

Challenges and Opportunities in Transforming Rural Industrial Heritage: The Bingcun Cement Plant Case Study

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Abstract. This article examines the protection and renewal design of rural industrial heritage using the Bingcun Cement Factory in Bingcun Town, Meizhou District, Meizhou City, Guangdong Province, China as a case study. It delves into the challenges and opportunities faced by rural industrial heritage in the context of cultural preservation and rural revitalization. By conducting on-site investigations at the Bingcun Cement Plant, a comprehensive design strategy encompassing spatial layout, planning guidance, architecture, and environmental considerations was developed. The strategy focuses on spatial optimization, architectural restoration, environmental enhancement, and ecological restoration, aiming to transform industrial heritage sites into cultural attractions with educational and aesthetic value, while also fostering rural economic and cultural vibrancy. The article concludes by suggesting that sustainable development of rural industrial heritage can be achieved through heritage preservation, integration into local culture, and multifaceted regional planning. Keywords: industrial heritage, conservation and revitalization, rural revitalization.

1. Background Overview

As an important part of cultural heritage, rural industrial heritage is deeply imprinted in the historical context of China's rural industrialization. It not only embodies rich historical, cultural and social values, but is also the historical witness of rural development and the key to the protection of rural culture^[1]. However, some heritage sites have suffered from neglect due to their remote location or undervalued historical value. With the in-depth implementation of the rural revitalization strategy and the vigorous development of ecological civilization construction, the protection and renewal of these heritage sites have become increasingly urgent and important. The deindustrialization of Europe has brought significant challenges to the heritage protection of industrial towns. For example, in the central Greek port city of Volos, redundancy and decay of buildings threaten the survival of much of the historical heritage. To address this challenge, choosing an appropriate protection strategy is crucial^[2]. In China, the protection and renewal of rural industrial heritage also face similar difficulties. However, through extensive community participation, scientific planning and innovative design, some rural industrial heritage sites have been effectively protected and revitalized^[3]. This article will discuss the protection and renewal of rural industrial heritage, as well as related strategies and practices, with a view to providing reference for the implementation of my country's rural revitalization strategy.

There are not many existing rural industrial relics in Meizhou, but as important carriers of rural regional

industrial culture, they carry rich historical memory and cultural value. However, with the changes of the times and economic development, many rural industrial relics are facing abandonment and forgetfulness. These relics not only occupy valuable land resources, but their dilapidated scene also has a negative impact on the rural environment. Therefore, landscape renewal design for rural industrial relics is not only a respect and protection for historical culture, but also a necessary condition for promoting sustainable rural development. Culture forms scenes, and scenes remain in culture. (As shown in Table 1.).

Bingcun Cement Factory is located in Bingcun Town, Meixian District, Meizhou City, Guangdong Province, China. It is positioned 1.5 kilometers east of the Chengdong Cement Plant, 487 meters north of the Mudun Technology Co., Ltd. area, 294 meters west of Yinshi Bus Station, and 80 meters south of the fields below the road. The plant is surrounded by industrial facilities and factory areas, benefiting from its advantageous geographical location. The layout of the cement factory buildings and villages follows a linear pattern along the road, closely linked with Hengshi Village. The area is enveloped by low hills and high terraces, abundant in green spaces and woodland resources. The road network, centered around Provincial Highway 224, radiates outwards effectively connecting the factories and villages, offering potential for a harmonious development of culture, tourism, industry, and landscape. Leveraging the unique characteristics of the region, this study examines the Meixian District cement factory cluster case, conducting on-site investigations and utilizing various methodologies

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to identify existing challenges. By proposing tailored design strategies focused on enhancing ecology, fostering industrial culture, and elevating landscape aesthetics, the aim is to integrate and revitalize the existing areas into a cultural theme park that combines industrial heritage, leisure activities, scientific education, sightseeing opportunities, and commercial ventures. While seeks to amalgamate cultural tourism, industry, and landscape development to achieve sustainable progress.

Table 1. Questionnaire for users interested in neighbourhood remodelling

Category	Subproject	Findings(%)
Demographics	Gender distribution	Male 62.2, Female 37.7
	Age distribution	<18 20.0, 18~30 8.8, 30~60 28.8, >60 42.2
Space requirements	Site requirements	Open space 4.4, Planting 8.8
	10-point Arial Italic	6 mm before 3 mm after
Treatment	Demolition	46.6
	Reuse	53.4
Reuse targets	Creative Factory	48.8
	Greening	68.8
	Site Park	15.5
	Residentia	13.3
	Other	22.2

2. Issues and Strategies

In the renovation and design project of Bingcun Cement Factory, a series of challenges were faced, including chaotic spatial layout, lack of planning, structural damage, safety hazards and environmental issues. These challenges not only affect the image and attractiveness of the countryside, but also restrict rural development. The designers responded to the challenge by adopting a strategy of integrating culture and environment, aiming to transform Bingcun’s industrial history, red spirit and Hakka culture into a space with educational and aesthetic value. (As shown in **Fig. 1**).

Drawing on successful cases of industrial heritage transformation at home and abroad^{[4][5]}, such as the introduction of cultural activities in the Iron Bridge Valley project and the cultural innovation transformation of the Ruhr area, as well as innovative practices in domestic rural areas that combine regional characteristics^[6], the Bingcun Cement Factory project can learn how to transform industrial heritage into Transformed into a new driving force for local economic development and cultural prosperity^[7]. The design goal is to transform the industrial heritage of Bingcun Village into a carrier of rural cultural protection and sustainable development through landscape renewal design. The renovation strategy should combine local cultural characteristics and modern needs, respecting history and being forward-looking. In this way, Bingcun Cement Factory is expected to become a space integrating educational significance, aesthetic value and cultural depth, injecting new impetus into the overall revitalization of rural areas. (As shown in **Tables 2, 3, & 4**).

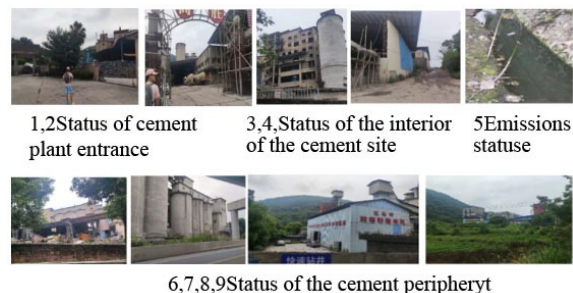


Fig. 1. Status of the area around the cement plant in Bicun.

Table 2. International Industrial Heritage Transformation Case Study and Inspiration

Case	Subproject	Enlightening
	Background	Water engineering and industrial facilities
Kurobe Dam, Toyama Prefecture, Japan	Retrofit strategy	Conversion of industrial facilities into educational centres
	What can be learnt from it:	Industrial Education Integration
	Challenges and responses	Matching educational content to local needs
1933 Old Square, Shanghai, China	Specific practical insights	Utilising industrial heritage for science education and raising public awareness
	Background	Abattoir Transformation in the City
	Retrofit strategy	Cultural and Creative Industries Park, Studio Shop
Walloon Steelworks, Belgium	What can be learnt from it:	Reuse of industrial buildings
	Challenges and responses	Maintaining a balance between historical features and modern needs
	Specific practical insights	Promoting the development of creative industries and balancing commercial and cultural values
Demographics	Background	ironworks site
	Retrofit strategy	Industrial heritage parks, museums art exhibitions
	What can be learnt from it:	Re-use of public recreational space
Challenges and responses	Challenges and responses	Conservation and reuse of industrial sites
	Specific practical insights	Creating public recreational space for community vibrancy

Table 3. (continuation sheet) International Industrial Heritage Transformation Case Study and Inspiration

Case	Subproject	Enlightening
Demographics	Background	birthplace of the Industrial Revolution
	Retrofit strategy	Preservation and restoration of historic buildings, introduction of museums and educational programmes
	What can be learnt from it:	Educational and cultural activities enhance heritage values
Challenges and responses	Challenges and responses	Funding mobilisation, low community participation

	Specific practical insights	Developing educational programmes using local characteristics to enhance community participation
	Background	Transformation of the Coal and Steel Centre
	Retrofit strategy	Abandoned factories transformed into cultural and artistic spaces
Ruhr Area, Germany	What can be learnt from it:	Industrial heritage as a platform for innovation
	Challenges and responses	Social acceptance of industrial transformation
	Specific practical insights	Creating cultural and artistic events to attract tourists and investment
	Background	Abandoned Mining Centre
	Retrofit strategy	Eco-Cultural Mixed Zone, Park Lake Art Centre
Lille Mining Basin, France	What can be learnt from it:	Integration of ecological restoration and urban renewal
	Challenges and responses	Environmental restoration techniques, financial constraints
	Specific practical insights	Combining ecological restoration and cultural activities to create multifunctional spaces

Table 4. Case Studies on Integration of Local Culture and Industry in China

Case	Subproject	Enlightening
Anhui Jingxian Xuanpa per Culture Village	Retrofit strategy	Combine traditional handicrafts with cultural tourism and establish the Xuanpaper Culture Museum.
	borrowing	Traditional craftsmanship meets modern tourism.
	Opportunities and challenges	Cultural heritage needs and innovations for the preservation of traditional crafts.
	Specific practical insights	Promote the inheritance of traditional handicrafts and enhance the attractiveness of cultural tourism.
Case	Subproject	Enlightening
Maotai town, Guizhou	Retrofit strategy	Industrial tourism development to enhance the display and experience of brewing cultural heritage.
	borrowing	An in-depth cultural experience of industrial heritage.
	Opportunities and challenges	The global influence of wine culture balanced with environmental protection and industrial development.
	Specific practical insights	Strengthen the cultural experience of industrial heritage and enhance the brand value.
Jiangxi Jingdezhen Ceramic Village	Retrofit strategy	Developing ceramic culture theme tourism and establishing ceramic art studios and markets.
	borrowing	Innovative development of traditional industries.
	Opportunities and challenges	International Markets for Ceramic Art with Skill Transmission and Market Competition.
	Specific practical insights	Innovate traditional industries and expand the cultural market.
Zhejiang Shaoxing	Retrofit strategy	Combined with the culture of yellow wine, the development of special towns and the organisation of events such as the Yellow Wine Festival.

Yellow Wine Town	borrowing	Local identity and cultural promotion.
	Opportunities and challenges	The promotion of local distinctive culture and the balance between cultural identity and commercial exploitation.v
	Specific practical insights	Use of local cultural characteristics for economic development.
	Retrofit strategy	Protecting and inheriting handmade paper-making skills and developing cultural experience tourism.
Sichuan Leshan Jiejiang Paper Township	borrowing	Preservation and transmission of traditional skills.
	Opportunities and challenges	Preservation of intangible cultural heritage and the ageing of skills bearers.
	Specific practical insights	Preservation and revitalisation of intangible cultural heritage and promotion of cultural tourism.

Retrofit strategies for bingcun cement plant:

• Integrated protection of culture and ecology: Combining the industrial history and local cultural characteristics of Bingcun Village, implement ecological restoration strategies, create green spaces, and protect and display industrial heritage^[8].

• Innovative use of multifunctional spaces: transforming industrial sites into integrated places for education, exhibitions, recreation, commerce and housing, while retaining their industrial character.

•Community participation and benefit sharing: Encourage community residents to participate in the planning and implementation process to ensure that the renovation plan meets community needs, and allow residents to participate in decision-making through community advisory committees and other forms.

• Economic development and industrial innovation: Use industrial heritage as a new platform for economic development to attract creative industries, technology enterprises and cultural activities, and promote the upgrading of local industries.

• Expand the value of education and science popularization: set up education centers or museums, carry out industrial history, environmental protection and local cultural education projects to enhance public awareness.

• Modern fusion of design and aesthetics: Focus on aesthetics and modernity in the renovation design, while maintaining harmony with the original industrial structure and creating attractive public spaces.

• Long-term planning and ongoing management: Develop long-term planning and ongoing management strategies to ensure the sustainability of the renovation project and adapt to changes in social and economic development.

• Technology Application and Brand Building: Utilize the latest technologies, such as virtual reality and augmented reality, to enhance the visitor experience while building the brand and increasing project visibility through storytelling and marketing.

• Policy support and partnerships: Seek policy support from the government and relevant institutions, establish partnerships, and jointly promote the implementation and development of the project.

By merging and optimizing these strategies, the Bingcun Cement Plant project can more efficiently

achieve the goals of cultural heritage protection, economic development, community participation, and environmental sustainability.

3. Case Design

3.1 Design Overview and Objectives

The design strategy of Bingcun Cement Factory aims to integrate the humanistic spirit and industrial heritage of the community with the cultural traditions of the Hakka people to realize the comprehensive revitalization of the factory. This project is dedicated to preserving industrial relics, revolutionary sites, and Hakka traditions, while also creating a cultural landmark that combines creativity, industry, art, and wisdom to boost the city's cultural economy.

3.2 Functional Functional Zoning and Planning

The project has planned multiple functional areas, including industrial memory area, leisure and entertainment area, science and technology popularization area, agricultural sightseeing area, commercial service area and cultural and creative area to meet the diverse needs of tourists. Each area focuses on the combination of ecological restoration, environmental protection, modern design concepts and technological innovation.

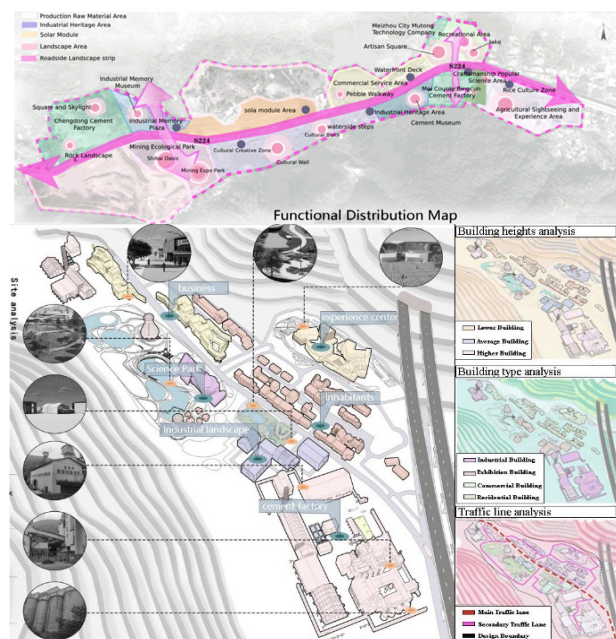


Figure 2: Zonage fonctionnel et planification.

3.3 Space and architectural design

3.3.1 Spatial integration and optimisation

In terms of spatial integration and optimization, the design team adeptly combined modern aesthetics with industrial heritage. Through repairing and reinforcing the damaged

building and incorporating contemporary design elements, they successfully restored the functionality of the structure while preserving its historical significance. The roof is adorned with gray asphalt fiberglass tiles, and the exterior walls predominantly feature vertically arranged yellow-brown Southern pine anti-corrosion boards. In addition, aged schist was used on some of the facades to highlight the original features (as shown in Figure 2).

3.3.2 Building restoration and renovation:

The restoration and renovation of the damaged building involved a combination of modern design and industrial culture. While maintaining the original style of the building, the design team implemented necessary reinforcements and transformations to align it with modern aesthetics and usage requirements. Additionally, careful consideration was given to the selection and coordination of building materials to reflect both the environmental protection concept and cultural characteristics of the project.

3.3.3 Building restoration and renovation

The selection of trees along the main road was carefully considered to strike a balance between aesthetics and safety. Trees with smaller crowns were chosen for narrow roads, while those with larger crowns were selected for wider roads, creating a distinctive landscape. Additionally, the agricultural tourism experience area integrates farmland features to enhance the overall visitor experience. This includes river enhancements, ecological riparian protection, strategic planting, and landscaping. Short fences were also installed to prevent floating debris in the water and to create water features, offering visitors a natural and immersive sightseeing experience.

3.3.4 Sustainable design and technology

Implement sustainable practices in existing rural photovoltaic industries^[9] to maintain their sustainability through the following aspects:

- Local material applications: Choosing local materials reduces transport costs and environmental impacts while promoting local economic development.
- Green Roofs and Solar Integration: Installing green roofs and solar panels on buildings improves energy efficiency while enhancing building insulation and biodiversity.
- Stormwater management: Design rainwater collection and recycling systems to conserve water resources and reduce reliance on traditional water supplies.

• Ecological restoration: adopt strategies to restore mountain vegetation, improve water quality, and enhance the stability and sustainability of the ecosystem.

Eco-friendly building materials and technologies: Use eco-friendly building materials and technologies such as recycled concrete, natural ventilation and solar heating systems to reduce the building's ecological footprint.

3.4 Featured Area Design

• *Cultural and Creative District*: The cultural and creative area features waterfront steps, a simple cylindrical hotel and a cultural landscape wall, integrating art and design elements. It will become a platform for artists and cultural and creative workers to showcase their talents. It will also be a good place for tourists to feel the artistic atmosphere and experience the charm of culture.

• *Commercial service areas*: The commercial service area features Hakka cuisine and specialty hotels as its main attractions. Through landscape designs such as pebble walkways, leisure plazas and waterfront steps, various commercial facilities are connected and the exchange of design concepts is encouraged. Visitors can taste authentic Hakka food and experience unique Hakka culture here.

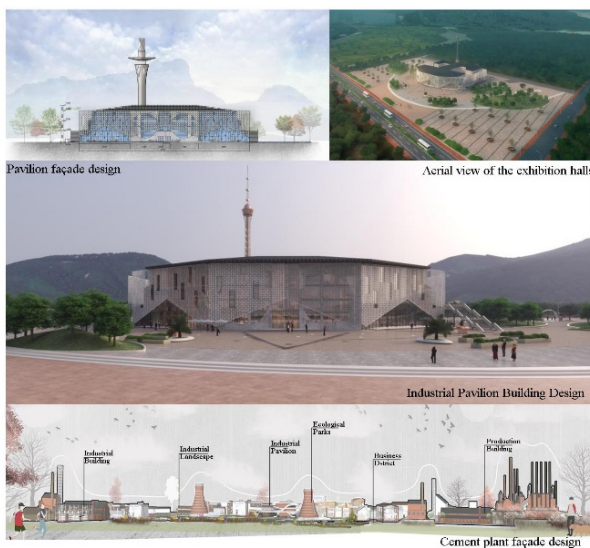


Figure 3: Elevation of rural industrial pavilions and industrial areas

• *The Industrial Science and Technology Park* integrates light industry with the natural beauty of its tree-lined and pleasant environment^[10]. Committed to attracting top technology companies and innovative projects, the park aims to establish a technology innovation center and a hub for talent. The industrial exhibition hall showcases the park's historical growth and scientific achievements, while also envisioning future developments and fostering cultural and knowledge exchange. Its design blends modern aesthetics with industrial characteristics, making it an iconic cultural symbol of the park. (as shown in Figure 3).

• *Recreation Area*: The recreation area offers a diverse range of leisure and entertainment facilities. Elevated levels feature multi-functional spaces, while the landscaping seamlessly connects indoor and outdoor areas. Wind-resistant plants, sculptures, and landscape walls contribute to a welcoming environment, allowing visitors to unwind and enjoy themselves.

3.5 Renovation strategy for cultural centres

The design strategy during the renovation process focused on integrating Hakka culture elements. By preserving industrial buildings, machinery, and red historical relics, while incorporating traditional Hakka cultural elements, the unique cultural charm of the countryside was emphasized. This approach not only honors and safeguards historical heritage, but also adds new cultural significance and tourism appeal to the region.

4. Conclusion

This study takes Bing Village Cement Factory as a case study and proposes a rural industrial heritage regeneration plan that integrates local culture and ecologically sustainable technologies. The plan not only deeply integrates the cultural characteristics of Bing Village, but also strives to combine cultural heritage protection and the environment through ecological restoration and modern design concepts, using multi-functional regional planning and a series of sustainable technologies such as green roofs, solar energy utilization and rainwater management. Find a balance between sustainability. This not only provides a possibility for the harmonious coexistence of environment and cultural heritage, but also provides innovative ideas for the regeneration of rural industrial heritage.

Future Outlook: Looking to the future, this research plan will continue to optimize the design plan through interdisciplinary cooperation and intelligent management strategies, and establish a comprehensive monitoring and evaluation system to ensure the long-term sustainable development of the project. We firmly believe that through close cooperation with policymakers and community members, the Bingcun Cement Factory Project is expected to become a benchmark for rural revitalization, providing practical cases and lessons for the regeneration of other rural industrial heritages. This will help promote the broader sustainable rural development process and achieve a win-win situation for the economy, society and the environment.

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