能夠吸引遊客或其他休閒導向訪客的特色，因此，若缺乏上述的工業遺產旅遊，這些地區在旅遊方面將全然無法和其他地區競爭。盧爾區串聯了多個城市的文化遺產路徑正是一個典範。

ERIH 的核心思想是將工業遺產旅遊拓展到其他地區，並打造能將歐洲的工業往事呈現給潛在遊客的旅遊業者網絡。在這個擁有超過兩千個景點的網絡中，特定的重要工業遺產點被標記為歐洲工業史的參考點。

我們在研究案例中檢視兩個前工業空間：阿爾馬登和薩韋羅作為工業遺產旅遊中心的發展。第一個案例可以看到歷經改造和重整的前工業空間變身成為旅遊景點的傑出範例。其成功獲得許多獎項認可，更被聯合國教科文組織列為世界遺產。改善遺產並將其作為旅遊觀光和文化使用的過程連帶創造出了以觀光客為中心的設施；但這個新生產單位的結構依舊薄弱，當地居民在阿爾馬登礦工初次靜坐抗議 40 周年時再度燃起對過往的不滿情緒，在在顯露出了這點。至於薩韋羅，當地居民和區政府一直對聖巴勒斯鐵廠改造為博物館一事爭論不休，因為其中一方立下了太多承諾，另一方又有太多毫

The key idea of the ERIH is to expand industrial heritage tourism to other locations and to create a network of operators that would showcase Europe's industrial past to potential tourists. Within this network of 2000 sites, certain Anchor Points are highlighted as reference points in European industrial history.

In our two case studies, we looked at the development of the ex-industrial sites of Almadén and Sabero, as centres for industrial heritage tourism. The first of these constitutes an outstanding example of the regeneration and renovation of an industrial complex as a tourist attraction. Its excellence has been recognised through several awards and by its inclusion on the UNESCO list of World Heritage sites. The process of enhancing heritage and its reuse for tourism and culture has given rise to the creation of other tourist-centred facilities; however, the fabric of this new productive sector is still weak, as shown by how the local population revived their historic grievances on the 40th anniversary of the first sit-in protest by Almadén's miners. In the case of Sabero, the museumization of the old San Blas ironworks has been the source of ongoing disputes between the local population and regional government, with too many promises being made by one side and too many unfounded hopes on the other. The opening of the museum has seen many important changes to the district's cultural calendar, but little else. Objectively, it would be too much to expect the creation of one museum to turn around the trends of several decades that have drained these peripheral rural areas both of their populations and economic opportunities.

The inclusion of Spanish Anchor Points into the ERIH has enabled these to become integrated into a cultural product of European scale, giving them greater international visibility. However, the quality of offerings within the ERIH is very variable—as the barometers mentioned seem to demonstrate—and despite attempts at integration, large differences remain between peripheral sites and those representing centres of industrial tourism. This is shown very clearly in our two case studies by the minimal numbers of international tourists recorded.

The mining industry in Almadén and Sabero closed due to environmental reasons. The ecological impact of the mercury and coal mines made these historic industrial spaces unsustainable. Years later, its transformation into a tourist attraction should have started with the environmental recovery of those areas.

無根據的期待。博物館的設立為當地的文化活動日程帶來了許多重大改變，但除此之外也再無其他影響。客觀地說，期待一間博物館的設立能夠扭轉數十年來周邊偏遠地區流失的人口和經濟發展機會，確實強人所難。

西班牙重要工業遺產點納入 ERIH 後，這些景點能夠以歐洲整體的規模整合成文化商品，獲得更高的能見度。然而，ERIH 體系內部品質參差—如上述調查所呈現—即便有整合的嘗試，偏遠地區工業旅遊中心象徵的場域仍存在大幅差異。文中兩則案例統計得出的少量國際遊客人數即可明顯看出這點。

阿爾馬登和薩韋羅兩地的礦業皆因環境因素關閉。水銀及碳礦帶來的生態影響讓這些歷史工業空間無法永續發展。多年後，被改造成為觀光景點的兩個場域環境應該也能開始回復。

理論終究會遭到現實的否決。因此，評估此類場域韌性模型的影響是必要的。 幾乎可以肯定地說，文化旅遊的意圖不在於讓許多前工業空間啟動新的生產流程，在高度環境影響和耗竭為主要論述的地區尤其如此。

工業旅遊在遠離經濟發展中心的地點並無永續性，作為該地區唯一能用來啟動發展的因子，就地域韌性而言也無法構成好的案例。文中的兩個案例無法拿來和英國的鐵橋建築、德國埃森的關稅同盟煤礦工業建築群、蓋森基爾亨、杜伊斯堡、蘇格蘭的新拉納克、或是美國的洛厄爾相提並論。在上述的所有案例中，重建的過程牽涉了大規模的環境重整，以及該地區社會和文化層面的復原。而西班牙的這兩個案例中，唯一經過重整的只有關閉後不久就被宣告列為文化遺產的舊礦坑和工廠。

兩個案例中唯一能被當作正面因子的只有公部門推廣的態度，替當地居民編織出了希望，至少就短期而言是如此。

依據詹森．韋爾貝克對永續的定義，阿爾馬登和薩韋羅的工業遺產旅遊都沒有達到進步

Reality ultimately imposes itself onto theory. As a result, it is necessary to reflect on models of resilience for this type of territory. It appears to be justified to say that a cultural-tourism purpose is not sufficient to enable new productive processes to take off in many ex-industrial spaces, where there is a dominant narrative of depletion and high environmental impact.

Industrial tourism is not sustainable in locations far from centres of economic development, nor does it represent good practice in terms of territorial resilience where it is the only lever put in place to instigate development. It is not possible to make a fair comparison between the two examples mentioned here and places such as Ironbridge, Zollverein, New Lanark, Geselkirchen, Duisburg or Lowell. In all these cases, regeneration involved wholescale restoration of the environment, and of the social and cultural fabric of the region. In the Spanish examples, all that has been renovated are old mines and factories, which were declared to be cultural heritage sites shortly after their closure.

The only positive element that can be highlighted in both cases has been the promoting attitude of the public administration, which has sown hope in the local population, at least in the short term.

Industrial heritage tourism in Almadén and Sabero has not generated progress, nor innovation in accordance with Jansen-Verbeke's definition of sustainability. They are exhibition centres visited for the most part by school parties on educational visits or by the elderly for recreation. They are not, however, motors for innovation or benchmarks for regenerating the productive fabric of these places. These targeted projects do not produce structural changes within a territory unless they are accompanied by many other initiatives, both public and private, that work together in a coordinated fashion to pursue a common goal.

This research presents a somewhat pessimistic conclusion, with many nuances that need to be explored through further case studies. In this way, within the context of other de-industrialised spaces, we may find the key to promoting sustainable and resilient regeneration.

This article was translated into Mandarin with the authorization of the original authors, the original article is available at:
Somoza-Medina X, Monteserín-Abella O. The Sustainability of Industrial Heritage Tourism Far from the Axes of Economic Development in Europe: Two Case Studies. Sustainability. 2021; 13(3):1077. https://doi.org/10.3390/su13031077

或創新。這兩個地點是多數學校團體安排做為教育參訪，或是年長者作為休閒前往的展覽中心。然而，他們並非驅動創新的引擎，也不是為這些地重新帶來生產力的標竿。除非搭配其他公部門及私部門的眾多計畫，以整合的方式追求相同的目標，這些目標計畫都無法在其所屬區域產生結構性的改變。

本研究提出的結論較為悲觀，仍有其他案例的細節值得加以探討。如此一來，在其他前工業空間的脈絡下，我們或許能找到推動永續和韌性再生的關鍵。

本篇文章獲原作者授權後中譯，原稿請見：
Somoza-Medina X, Monteserín-Abella O. The Sustainability of Industrial Heritage Tourism Far from the Axes of Economic Development in Europe: Two Case Studies. Sustainability. 2021; 13(3):1077. https://doi.org/10.3390/su13031077

“Linking: The Exchange Forum for International Organizations of Cultural Preservation” & Cross-Disciplinary Sustainability Initiatives for Cultural Heritage and Museums in Taiwan

鏈結：文化保存國際組織交流論壇 - 臺灣文化資產與博物館的跨域永續及倡議

Chao-Shiang Li (Adjunct Assistant Professor of Department of Interior Design, China University of Technology, Taiwan)

中國科技大學室內設計系兼任助理教授 李兆翔

In the highly globalized 21st century, cross-national and cross-disciplinary cooperation in cultural preservation has become a prominent trend. Over the last two years, COVID-19 has significantly affected the world. Digitization has become the new norm in the post-pandemic era. The emergence of new cultural concepts and representations has led to more cultural perspectives and reinterpretations. In this globalized and post-pandemic era, cultural preservation strategies, cultural participation, and cultural governance are fraught with uncertainties and pressures for digital transformation. To broaden Taiwan's horizons in the fields of international cultural preservation and to respond to the international trend of holistic cultural preservation, the Bureau of Cultural Heritage, Ministry of Culture, held the “Linking: Exchange Forum for International Organizations of Cultural Preservation” on April 15-16, 2022. This forum invited experts and scholars from Taiwan and abroad who have been actively involved in cultural heritage and museum-related INGOs (International Non-Governmental Organizations) to discuss topics of “participation,” “linkage,” and “cooperation” and on important international issues of “sustainable development,” “cultural equality,” “digital transformation,” and “increased participation” in the fields of cultural heritage and museum studies. Echoing the UN Sustainable Development Goals (SDGs)[1], the

在高度全球化的 21 世紀，跨國跨域的文化保存合作已是國際趨勢。近兩年間，COVID-19 影響全球甚鉅，「數位化」成為後疫情時代的「新常態」，更多嶄新的文化觀念和呈現方式，提供對於文化的多角度理解與再詮釋。全球化與後疫情時代下的文化保存策略、文化參與及治理等諸多面向，充滿各種不確定性及數位轉型壓力。為拓展臺灣國際文化保存領域的視野，回應國際強化整合的趨勢，文化部文化資產局於 2022 年 4 月 15-16 日辦理「文化保存國際組織交流論壇」，著重文化資產與博物館跨域之「參與、鏈結與協作」，聚焦四大主題—「永續發展」、「文化平權」、「數位轉型」跟「擴大參與」，邀集國內外積極參與文化資產及博物館領域國際非政府組織 (International Non-Governmental Organization, INGO) 的專家學者進行交流分享，響應「聯合國全球永續發展目標 (Sustainable Development Goals, SDGs)」[1]、「418 國際古蹟遺址日：遺產與氣候 (Heritage and Climate)」[2]，以及「518 國際博物館日：博物館力量 (The Power of Museums)」[3]，促進國內外文化資產與博物館跨域鏈結及青年參與，並向國際推展臺灣文化保存整合成果。

[1] In response to the growing challenges of climate change, economic growth, social equality, and wealth gap, in 2015, the United Nations announced the Sustainable Development Goals (SDGs)—a set of seventeen goals to guide the global efforts towards sustainability, including calls to end poverty, mitigate climate change, achieve gender equality, etc.

[1] 由於氣候變遷、經濟成長、社會平權、貧富差距等難題與挑戰日益嚴峻，2015 年，聯合國宣布了「2030 永續發展目標」（Sustainable Development Goals, SDGs），包含消除貧窮、減緩氣候變遷、促進性別平權等 17 項 SDGs 目標，指引全球共同努力、邁向永續。

[2] 國際古蹟遺址日（International Day for Monuments and Sites），亦稱為世界遺產日（World Heritage Day），由國際文化紀念物與歷史場所委員會在 1982 年 4 月 18 日提出，並經聯合國教科文組織認定的國際性活動，鼓勵世界各國舉行各種不同類型的文化資產紀念活動。1999 年歐盟進一步發起「歐洲遺產日」（European Heritage Days）於每年 9 月舉行，獲得廣泛迴響。臺灣自 2001 年開始響應，每年 9 月第 3 週的週末開放古蹟參訪及辦理系列活動的「全國古蹟日」。

[3] 1977 年，國際博物館協會（the International Council of Museums, ICOM）將每年 5 月 18 日訂為國際博物館日（International Museum Day），每年以全球社會發展相關主題，推動博物館響應並辦理活動，以發揮社會影響力。

April 18th International Day of Monuments and Sites: Heritage & Climate[2], and the May 18th International Museum Day 2022: The Power of Museums[3], this forum successfully promoted cross-national and cross-disciplinary linkage in the fields of cultural heritage and museum studies, encouraged youth participation, and showcased Taiwan's cultural preservation achievements with the international community.

Held both physically and online (live-streamed on Facebook and YouTube), the two-day forum attracted a total of 2,129 online viewers, had over 170 audience members in attendance, and was joined by 47 experts and scholars (including those participating online) from Taiwan and abroad. Furthermore, pamphlets and posters introducing seventeen domestic and international cultural preservation NGOs were displayed at the meeting venue. The two-day forum featured twelve keynote speeches (including two international speeches) and four panel discussions, as well as opening remarks presented by representatives from six international NGOs dedicated to cultural preservation[4]. During this event, the Initiative of Promoting Taiwan's Participation in Cultural Preservation INGOs was signed. The initiative

本次論壇採實體與線上直播雙平臺 (Facebook 與 YouTube) 進行，兩日累積 2,129 線上觀看人次，現場出席超過 170 位聽眾，國內外專家學者參與 47 人 (含線上)；現場並展示 17 個國內外文化保存非政府組織文宣海報，兩天論壇共有 12 場專題講座 (包括兩場國際專題演講) 以及四場專題座談，邀集六個國際文化保存組織 (INGO) 代表致詞[4]，並發布《推動臺灣參與文化保存國際非政府組織倡議》。該《倡議》，延續近年多場在臺辦理之文化保存國際會議所參與的全球呼籲[5]，針對「強化文化保存與國際接軌」、「推動文化保存之跨域共學」、「促進文化保存之整合協作」、「鼓勵青年參與文化保存」四大方向擬定策略目標及製作行動綱領。本次論壇的舉辦與倡議行動，引領更多的青年專業者共同參與各項文化保存議題，落實國際交流經驗的傳承，並促進文化傳承及世代永續參與的文化活力。

Figure 1. Forum Poster
圖 1：論壇活動海報

[2] International Day for Monuments and Sites, also known as World Heritage Day, was proposed by the International Council on Monuments and Sites (ICOMOS) on April 18, 1982, and later recognized by UNESCO as an international event that helps encourage countries around the world to commemorate various types of cultural heritage. Beginning in 1999, the European Union started to organize European Heritage Days in September each year, receiving a widespread response. In 2001, as a response to the international monument days, Taiwan began to hold "National Heritage Day" on the third weekend of September every year, during which the public is invited to visit the monuments and a series of activities are organized.

[3] In 1977, the International Council of Museums (ICOM) designated May 18 as the International Museum Day, encouraging museums to make an impact on society by organizing relevant activities under a theme related to the development of global society.

[4] The six international NGOs invited to the forum were: International Council on Monuments and Sites (ICOMOS), International Committee for the Conservation of the Industrial Heritage (TICCIH), Asia-Pacific Regional Conference on Underwater Cultural Heritage (APCONF), International Committee for Documentation and Conservation of Buildings, Sites and Neighbourhoods of the Modern Movement (DOCOMOMO), International Council of Museums (ICOM), and International Union for Conservation of Nature (IUCN).

[4] 六個 INGO 分別為：國際文化紀念物與歷史場所保存委員會 (ICOMOS)、國際工業遺產保存委員會 (TICCIH)、亞太區域水下文化資產研討會 (APCONF)、現代運動建築、場所及鄰里文件與保存國際委員會 (DOCOMOMO)、國際博物館協會 (ICOM)、國際自然保育聯盟 (IUCN)。

[5] 例如：海洋與臺灣研討會的「海洋臺灣行動綱領」(2014)、國際濕地大會的「濕地保育臺北宣言」(2018)、國際博物館協會自然史博物館委員會年會的「臺北宣言 - 保育生物多樣性」(2015)、參與「里山倡議國際夥伴關係網絡」(2011)、「TICCIH 臺北宣言」(2012)、「ICOMOS-CIPA 臺北宣言」(2015) 等。

Figure 2. A group photo of the representatives who signed the initiative.
圖 2：倡議簽署代表合影

echoes the global call which has been made at several international cultural preservation conferences recently held in Taiwan[5]. Strategic goals and action plans have been made in four major directions: “strengthening cultural preservation and international integration,” “promoting cross-disciplinary learning in cultural preservation,” “promoting integrated collaboration in cultural preservation,” and “encouraging youth participation in cultural preservation.” The forum, together with the initiative, have succeeded in bringing cultural preservation issues to the attention of more young professionals, facilitating international cultural exchange and experience sharing, while bringing more people to join the ranks of cultural heritage preservation.

Figure 3. Forum Live Recordings (YouTube)
圖 3：論壇直播紀錄 (YouTube)

Figure 4. Forum Brochure (PDF)
圖 4：論壇手冊下載 (PDF)

[5] Some examples are the Taiwan's Marine Action Plan released at the 4th Ocean and Taiwan Conference (2014), the Taipei Declaration on Wetland Conservation announced at the 2018 International Wetland Convention, the Taipei Declaration on Natural History Museums and Biodiversity Conservation proposed at the ICOM NATHIST 2015 Taiwan Conference, the International Partnership for the Satoyama Initiative (2011), the Taipei Declaration for Asian Industrial Heritage made at the TICCIH Congress 2012, and the Taipei Declaration on the Integrated Documentation Management of Cultural Heritage issued at the 25th CIPA International Symposium (2015).

European Union Proposes Sustainable Management of Industrial Heritage as an Important Resource for Urban Development

歐盟提出產業文化資產的永續管理作為城市發展的重要資源

Yu Tung (Historic Building Assistant, Stephen Levrant Heritage Architecture Ltd.)

Stephen Levrant Heritage Architecture Ltd. 歷史建築部門助理 董昱

In the face of extreme weather, global warming, and climate change, as well as the increasing pressure for urban development, the term “sustainability” has, in the last decade, become one of the most important keywords in the field of cultural heritage. In Western countries, a growing number of publications and case studies have proposed various sustainability-related evaluation frameworks and practice strategies. This article will focus its discussion on the concept of sustainability and introduce the CONSIDER project which was initiated by the European Union in 2020 to address industrial heritage issues.

In fact, the concept of sustainability has been around since the early 21st century. The earliest discussions of sustainability centered on the economics of cultural heritage. At the time, scholars believed that sustainability meant “long-term and stable economic growth.” As a result, research focused mainly on the positive and negative impacts of the tourism industry on cultural heritage. Starting in the 2010s, with the increase in extreme climate events, the issue of environmental change became a concern for conservation science. Discussions related to sustainability gradually expanded beyond economic aspects to include issues such as energy efficiency, resilience of building materials, environmentally-friendly facilities, etc. In recent years, the advocacy of gender diversity and the Black Lives Matter movement have brought the social aspects of sustainability into focus as well. In summation, the sustainable management of cultural heritage is no longer a topic for discussion by the experts in a single field, but rather an issue that requires interdisciplinary connections and cooperation.

In response to this trend, the European Union launched the CONSIDER project in 2020; the project kicked off in 2021 and will run until 2025. The aim of this project is to develop the sustainable management model (SMM) for industrial heritage. The three main research objectives

面對極端氣候、暖化與氣候變遷、以及日益增長的都市開發壓力，永續性（sustainability）一詞在近十年成為文化資產領域最為重要的關鍵字之一。在西方各國也有越來越多的出版品與個案研究，針對永續性一概念的可能性提出各自的評估架構與實踐策略。本文將針對永續性一概念進行討論，並且介紹歐盟 2020 年針對產業文化資產所推出的 CONSIDER 計畫。

永續性一概念事實上早在 21 世紀初期就開始為人使用。最早關於永續性的討論，主要針對文化資產的經濟效益（economics）；當時的學者認為，永續的意義在於「長時間且穩定的經濟成長」。這些研究因此專注於觀光旅遊產業對於文化資產的正、負面影響。直到 2010 年代前後，伴隨著極端氣候事件的增長，環境（environment）變遷的議題開始成為保存科學關注的議題；這些討論的範圍從經濟的面相，逐漸擴展到能源效率、建築材料的韌性、環境友善的設施 ..... 等相關的討論。近年來又因為受到多元性別與黑人民權運動 (Black Lives Matter) 的影響，使得「社會」（society）面向的永續性也成為關鍵。綜合以上，關於文化資產如何永續經營的討論其實不再仰賴單一領域的專家，而是更強調跨領域的連結與合作。

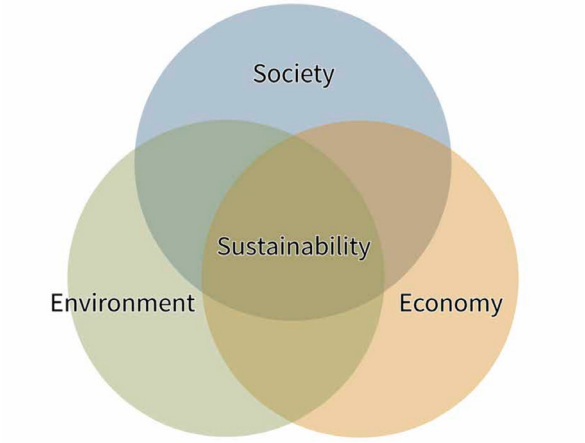


Figure 1. Historic England's definition of sustainability encompasses many aspects.

圖 1：歷史英格蘭對於永續性的定義，包含了許多面向。（圖片來源：作者）

Figure 2. Newcastle, a major industrial city in the north of the UK, is one of the few UK cities to have joined the CONSIDER program.

圖 2：英國北方重要的產業城市 Newcastle，是少數有加入 CONSIDER 計畫的英國城市。（圖片來源：作者）

Figure 3. A historic factory in the Hardcastle Crag Nature Reserve at Hebden Bridge.

圖 3：位於 Hebden Bridge 的 Hardcastle Crag 自然保留區中有座歷史悠久的工廠。（圖片來源：作者）

of this project are: i) to expand on what is considered and recognized as industrial heritage and propose related preservation strategies; ii) to investigate the history of industrial heritage; iii) to explore more inclusive, interdisciplinary governance and participatory models, integrate industrial heritage tools, and pass down heritage within society. All interested private enterprises, academic institutions, and local governments can apply for CONSIDER grants, and the results will be published on the official website[1].

Following the CONSIDER project, Historic England, the UK's representative organization for cultural heritage, updated its Climate Change Strategy at the end of March this year. The Climate Change Strategy clearly set out the strategies to be adopted by the UK cultural heritage sectors in response to extreme weather. These include understanding the impact of extreme weather on cultural heritage, reducing carbon emission, and implementing energy-saving measures that take into account both heritage conservation and modern living. For more details on these strategies, please visit the official website[2].

針對這個趨勢，歐盟於 2020 年發布了 CONSIDER 專案，並且於 2021 年至 2025 年執行。這個專案主要的目的是針對產業文化資產，提出可操作的永續經營管理模型（sustainable management model，SMM）。該專案的研究目標主要有三，分別是：i) 擴展產業文化資產的內容與認定範圍、並且提出相關的保存策略；ii) 調查產業文化資產產的歷史；iii) 探索更具有包容性、跨領域的治理和參與模式，整合產業文化資產的工具與社會傳承。只要是民間企業、學術單位、地方政府對該領域有興趣的，都可以申請 CONSIDER 計畫的補助，相關的成果也會發表於官方網站[1]。

除了 CONSIDER 之外，英國在文化資產領域的代表組織歷史英格蘭（Historic England）也於今年三月底更新了氣候變遷策略（Climate Change Strategy）。該指引明確的制定了英國文化資產部門為了應對極端氣候的策略，包括了解極端氣候對於文化資產的影響、降低碳排放、兼顧保存和當代生活的節能措施。更多詳細的策略，可上官網查詢[2]。

[1] https://considerproject.eu

[2] https://historicengland.org.uk/whats-new/features/climate-change/our-strategy/#glossary

Industrial Heritage and Climate: Seeking a New Paradigm for Industrial Heritage Preservation

產業文化資產和氣候：尋找產業文化資產保存的新範型

Jieh-Jiuh Wang (Professor, Department of Architecture, Ming Chuan University)

銘傳大學建築學系教授 王价巨

Well-preserved industrial heritage can benefit community life, livelihood, and culture. However, such a reciprocal relationship has been interrupted by greater external forces in recent years. In the 21st century, global surface temperatures are rising rapidly, and greenhouse gas concentrations are reaching record highs. Starting in 2019, various climate-related disasters, coupled with the Covid-19 pandemic, have had a serious impact on the world's economy and health systems, which in turn has disrupted the daily lives of community residents and the preservation of industrial heritage.

In 2019, the International Council on Monuments and Sites (ICOMOS) published the report "The Future of Our Pasts: Engaging Cultural Heritage in Climate Action—Outline of Climate Change and Cultural Heritage." In 2020, ICOMOS declared the Cultural Heritage and the Climate Emergency. In 2021, the theme for the International Day for Monuments and Sites was "Complex Pasts: Diverse Futures," and in 2022, building on the 2021 theme, "Heritage and Climate" was selected as the theme for further exploration. These milestone documents have indicated that, as we face climate crises, environmental degradation, extreme events, and normalized catastrophes, environmental conditions will only become more severe in the future. In industrial heritage preservation and sustainable development, "mitigation" and "adaptation" are fundamental strategies, and in the long run, building resilience proactively is of great significance.

Sustainable Management of Industrial Heritage: Addressing Climate Crises

Climate change not only directly affects the physical structures of industrial heritage such as the heritage sites, monuments, and buildings (complexes), but also has the potential to affect non-physical heritage

好的產業文化資產保存與社區生活、生計、文化有一定的良好關係。然而，這個狀態在近年受到更大的外力干擾，廿一世紀全球表面氣溫快速上升，溫室氣體濃度屢創新高。2019 年開始，各種氣候相關災害再加上新冠肺炎的複合式災害，更重擊經濟和衛生體系，連帶擾動社區的日常，進而影響產業文化資產保存。

國際文化紀念物與歷史場所委員會（ICOMOS）在 2019 年發表《我們過去的未來：將文化資產納入氣候行動—氣候變遷與文化資產概要》，在 2020 年宣告世界進入「文化資產和氣候緊急狀態」，在 2021 年將國際古蹟遺址日的主題訂為「複雜的過去：多樣化的未來」，並在 2022 年進一步探討「文化資產和氣候」這個主題。氣候危機、環境惡化、極端事件、巨災常態化，未來的環境情勢只會更險峻。要談產業文化資產保存與永續發展，氣候變遷的減緩（mitigation）與調適（adaptation）是基本課題，長遠更須積極導入「韌性」建構。

產業文化資產的永續經營必須正視氣候危機

氣候變遷除了直接影響產業文化資產的遺址、紀念物、建築物（群）等結構物外，對於非實質層面的潛在影響更長遠，重要文化脈絡、自然資源系統，故事甚至歌曲和工作方法不再存在於可辨識的景觀中，影響人與人、人與環境的互動及其認同的地方關係，可能導致文化記憶喪失，削弱社會凝聚力，連帶改變社會結構。

從理解更大尺度的周邊災害風險與脆弱度開始

氣候變遷趨勢不可能減緩，災害風險必然持續增加，「以風險知情為基礎的決策 (Risk-Informed Decision Making)」或以「風險為基礎的規劃 (Risk-based Planning)」，必須清楚辨識在地的實質環境、社會經濟狀況、科技發展和社區心理素質等各類可能疊加的危害、脆弱性，及其對應保護標的的優先次序，並與社區及所有利害關係人合作推動在地化的減緩和調適策略。產業文化資產管理者亦需從系統性空間架構切入，觀察受影響的「人」與「場域」，從更大尺度思考降低脆弱度的可能手段。

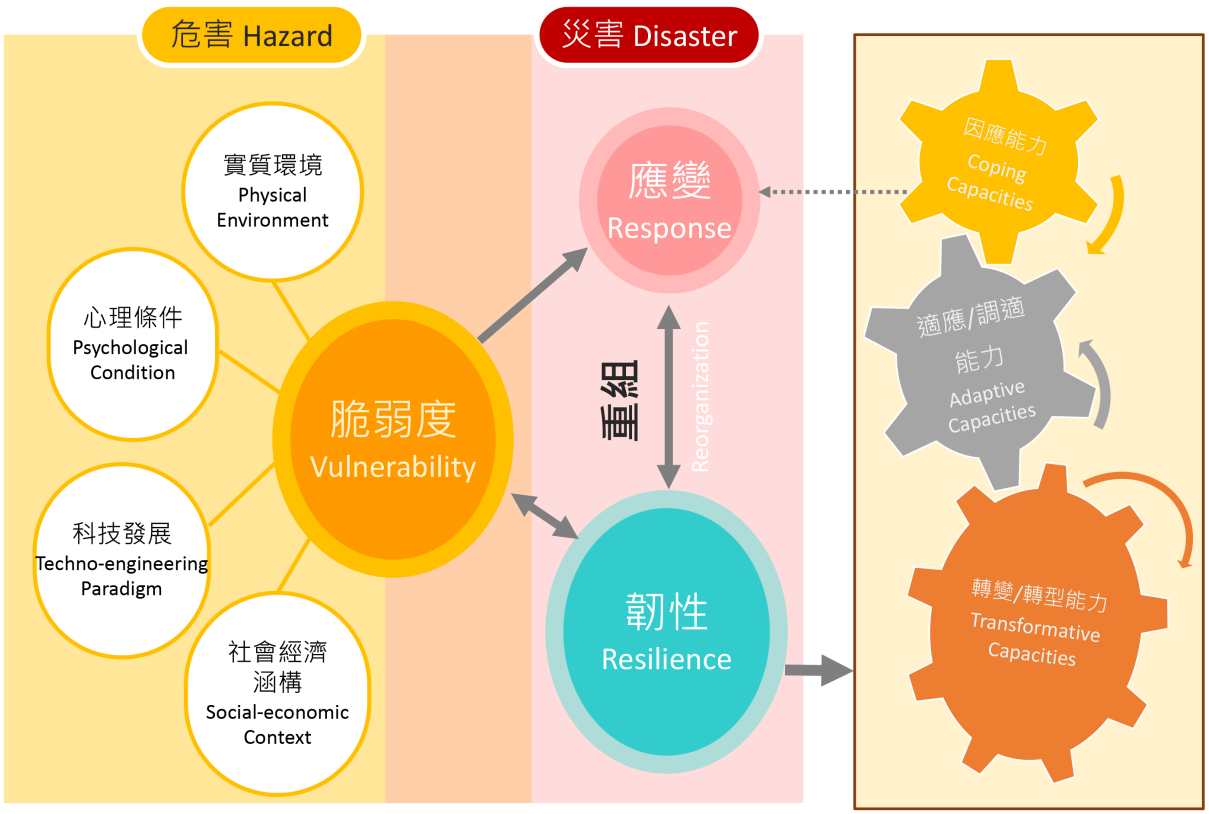


Figure 1. Vulnerability-Resilience Relationship
圖 1：脆弱度 - 韌性關係圖

in the longer run. Significant cultural contexts, natural resource systems, stories, songs, and even work practices may one day disappear from the landscapes that have changed beyond recognition. This will adversely affect how people interact with each other, their relationship with the environment, and how they identify with their local communities. This can ultimately lead to loss of cultural memory, weakening of social cohesion, and consequent changes in social structures.

Starting Point: Understanding the Surrounding Disaster Risks and Vulnerability on a Larger Scale

Climate change is unlikely to slow down, and disaster risks are bound to increase. When adopting the Risk-Informed Decision Making (RIDM) or Risk-based Planning (RBP), it is important to clearly identify potential overlapping hazards and vulnerabilities that may be present in the local physical environments, socio-economic contexts, trajectories of technology development, and the local communities' psychological conditions. It is also

建構韌性：因應能力、調適 / 適應能力、轉變 / 轉型能力

產業文化資產結構體的強化和改善必須持續因應，「人（利害關係者）」更是重點。利害關係者的能力培育是韌性建構的關鍵。應變能力和韌性需要遇到災害才能得知是否有效具備，但是每個事件都是經驗學習。在面對災害 / 危機的過程中，除了因應能力涉及應變品質外，希望「重建的更好（build back better）」必須要推動適應 / 調適能力，進而培育轉變 / 轉型的能力，社會及組織也必然持續經歷重組的過程。

結語

文化可以發揮橫向串接作用，成為永續發展的驅力和機會。產業文化資產受到氣候變遷影響，相對的也能以更多元和創新方式支援氣候變遷調適，包括從過去社會調適能力、環境變化學習及利用場所感和減災行動形成的社會價值 (Social Value of Mitigation Activities)。產業文化資產場域和社區不能個別尋求出路，需要連結自然 / 文化與產業文化資產 / 在地社區的新願景，擴大合作尋求共識，建構新文化資源網絡，並提供在地系統化適性減緩和調適措施的更多選擇。

essential to prioritize protection targets and work with the communities and all stakeholders to promote localized mitigation and adaptation strategies. In addition, industrial heritage managers must look at the systemic spatial structure, observe the “people” and “places” affected, and explore possible means to reduce vulnerability on a larger scale.

Building Resilience: Coping Capacities, Adaptative Capacities, and Transformative Capacities

It is important to keep strengthening the physical structures of our industrial heritage with adaptive strategies, and “people (stakeholders)” play a crucial role in this. Cultivating stakeholders’ capacities is the key to building resilience. Response capabilities and resilience can only be tested in the event of a disaster, but each event can be a learning experience. In times of disaster or crisis, our coping capabilities determine how well we respond. To “build back better,” we need to develop adaptative and transformative capacities and enable society and organizations to undergo continuous restructuring.

Conclusion

Culture can act as a horizontal link that drives and creates opportunities for sustainable development. Climate change is affecting industrial heritage, and as we respond, we draw on society’s past experiences and learn to create diverse and innovative ways to adapt to climate change, such as the new climate policy tool—Social Value of Mitigation Activities (SVMA). In the face of climate change, industrial heritage sites and their surrounding communities can no longer work independently. It is imperative to take into account nature, culture, and the visions of industrial heritage sites and local communities in order to expand cooperation, seek consensus, build new cultural resource networks, and develop more systemic, locally applicable mitigation and adaptation strategies.

Industrial Legacies and Cultural Landscapes in World Heritage Sites
世界遺產中的產業文化資產與文化景觀

Chun-His Wang (Assistant Professor, Graduate Institute of Folk Arts and Cultural Heritage, National Taipei University)
國立臺北大學民俗藝術與文化資產研究所助理教授 王淳熙

The 1972 World Heritage Convention categorizes heritage into "natural heritage," "cultural heritage," and "mixed cultural and natural heritage," and divides cultural heritage into monuments, groups of buildings, and sites. But as the World Heritage list continues to grow, the Outstanding Universal Value (OUV) of a cultural heritage site often extends beyond its value as a building or an archaeological site. How does one define the characteristics of a cultural heritage when its value is manifested through the interaction between humans and nature? In 1992, the World Heritage Committee defined cultural landscapes as representing "the combined works of nature and of man," as stipulated in Article 1 of the Convention, and noted that "they are illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal."

Based on this definition, a total of 121 cultural landscapes have been inscribed as of 2021, and a total of 155 cultural landscapes had been recommended for inscription by ICOMOS in the preliminary evaluation stage. Quite a number of the inscribed cultural landscapes are related to industrial cultural assets. Cultural landscapes are representative of the interaction between humans and nature; therefore, if a site's industrial production and operation activities demonstrate such an interaction, it qualifies as a cultural landscape according to the World Heritage Committee's definition. Industries vary widely from the light industry and the agricultural products processing industry to the heavy industry emerging after the industrial revolution. As such, cultural landscapes can take on many different forms.

Industrial activities in the light industry and agricultural products processing industry often involve the use of

1972 年頒布的《世界遺產公約》雖然涵蓋了自然遺產、文化資產與複合遺產等基本分類，並且在文化資產中又可以從其樣態分為紀念物（monument）、建築群（group of buildings）以及歷史場所（site）。但隨著世界遺產案例的增加，一個文化資產場域具有的傑出普世價值（OUV），往往不僅限於建築物或是考古遺址：當價值的展現是透過人與自然互動而形成時，這種文化資產的樣態又該如何定位？在 1992 年，世界遺產委員會提出「文化景觀」的定義為：《世界遺產公約》第一條所述之「自然與人類的共同作品」，展現出人類社會和聚落在受到自然環境的物理限制和 / 或機會，以及連續來自社會、經濟、文化的內外在力量的雙重影響下的長期演變過程。

在此定義下，截至 2021 年共列名（inscribed）121 處的文化景觀，而經由 ICOMOS 在初評階段建議列名為文化景觀者則有 155 處。綜觀其中列名的案例，不乏與產業文化資產有關。由於文化景觀強調了人和自然的互動，若產業的生產與運作能呈現出人與自然的互動，也就符合了文化景觀的概念。然而由於產業的範疇也相當廣泛，從過去的輕工業、農產的加工、到工業革命以來重工業的發展，反映在文化景觀的案例之中也就呈現不同的樣貌。

一些輕工業與農產加工的案例，往往是做為農業生產後端的加工工作，運用到了機械與設備。由於農業生產本質上十分符合了文化景觀人和自然互動的基本定義，在世界遺產中就數有機演進景觀（organically evolved landscape）的持續性景觀（continuing landscape）的數量最多。例如：葡萄酒的種植與釀造景觀，是世界遺產文化景觀中具有代表性的案例（例如：葡萄牙的上杜洛葡萄酒產區和法國的勃根地葡萄園風土）。但從文化景觀的案例來看，其中釀酒的技術可能非常傳統、或是僅有少量的近現代產業技術融入其中。但從產業的角度來看，這些案例則可能工業化的程度相對較為薄弱，甚至不見得能被視為產業文化資產。

而更符合產業文化資產概念的文化景觀案例，則恰都與礦業的開採有關。包含了金、銀、銅、煤等礦產的開採、選煉、運輸，以及其整體的工業村，藉由運用不

machinery and equipment in the later stages of production. Since agricultural production activities inherently engage with humans and nature, the agricultural processing site fits well with the basic definition of a cultural landscape. Therefore, the most common cultural landscapes on the World Heritage List can be found in the category of “organically evolved landscapes” – “continuing landscapes.” Landscapes of viticulture and winemaking, such as the Alto Douro Wine Region (Portugal) and the Climats, terroirs of Burgundy (France), are representative examples of World Heritage cultural landscapes. However, winemaking techniques may be very traditional in nature, with little application of modern, industrial techniques. From an industrial point of view, therefore, some of these sites are not considered industrial heritage since they are relatively less “industrialized.”

The cultural landscapes that better meet the criteria of industrial cultural heritage are mostly related to the mining industry. Mining activities such as the mining, refining, and transporting of the non-renewable natural mineral resources of gold, silver, copper, and coal, as well as the mining industrial villages, jointly form industrial complexes or ensembles that reflect the interaction between humans and nature and possess historical, cultural, and scientific values. Some examples are the Hallstatt-Dachstein / Salzkammergut Cultural Landscape in Austria (salt mine), Røros Mining Town and the Circumference in Norway (copper mine), and Iwami Ginzan Silver Mine and its Cultural Landscape in Japan. Mining cultural landscapes are classified as a “organically evolved landscapes” – “relict (or fossil) landscapes” by the World Heritage Committee. The “relict (or fossil) landscape” refers to a landscape in which an evolutionary process came to an end at some time in the past, either abruptly or over a period. Its significant distinguishing features are, however, still visible in material form. A “relic landscape” is essentially static, revealing its historical significance and value through the remaining topography and landforms, buildings, and equipment. The greatest difference between a “relict landscape” and other types of cultural landscapes lies in the degree of preservation and the nature of maintenance. In a “relic landscape,” traces of the past are “fro-

可再生的自然資源，形成的文化資產群體（complex or ensemble），反映出人和自然的互動過程，並且形成歷史、文化與科學的價值。案例包括了奧地利哈爾斯塔特 - 達赫斯泰因 薩爾茲卡莫古特的鹽礦文化景觀、挪威雷羅斯礦城及其周邊地區的銅礦景觀，以及日本石見銀山及其文化景觀等。礦業文化景觀的類型，屬於世界遺產有機演進景觀中的「殘遺物（或化石）景觀」，此類景觀在某個過去時間點之前已經突然或逐漸結束其演化過程，但在實物上仍可見其突出特徵。相對於其他的文化景觀類型，「殘遺物景觀」本質上是一種靜態的空間，透過殘留的地形與地貌、建築物、設備機具，展現出曾經的歷史意義和價值。相較於其他類型文化景觀最大的差異即在於保存維護的細節。若其他類型的文化景觀更強調了動態的使用、串聯過去的歷史風貌與現在民眾的生活與使用，則「殘遺物景觀」往往必須大幅度地凍結過去，才能夠展現其文化資產價值。

因此，產業文化資產文化景觀的保存（preservation）與維護（conservation），也就更加具有挑戰性，包含對於大面積場域的管理和管制，維持範圍內民眾的生活、又需兼顧文化資產的價值。這些都仰賴地方民眾和文化資產保存單位的協調、共識與合作，才能向前邁進。

Figure 1. Shimizudani Refinery Site, Iwami Ginzan Silver Mine and its Cultural Landscape (Japan). (Source: Author’s Photo)

圖 1：清水谷精鍊所跡：石見銀山及其文化景觀 (日本) 。（圖片來源：作者）

Figure 2. Floatation plant at Nedre Storwartz in Røros Mining Town and the Circumference (Norway). The copper ore from Olav's mine was transported by the overhead cable system. (Source: Author's Photo)
圖 2：浮選廠：雷羅斯礦城及其周邊地區 (挪威) 。奧拉夫礦山以架空索道系統運輸銅礦。（圖片來源：作者）

zen" to a significant extent and preserved substantially in order to exhibit the landscape's cultural heritage value. In other types of cultural landscapes, however, more focus is given to how a landscape's past is dynamically linked to the current lives of the local people as well as the use of the landscape today.

The preservation and conservation of industrial heritage landscapes can be challenging, as it often requires the management and control of large premises, the protection of local communities' livelihoods, and the representation of the site's heritage value. This can only be achieved through the coordination, consensus, and cooperation between the local people and the cultural heritage preservation institutions.

Theatres of History & Memory: Industrial Heritage of 20th Century Singapore
《記憶劇場：20 世紀新加坡的工業遺產》

Reviewed by; Szu-Ling Lin (Profess of the Department of Cultural and Creative Industries, National Pingtung University, Taiwan)
書評：國立屏東大學文化創意產業系教授 林思玲

Theatres of History & Memory: Industrial Heritage of 20th Century Singapore is a book that illustrates Singapore's industrial development during the baby boom. At that time, due to the population boom and lack of employment opportunities, people in Singapore were living in poverty. The society was pervaded by an atmosphere of pessimism. In addition, Singapore was also facing increasing competition from neighboring countries. Under such circumstances, the Singapore government believed that the only way to solve these problems was to promote industrialization. This is how Singapore's modern industrialization came into being.

This book is not just an official account or historical writings of Singapore's industrialization by professional historians; it is a book that comprises both official and unofficial historical records. It contains official narratives because the authors have consulted records in the National Archives of Singapore and official documents. What makes this book unique is that the narratives of what the authors call the “little people” are also included. The “little people” acted as key players and were deeply involved in the industrialization of Singapore, but they were given little attention throughout the whole process. Collecting oral histories from these people through interviews can be difficult and intimidating, but with the help of social media platforms such as Facebook, the process has been made easier and the stories collected are generally insightful and touching. This book contains not only the mainstream views of the historians, but also the recollections of the “little people”, the witnesses of Singapore's industrialization, thus allowing readers to gain a deeper understanding and picture of Singapore's industrialization history.

In the 1960s, Singapore hired the Dutch economist, Albert Winsemius, to make concrete recommendations for

《記憶劇場：20 世紀新加坡的工業遺產》（Theatres of History & Memory: Industrial Heritage of 20th Century Singapore）一書，闡明了嬰兒潮時期新加坡工業發展的狀況。當時的新加坡隨著人口的激增，就業機會的匱乏使人民生活貧困，這樣的悲觀氣氛在新加坡社會上盛行。此外，還有來自於新加坡周邊國家日益激烈的競爭。因此，當時新加坡政府認為解決這些問題唯一的方法是就是進行工業化，此點正是新加坡近代工業化計畫的起點。

這本書不只是專業歷史學家對新加坡工業化進程的官方描述或歷史書寫，亦是一本結合了官方和非官方收集歷史資料方式的書。對於前者，作者從國家檔案館和正式文件中收集資料，但本書與眾不同之處在於作者從他們所謂的「小人物」（Little people）那裡收集資料，而這些人作為新加坡的工業化關鍵參與者而且深入參與其中，但這些人在工業化過程中卻很少被重視。然而，以這種方式收集資料的過程，例如透過採訪和收集口述歷史，可能非常困難而令人怯步。然而在 Facebook 等社交媒體平臺的幫助下，作者得以減少這收集資料的難度，而且所蒐集到的故事總是富有洞察力和感人的。由於這本書包含了「小人物」的記憶，因此這本書不僅提供了主流歷史學家的觀點，還為讀者提供了新加坡工業化過程更深刻的見解和更全面的場景，這些「小人物」是這個過程的見證者。

1960 年代新加坡聘用荷蘭經濟學家阿爾伯特 溫塞米烏斯（Albert Winsemius）對經濟發展提出實質的建議，逐步拓展新加坡的工業化，並實現於裕廊（Jurong）地區。此外，花園工業城市（Garden Industrial Town）計畫，讓女性參與工業勞動的比例增加。本書也透過許多女性勞動者的口訪，呈現當時女性參與勞動如何在家庭與工作中取得平衡。其次，新加坡製造（Made in Singapore）的產品是透過外國和本地工人的合作所製造的。在這些產品中，最著名的是 1970 年代德國知名品牌 Rollei，當時選擇在新加坡製造生產祿來 35 相機（Rollei 35 camera），進而成為新加坡國產產品的象徵，也激發了新加坡人民對於民族認同感和自豪感。再者，本書深入探討了技能培訓的必要作用。它討論了職業學校與機構（Vocational schools and

the country's economic development, which subsequently led to the gradual industrialization of Singapore with Jurong being the first industrialized region. Meanwhile, Singapore implemented the Garden Industrial Town project, resulting in an increase in women's participation in the industrial workforce. In this book, many interviews with women workers are included to show how women balanced family and work at the time. During that period, local workers in Singapore also collaborated with foreign companies to manufacture made-in-Singapore products. One of the most famous products is the Rollei 35 camera. It was manufactured in the 1970s by the well-known German brand, Rollei. It went on to become a symbol of domestically-produced products, fostering a sense of national identity and pride among Singaporeans. This book also delves into the indispensable role of skills training, describing the functions of vocational schools and institutions, as well as their relationship to the modern education system, and how local trainees acquired the necessary skills from foreign companies. In the final part of the book, the authors describe the lives of foreign workers in Singapore from the 1960s to the 1980s and illustrate how these foreign workers made up for the manufacturing worker shortage that Singapore experienced at that time.

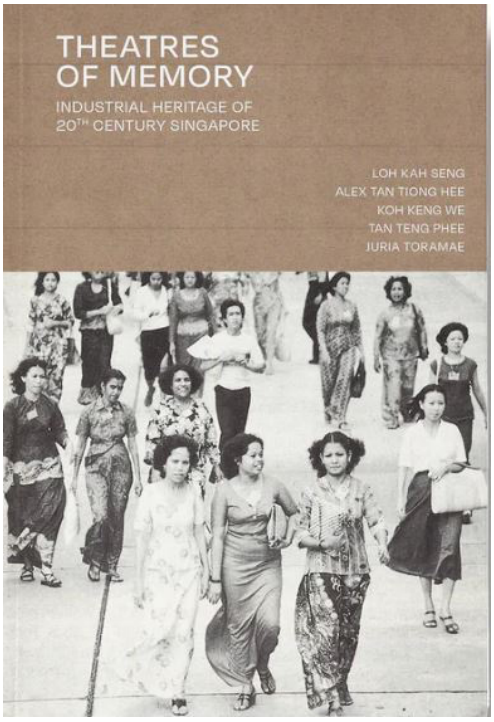
The authors suggest that readers should keep in mind the following questions while reading the book: 1. Why did Singapore need industrialization? 2. What led to Singapore's industrial reforms? 3. Who and what were the driving forces behind Singapore's industrialization? 4. How did people at that time adapt to the fast-changing lifestyle? 5. What role did vocational institutions play in that period and how important were they?

Featuring public discussions, this book allows readers to learn Singapore's industrialization history from the perspective of the common people and their daily lives.

institutions）的作用及其與現代教育體系的關係。此外，本書還重點介紹了當地學員如何從外國企業獲得必要的技能。在本書的最後一部分，作者介紹了 1960 年代至 1980 年代在新加坡的外國工人的生活，並且說明這些外國工人如何彌補新加坡製造業工人的短缺。

作者建議讀者在閱讀本書時應該思考以下問題：1. 為什麼新加坡需要工業化？ 2. 是什麼導致了新加坡的工業改革？ 3. 誰和什麼是工業化背後的驅動力？ 4. 當時的人們是如何適應快速變化的生活方式的？ 5. 職業院校在那個時期的角色與重要性。

本書透過公眾的角度談論新加坡工業化的歷程，讓讀者可以了解新加坡工業化過程中最日常生活的面貌。



Theatres of History & Memory: Industrial Heritage of 20th Century Singapore
《記憶劇場：20 世紀新加坡的工業遺產》
Author 作者： Loh Kah Seng / Alex Tan Tiong Hee
Koh Keng We / Tan Teng Phee
Juria Toramae
Publishing Year 年代： 2021
Publisher 出版：
Pagesetters Service/
Pagesetters Service 出版
ISBN： 978-981-18-1516-4

Taiwan

The Sixth Fuel Documenta 2022:The Sixth Fuel Factory in Motion
2022 六燃文件展：移動的六燃

Date 活動日期：6th June-20th July, 2022/ 2022 年 6 月 6 日至 7 月 20 日
Place 活動地點：Hsinchu City, Taiwan/ 新竹市，臺灣
Organizer 主辦單位：
Institute of Applied Arts of National Yang Ming Chiao Tung University
國立陽明交通大學應用藝術研究所
Official Web 活動官網：
https://iics.nctu.edu.tw/zh_tw/intro/News/event/2022-%E5%85%AD%E7%87%83%E6%96%87%E4%BB%B6%E5%B1%95-%E7%A7%BB%E5%8B%95%E7%9A%84%E5%85%AD%E7%87%83-17527087

Information 活動說明：

The imagination about a “moving museum” manifests itself in the Sixth Fuel Factory in motion, which also serves as the theme of the Sixth Fuel Documenta 2022. Such motion is not so much leaving any fixed place as relocating itself and transcending rigid confines. It is the shift of cognition, thought, and paradigm, as well as the advance of history, action, and discourse. Comprising four featured sections, (i.e., the good-neighboring Sixth Fuel Factory, the towering Sixth Fuel Factory, the mobile Sixth Fuel Factory, and a decentralized museum), this Documenta seeks to investigate six types of motion (incl. sustainable life, local texture, cultural heritage interpretation, governance strategy, historical writing, and museum paradigm), so as to explore the possibilities for the Sixth Fuel Factory to become a decentralized museum. In addition, the Documenta attempts to progressively establish a localogical knowledge system and a living museum framework for the Sixth Fuel Factory by means of transdisciplinary artistic praxis, sustainable life design, smart technology-based conservation,

「移動的六燃」給出了「移動的博物館」之想像，也是 2022 年六燃文件展的命題。與其說移動是打破定點，不如說是移置自我，超越框架。是認知、思想、典範的移轉，是歷史、行動、言說的挺進。

六燃文件展將透過保溫的六燃、屹立的六燃、移動的六燃、分散式博物館四個特色分項，逐一探討永續生活、在地紋理、文資詮釋、治理策略、歷史書寫、博物館典範的六種移動，思考六燃去中心、分散式博物館的可能性。

以藝術跨域實踐、永續生活設計、智慧科技保育、田野走讀漫遊、六燃地方學講座、博物館工作坊等行動，逐步建構六燃地方學的知識系統與六燃生博物館架構，明晰六燃文史的脈絡，揭示六燃二戰工業遺構的當代價值與定位，連結日本海軍第六燃料廠與臺灣高科技的臍帶關係，將全球語境下的六燃生活、生命與生產之新意義帶至光亮處，給出六燃活隱喻・活博物館的文化路徑與動態系統。（撰文／策展人　賴雯淑）

field trip and flâneuring, localogical lectures on the Sixth Fuel Factory, and museum workshops. This endeavor not only clarifies the Sixth Fuel Factory's cultural and historical contexts, but also demonstrates its contemporary value and orientation as a WWII industrial relic, all the way down to identify the umbilical cord between the former Japanese Navy's Sixth Fuel Factory and the development of Taiwan's high technology, and eventually, within the global context, brings the new meanings of the life, living beings and production at the Sixth Fuel Factory into the light. We hope this collective endeavor will create the cultural routes and dynamic system of the Living Metaphor・Living Museum.

Taiwan

The World of Railways: Ting-Wei Ku's Railway Photo Exhibition
鐵道臺灣 · 火車世界－古庭維攝影展

Date 活動日期：9th June-24th July, 2022/ 2022 年 6 月 9 日至 7 月 24 日
Place 活動地點：Taichung City, Taiwan/ 臺中市，臺灣
Organizer 主辦單位：
Taichung Station Railway Cultural Park
臺中驛鐵道文化園區
Official Web 活動官網：
https://www.facebook.com/cri.taichung/posts/562024655290879

Information 活動說明：

This exhibition, jointly curated by Ting-Wei Ku, Director of the Takao Railway Museum and Rail News, features three photo series- "Railway Life," "Railway Scenery," and "Railway Workers." The aim of this exhibition is to evoke the public's fond memories of railway travels and to celebrate the true beauty and charm of the railway. Here are the descriptions of the three themes:

"Railway Life"

Trains carry passengers and freight back and forth between different places as people go about their lives. The "Railway Life" photo series captures the most natural interactions between people and the railway, showing us how people are intimately connected with the railway in their daily lives.

"Railway Scenery"

Trains run through mountains and hills, carrying people between places they know and the ones they are yet to explore. The "Railway Scenery" photo series captures the moments of trains passing through

由舊打狗驛故事館古庭維館長與 Rail News 鐵道情報共同舉辦的鐵道主題攝影展，透過「鐵道生活」、「鐵道風景」、「鐵道職人」三大主題，串聯大眾與鐵道的青春記憶，看見鐵道的真誠與迷人之處，各主題介紹如下：

「鐵道生活」

火車擔負客運及貨運功能，配合生活節奏在不同場域間來回奔走。「鐵道生活」系列作品捕捉鐵道旁毫不造作的生活點滴，隱於平凡日常中的雋永自然流露。

「鐵道風景」

火車搭載人們穿山越嶺，在熟悉與陌生之間往返。「鐵道風景」系列作品尋找臺灣秀山麗水、異國奇風異景，火車穿梭其中，時而龐然時而渺小，其為主角抑或配角，端視觀者之眼與心，畫面饒富趣味。

「鐵道職人」

火車能安全乘載旅客，植基於背後一群鐵道職人默默付出的辛勞。「鐵道職人」系列作品，呈現職人們在維修、保養、行車管制、搬運等種種場景，專注與執著在鏡頭下凝成永恆的美麗。

breathtaking mountains and scenic landscapes in Taiwan and in foreign countries. Trains sometimes appear to be huge and sometimes tiny, but whether the train is the central or the secondary focus in the photo depends on the viewer's eyes and mind, and that is quite fascinating.

"Railway Workers"

Trains wouldn't be able to transport passengers safely if it weren't for many railway workers who silently put in their hard work. The "Railway Workers" photo series captures the scenes of workers repairing and maintaining trains, controlling traffic, and transporting goods. Captured in the camera's lens, their dedication and persistence have been turned into eternal beauty.

ITALY

Industrial Heritage: Free Training And Summer School
產業文化資產：免費線上培訓與夏令營

Date 活動日期：12th-18th September 2022/ 2022 年 9 月 12 日至 18 日
Place 活動地點：Hybrid Event(Online course/Physical summer school in Italy)/
混合活動 (線上培訓課程與一週的義大利實體夏令營)
Organizer 主辦單位：
Hector Project
Hector 計畫
Official Web 活動官網：
http://www.hector-training.eu/program/

Information 活動說明：

HECTOR Project is an Erasmus+ project created by a diverse team of nine partners from seven different European countries: Italy, Slovenia, Spain, Belgium, Germany, Austria and Bulgaria.

In the HECTOR project ("Industrial Heritage as Key Competencies for Tourist Operator"), online training is now ready for anyone who wants to qualify in industrial heritage preservation and cultural tourism.

The training provides core competences and specialization for experiential tourism in industrial heritage.

The online courses are open to everyone, but to qualify for the summer university in Italy you should be between 18 – 35 years old, be able to complete the training in English and demonstrate your interest in tourism.

After successful completion of the online training, they can participate in a summer school in Tuscany, which takes place in the Park Museum of the Mercury Mine of Abbadia San Salvatore, in the National Park of the Amiata Mines near Siena, Italy.

HECTOR 培訓為伊拉斯謨計畫 (Erasmus+ project) 項目之一，由來自 7 個歐洲國家 (義大利、斯洛維尼亞、西班牙、比利時、德國、奧地利與保加利亞) 共 9 位夥伴所組成的多元團隊創辦。

目前，HECTOR 培訓 (產業文化資產作為觀光從業者的關鍵技能) 已籌備完成，提供有興趣取得產業文化資產保存與文化觀光資格的學員，關於「產業文化資產體驗式旅行」的專業知識與關鍵技能。

線上培訓課程開放大眾報名；然而，為符合義大利暑期大學研讀資格，報名者需為 18 至 35 歲的青年，具備以英文全程參與的能力，並展現自身對觀光旅遊的興趣。

完成線上課程後，學員將前往義大利托斯卡尼 (Tuscany) 進行為期一週的夏令營，活動預定於西恩納市 (Siena) 阿米亞塔礦業國家公園 (National Park of the Amiata Mines) 中的阿巴迪亞聖薩爾瓦托雷汞礦公園博物館 (Park Museum of the Mercury Mine of Abbadia San Salvatore) 舉行。

SPAIN

The 24th International Conference on Industrial Heritage - “Industrial Sites and Public Works. From local to universal”

西班牙第 24 屆產業文化資產國際研討會「工業遺址與公共工程 - 從在地到全球」

Date 活動日期：28th September-1st October, 2022/ 2022 年 9 月 28 日至 10 月 1 日
Place 活動地點：Laboral Ciudad de la Cultura of Universidad Laboral de Gijón, Spain/
LABoral 文化中心，希洪勞動大學 (Universidad Laboral de Gijón)，西班牙
Organizer 主辦單位：
INCUNA (Association For Industrial Archeology)
工業考古協會 (INCUNA)
Official Web 活動官網：
https://incuna.es/jornadas-internacionales-de-patrimonio-industrial/jornadas-2022/

Information 活動說明：

The 24th International Conference on Industrial Heritage, organised by INCUNA with the collaboration of various public and private institutions, and running under the title of “Industrial Sites and Public Works. From local to universal”, will be held this year 2022 in the Ciudad Laboral de la Cultura in Gijón (Asturias) – Spain.

The event is to celebrate the 50th anniversary of the Paris Convention of 1972, when UNESCO adopted its important resolution with respect to the protection of cultural and natural heritage.

The Conference is designed to produce reflection on the state of industrial heritage and related civil or public works, both in terms of their nomination and the management issues of sites and places in the world related to industrial memory, as well as the situation of the many other elements, ensembles, landscapes and tangible and intangible industrial heritage of local or regional importance not included in the UNESCO World Heritage List.

Hence the motto “from local to universal”.

由工業考古協會 (INCUNA) 主辦的第 24 屆產業文化資產國際研討會，主題為「工業遺址與公共工程 - 從在地到全球」，由各公私組織共同協辦，將於西班牙希洪勞動大學（Universidad Laboral de Gijón）LABoral 文化中心登場，慶祝 =1972 年通過的「巴黎公約（Paris Convention）」屆滿 50 週年，該公約體現出聯合國教科文組織（UNESCO）保護文化與自然資產的重要決議。

本次研討會著重於產業文化資產與相關土木或公共工程的反思，包括全球與工業記憶相關遺址及場域的提名與管理議題，並將各地尚未登錄為世界遺產名錄，但對在地或區域人民來說，具部分、整體、景觀、有形與無形等重要價值的產業文化資產納入討論。因此「從在地到全球」亦為本次研討會的精神主軸。