

Review Article

Sustainable Urban Regeneration Strategies in Korea's Abandoned Mine Area Using Industrial Heritage

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Received 29 June 2022; Revised 22 September 2022; Accepted 23 September 2022; Published 25 October 2022

Academic Editor: Timothy O. Olawumi

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The purpose of this study was to establish sustainable urban regeneration strategies for the abandoned mine area by applying the industrial heritage in Taebaek city. To this end, this study first analyzed the urban regeneration strategies for abandoned mine areas in Western societies like the United Kingdom, Germany, Poland, the United States, and Spain. In addition, in-depth interviews were conducted with the concerned parties to analyze the abandoned mine areas in Taebaek city in line with the urban regeneration theoretical framework. The provision of urban regeneration strategies that apply the industrial heritage of the coal-mining areas involves the categories of urban regeneration like society, economy, environment, history, and cultural frameworks. The final findings deduced measures for two categories including the measures of activating Taebaek city as a cultural and also a leisure and sports city. The urban regeneration strategies to design Taebaek city as a cultural city include an EDM Festival by applying the dismal mood of the coal preparation plant industrial heritage in Taebaek city and Cheoram music and Lightning Road with industrial heritage. The urban regeneration strategies to design a leisure and sports city include a road bicycle racing contest by utilizing the geographical environment in Taebaek city which boasts high altitudes and Color Run. The two strategies of culture and leisure and sports contents deduced in the study can commonly utilize the industrial heritage of Taebaek city. Furthermore, as there is a continual demand for community participation, it is anticipated to apply it as the sustainable urban regeneration strategies of Taebaek city.

1. Introduction

Over the past half-century, growth-oriented economic development policies have focused on urban-oriented development, accelerating urban population concentration. In addition, vehicle-centered urban development caused environmental problems and a loss of cultural identity, resulting in negative consequences of deteriorating urban competitiveness [1]. The urban development policy, which was carried out to solve this problem, has led to excessive demonstration of development, focusing on development that completely changes the city while losing the history and cultural value of the region [2]. However, this paradigm shift is now necessary, and many developed countries are already interested in urban regeneration, accepting new urban plans for environmentally sound and sustainable development [3].

Many scholars define sustainable development in various ways. McDonald [4–10] argues that ecological sustainability and social sustainability should be sustainable planning goals in sustainable development planning research. Grant et al. defined sustainable development as a natural process for future generations and a community effort to protect landscape functions and preserve resources. They argued that to become a sustainable settlement, a healthy social environment must be promoted by maintaining and restoring landscape functions, minimizing the ecological impact of settlements, protecting natural and land resources for future generations, reducing waste emissions from settlement development, and increasing residents' participation in promoting sustainability. Atkinson classified sustainable development into technology-oriented sustainable development and ecological-oriented sustainable

development in a study of the sustainable development paradigm. Poverty eradication and environmental problems can be solved through technology-oriented sustainable development, but ecological-oriented sustainable development requires changes in residents' attitudes, lifestyles, and social systems, and growth or progressive ideas can be abandoned. Among the definitions of sustainable development mentioned by various scholars, this study intends to use Grand et al's definition of sustainability. One of the purposes of this study is to induce sustainable urban regeneration using the declining industrial heritage in the city, which includes encouraging residents to voluntarily participate in protecting ecosystems and nature and enhancing community awareness.

Based on this definition, this study aims to find out the sustainable urban regeneration strategy of Taebaek city, Gangwon-do, a closed mining city in Korea. In the 1960s and 1970s, Korea's representative energy source was coal, and Taebaek city was a representative coal-mining city. However, it began to decline after maintenance work was carried out according to the coal "industrial rationalization" policy [9, 10], and in the process of rapid industrialization and alternative energy development, local cities and underdeveloped areas began to decline. In addition, various by-products generated during the coal resource development process have become a cause of environmental pollution and emerged as a serious problem in Taebaek city [11, 12].

Taebaek city will erase the traces of coal mines remaining in the region to solve various social and environmental problems and promote policies with the aim of a highland tourism city [13]. The plateau tourism city is to complete a sports and tourism city by utilizing the advantages of high places. Obviously, the purpose is good, but the problem is that the coal-mining village, an industrial heritage of Taebaek city, will be eliminated and new infrastructure will be built there to build a highland tourist city. However, this approach resulted in the disappearance of Taebaek city's unique culture, history, and local communities and led to the loss of local identity [14].

Urban regeneration is a global trend [8]. But in fact, in the meantime, urban regeneration policies have focused on reconstruction and redevelopment, which is the "hardware" aspect, focusing on improving the functions of the city and the speed of administration [4]. However, recent urban regeneration policies actively utilize the "software" aspects of culture, arts, and history as incentives for population and industry and expand residents' participation while emphasizing the quality of life of urban residents [5]. It is developing in the direction of utilizing empty spaces existing throughout the city by giving flexibility in location [2]. Recent "software" urban regeneration means economically, socially, and physically reviving cities by introducing and creating new features in existing cities [6]. Representative "software" programs for urban regeneration include cultural facilities and cultural contents, high-tech industries and work, large-scale complex facilities, and tourism and sports leisure facilities [7]. Taebaek city also aims to build a highland tourism city in consideration of such software aspect development. However, the researcher's critical view

is that eliminating the existing industrial heritage and continuing to pursue new infrastructure is not the right direction in terms of sustainability.

To compensate for these problems, it is necessary to find ways to revitalize developed-country sustainable cities by recognizing their value as a representative heritage of the Korean industrialization process rather than approaching economic logic [15]. Therefore, this study first analyzes the successful cases of urban regeneration in overseas abandoned mine areas with similar experiences to Taebaek city to find out Taebaek city's sustainable urban regeneration strategy using industrial heritage. Based on the results of the analysis, Taebaek city aims to establish an urban regeneration development strategy using industrial heritage from the perspective of culture and leisure sports, and to achieve this, this study presents the following two research problems.

First, what is Taebaek city's sustainable urban regeneration strategy?

Second, what is the realization plan of Taebaek city's sustainable urban regeneration strategy?

The scope of the study was aimed at Taebaek city, Gangwon-do, a representative abandoned mine area in Korea, to find the success characteristics of Taebaek city, focusing on overseas cases that revitalized old industrial facilities and to derive strategies to solve problems of abandoned mine areas through urban regeneration.

The research method was conducted based on the following process. First, a basic study on the concept and trend of urban regeneration was conducted, and the current status and problems of urban development in Taebaek city, the target site, were described. Second, this research analysis system was established through previous studies and literature studies on overseas abandoned mine areas from the perspective of urban regeneration, and success factors were analyzed through various abandoned mine area cases. Third, in-depth interviews with stakeholders were conducted with city hall officials, urban development researchers, and local residents who comprehensively managed the coal mine in Taebaek city. Fourth, the direction of Taebaek city's urban regeneration strategy was presented based on the success factors obtained through the previous overseas success case analysis and should be succinct, with no subheadings. Limited figures may be included only if they are truly introductory and contain no new results.

2. Literature Review

2.1. Urban Regeneration

2.1.1. Concept of Urban Regeneration. Urban regeneration means strengthening regional capabilities, introducing new functions, and utilizing local resources to revitalize a declining city socially, economically, and environmentally [16]. Urban regeneration means that the old city, which has declined physically and functionally, is transformed into a vibrant city in response to changes in the new urban environment through functional recovery [17].

In other words, it can be said that the purpose of urban regeneration is to revitalize a declining city and regain its

vitality. Urban regeneration should be approached from various aspects, not from a fragmentary approach. Urban regeneration can be largely divided into four categories: environmental, economic, social, historical, and cultural aspects [18]. Details are shown in Table 1.

In the case of overseas countries, the paradigm of urban planning was changed by “urban reconstruction in the 1950s,” “full redevelopment in the 1970s,” “urban redevelopment in the 1980s,” and “urban regeneration in the 1990s” [9]. Overseas advanced countries such as the United States, the United Kingdom, and Germany, which experienced urban decline first, have already started urban regeneration projects to solve the urban decline problem since the 1970s. Rather than revitalizing the central city, Britain began to systematically manage the area. In addition, Japan is actively promoting regional-led village creation along with various urban regeneration support policies such as “local revitalization projects” and “environmental city projects” [18]. In the case of Korea, urban development began in established urban areas as urban planning for high urbanization and quantitative growth caused social problems. It has not been 20 years since the concept of urban regeneration for such a declining area began to be discussed [19].

2.1.2. Urban Regeneration through the Utilization of Industrial Heritage. Urban regeneration refers to all ways to revitalize cities through appropriate programs along with physical maintenance projects [8]. European cities have aligned the main direction of urban regeneration with cultural strategies to refresh their urban image and introduce various cultural events and have focused on planning urban development models centered on the tourism and service industries [20]. In this context, with the recent rise of the creative economy paradigm, the “Creative City” project began to be actively discussed after the mid-1990s [21]. A creative city is defined as a city with the ability to foster its own art culture and create new industries through sustainable and self-sustaining development [22]. The Creative Cities Network, launched by the UNESCO in 2004, and the European Union’s European Cultural Capital Program are representative examples of the Creative City project [23].

For urban regeneration using culture, it is important to interpret and restore the cultural resources of the region [24]. In that context, various forms of cultural heritage have played an important role in promoting new development strategies for declining cities [25, 26]. In the tourism and service industry, which can replace the manufacturing industry, tangible and intangible cultural heritage provided a concept [27] and was effectively used to promote the image of the city [16]. However, the concept of industrial heritage, which belongs to the universal category of cultural heritage but has a more special character, has also been discussed in earnest [28].

Industrial heritage is a concept that began to emerge as manufacturing-oriented industrial facilities built in large quantities over 100 years after the industrial revolution aged and materialized according to changes in the industrial structure [29]. The discussions began in earnest in 1973

when the International Committee on the Conservation of the Industrial Heritage was established in Europe [16]. This served as an opportunity to show a change in the paradigm gradually recognized as a cultural property in the concept of functionality for existing industrial facilities. Since then, the term industrial heritage has been officially used, and several studies have begun on the value and utilization of the cultural property of industrial heritage only [30, 31]. In other words, the industrial heritage was recognized as a major facility that not only played an important role in revitalizing the local economy through economic activities such as employment and labor but also showed the role of social and cultural communities at the time [29].

It was very encouraging that industrial heritage could be a new means of regional regeneration in a target that should be discarded with the past traces of industries that were prosperous in the past [32]. However, not all industrial facilities can be regarded as industrial heritage. The basic conditions for being recognized as an industrial heritage are as follows: First, it should be an industrial facility with a certain degree of historicity from a historical perspective. Second, from an economic point of view, it should be an industry that has been the driving force for regional economic development as a local industry. Third, from a spatial perspective, the scale should be relatively large or have landscape specificity. Fourth, from the perspective of locality, it should be of public interest to local residents. Fifth, from a symbolic point of view, it should have an imaginary value formed in the tacit consent of the local level that it should not be easily replaced or dismantled for other uses [26, 33].

Industrial heritage is regarded as an important modern cultural heritage that serves as a bridge between traditional and modern architectures [34]. In Europe, modern buildings began to be registered as cultural properties in 1975 with the European Architectural Heritage Year, and about 3,500 industrial properties were registered as cultural properties in North Rhine-Westphalia, Germany alone [33]. However, it cannot be considered that only hardware such as buildings is the industrial heritage used for urban regeneration. The unique stories of human resources put into each industry and the various liberal arts they created can also be seen as a legacy left by industries in their heyday [35]. They can be used as excellent materials for cultural contents that show the era. In other words, if buildings such as abandoned factories, warehouses, and power plants can be recycled for other purposes, such as theaters, galleries, and cultural centers, storytelling in the heyday of the industry can be recreated as cultural contents to fill them [16, 36].

2.1.3. Status of Urban Development in Taebaek City, Coal Mine Village. Korea’s coal industry was formed in earnest in the Japanese colonial era and steadily grew, but it was revived through the 1960s and 1970s, but as the coal industry rationalization progressed in the late 1980s, it was on the decline due to the specifications of the coal industry [37]. As a result, the population, which was 120,000 at the end of 1987, decreased to 47,000 at the end of 2015 based on

TABLE 1: Categories of urban regeneration.

Sortation	Content
Social aspect	- Improve the situation through various participation with local residents, etc., rather than unilateral approach - Activities such as urban infrastructure management and regional participation
Economic aspect	- Positive economic contribution and urban revival by promoting land use and economic activities - Regional industrial and economic revival through employment expansion
Environmental aspect	- Improve efficiency through physical and environmental improvement to prepare an opportunity for population inflow - Systematic improvement and planned development of urban areas are appropriately induced in declining areas
Historical and cultural aspects	- Establishing pride of residents by discovering local cultural values and preserving cultural heritage/identification - Strengthen city competitiveness through sincere place marketing

Source: Korea Research Institute for Human Settlements (KRIHS), 2015, A Study on Regional Development Strategies Using National Cultural Resources, a research report.

resident registration [38]. This trend of coal-mining villages is a global trend, and although it occurred first in the West, there are many overseas cases selected as world heritage sites or successful due to regional revitalization policies and the attraction of alternative industries. In this context, Taebaek city, the only coal-mining city in Korea, aims to erase the traces of coal-mining villages remaining throughout Taebaek city and become a highland tourist city [39]. Large-scale projects are being carried out to highlight the tourism industry in the Taebaek area, such as the development of a Seohak complex resort and the construction of a natural history museum in Dongjeom-dong, and to maximize the topographical advantage of the plateau [40]. However, Taebaek city's policy to revitalize abandoned mine areas fundamentally has the following problems. Taebaek city used a coal mine city called "Yubari" in Hokkaido, Japan, as an advanced model for revitalizing abandoned mine areas [41]. However, Yubarishi's finances collapsed and he had to pay back 26 billion won per year. The cause of Yubari's failure was top-down development that did not reflect the will of the local residents [42]. Currently, the regional development of Taebaek-si is on a similar path, and the sense of alienation among local residents is increasing. Although coal-mining villages still retain their old appearance, the historical significance of coal-mining villages has been ignored and treated as an obstacle to the development of Taebaek city [37].

3. Case Study and Analysis of Abandoned Mine Areas

3.1. A Case Study of Urban Regeneration in an Abandoned Mine Area. The coal industry first began decommissioning and restructuring in Western Europe in the course of changes in the global energy structure [43]. Miners' resistance to abandoned mines was fierce, and to solve this problem, urban regeneration projects were implemented as policies to attract alternative industries and revitalize regions were prepared at the government level [44]. As a result, cases of revitalizing the village economy, either designated as a World Heritage Site or successful, began to appear [45]. Taebaek city is the largest coal-mining city in Korea, but it



aims to be a highland tourist city by removing traces of coal-mining villages that remain everywhere, so unilateral top-down development is taking place [39]. For this reason, we tried to find success factors by analyzing overseas success cases.

The successful case site of this study was an abandoned mine area village due to changes in the global energy structure, such as Taebaek city, but it was a place where urban regeneration projects were successfully achieved. It was intended to analyze common success factors by selecting successful cases by revitalizing the city through urban regeneration of old industrial facilities in abandoned mining areas such as Taebaek city. Therefore, we tried to analyze common success factors by selecting successful urban regeneration cases in economic, social, environmental, historical, and cultural categories for old industrial facilities in abandoned mine areas such as Taebaek city.

3.1.1. Economic Urban Regeneration: Eden Project. Cornwall, at the southwestern tip of the United Kingdom, flourished as a kaolin mining area, but as resources dried up, it became one of the UK's most deprived areas, and discussions on regional regeneration were raised [46]. Various environmental performances were held, including education on the natural environment, animal and insect experience, and natural material experience programs, as a project started to establish regional identity and revitalize the local economy [47]. As a result, it has created more than 300 billion won in economic effects in the UK, and about 75% of the workforce has created employment effects for local residents and about 1,700 jobs. It was also named one of the UK's top 50 brands, and by 2008, the local economic stimulus effect was £ 900 million [1]. The results of urban regeneration in the area and the contents of the project are shown in Table 2.

3.1.2. Social Urban Regeneration: Hay-on-Wye Project. As it became an abandoned mine in Central Wales, nearby villages gradually declined, but the villagers directly purchased old castles and warehouses and converted them into used bookstores [48]. In addition, by collecting used books

TABLE 2: Result of urban regeneration for Eden Project in the United Kingdom.

World's Largest Greenhouse (Eden Project)	
	
Urban regeneration results	Contents of urban regeneration project
Botanical garden	- Natural environment, animal experience - Various environmental-themed performances

from all over the world and operating specialized bookstores specialized by period, theme, and age, the entire village was formed as a large city of culture [49]. Every year, the world's largest philosophy and music festival is held with the voluntary progress and participation of the villagers, and more than 500,000 tourists visit each year [50]. The results of urban regeneration in the area and the contents of the project are shown in Table 3.

3.1.3. Environmental Urban Regeneration: Regeneration of Zollverein Coal Mine City. Germany's Zollverein area was Germany's largest coal mine, but when the coal and steel industries became declining industries, it gradually declined, and even the general public was abandoned and became dead land [51]. However, the German state government has set up a regeneration policy to preserve industrial areas, restoring destroyed cities and restoring ruined industrial facilities and cities. Educational facilities, rest, and cultural spaces were created in the Zollverein Coal Mine area to revitalize the local economy with lodging and restaurant businesses for visitors [52].

Along with the Zollverein Coal Mine, Krupp Park, where the coke factory is located, is also meaningful [53]. Krupp Park's old gray building has been transformed into a museum and design campus centered on industrial heritage, art, history, and design, and restaurants, performance halls, and craft workshops by full-time artists are popular with 1.5 million visitors a year. It is also the key to the Essenian and Essen city urban strategies to establish itself as the best cultural and green city in Europe [54].

Essen city also carried out waterfront maintenance projects at the same time as urban regeneration using industrial resources [51]. Since Essen city secured waterfront space through the regeneration of the Emscher River, where the Zollverein abandoned mine was located, citizens have become more active in moving through waterfront roads and play a decisive role in revitalizing the city [55]. Essen city built a vast network of bicycle lanes that can penetrate the north-south and east-west regions to clean up the city center and restore citizens' health by reducing the use of cars

without stopping here. To this end, the Radschnellweg Road was expanded to 100 km, which was completed in 2020. The bike-only highway was built on a closed train rail, and the first 5 km section passes through the city center of Essen, serving as the backbone of a sustainable transportation system [56]. To facilitate this, Germany's largest shared bicycle system, Metropolradruhr, is currently operating with 3,000 bicycles in 10 cities, including 52 rental locations [46]. The results of urban regeneration in the area and the contents of the project are shown in Table 4.

3.1.4. Environmental Urban Regeneration: Urban Regeneration in Bilbao Area. Due to the decline of the shipbuilding and steel industry, Bilbao, a ruined small and medium-sized Spanish city with 25% unemployment and various crimes, recognized this seriousness and regenerated the city. Bilbao city moved the old port near the city center to the outskirts; invested 1 trillion won around the river to create trails, bicycle paths, parks, and cultural facilities; and hosted art exhibitions and cultural performances by attracting the Guggenheim Museum to Bilbao city [34]. As a result, Bilbao was visited by more than 1 million tourists every year, achieving an economic effect of KRW 200 trillion as of 2007, resulting in the term Bilbao Effect.

However, Bilbao city's success is not simply due to the Guggenheim Museum, but also because the state has been strategizing and implementing local culture for a long time. The core of this strategy is that it thoroughly protects its tradition, local culture, and residential areas and induces balanced development according to local characteristics. More than 160 villages were actively supported and encouraged by the government to maintain as many local cultures as possible rather than development [66]. The results of urban regeneration in the area and the contents of the project are shown in Table 5.

3.1.5. Historical and Cultural Urban Regeneration: Wieliczka Salt Mine. Salt mines, Poland's most important source of income, were discontinued in the 2000s as their meaning as salt mines declined [57]. However, it succeeded in making it

TABLE 3: Result of urban regeneration for Hay-on-Wye Project in the United Kingdom.



The World's Book Village (Hay-on-Wye)	
	
Urban regeneration results	Contents of Urban Regeneration Project
Used book village	- Collect and sell used books around the world - World's largest philosophy and music festival held annually

TABLE 4: Result of abandoned mine area urban regeneration in Zollverein Coal Mine, Germany.





Culture and Art Park (Zollverein Coal Mine)	
	
Urban regeneration results	Contents of Urban Regeneration Project
Cultural and artistic complex	- Transforming into a complex cultural complex - Revitalizing the regional economy, such as lodging and restaurant businesses

TABLE 5: Result of urban regeneration in Bilbao Guggenheim Museum.

Bilbao Guggenheim Museum	
	
Urban regeneration results	Contents of Urban Regeneration Project
Cultural and artistic complex	- Establishment of representative buildings and readjustment of port cities - Transforming into a city of culture and art

a tourism resource while preserving the unique mining culture of underground squares and underground chapels left by workers in the past [58]. In general, it is common to display minerals and mining equipment in abandoned mines, but it is characterized by numerous legendary statues and figures related to salt mines, and even a chapel as wide as a regular church [59]. Inside, artworks and sculptures made by carving rock salt are preserved as they are. As a result, the economic effect was designated as a World Heritage Site for the first time by the UNESCO, with 1.5 million people annually [60]. The results of urban regeneration in the area and the contents of the project are shown in Table 6.

3.1.6. Historical and Cultural Urban Regeneration: Calico Mine City Regeneration. The Calico Silver Mine, located in California, the USA, used to mine large amounts of silver, but it was an abandoned village called a “ghost town” for nearly 50 years after it declined along with the silver mine abandoned [61]. As the state government stepped up to regenerate the city, it was reborn as a local cultural tourist destination with a historical value [62]. The reason why modern industrial heritage such as abandoned mines could be made into new values is not just the forgotten heritage of the past, but because the past and present coexist and developed creative cultural contents to experience it [55]. At that time, buildings and mines were preserved as they were so that people could know the culture of the people at that time and experience them at the same time [63]. As a result, it has become a representative attraction in the western United States as a local cultural tourist destination with nostalgia and historical value. The results of urban regeneration in the area and the contents of the project are shown in Table 7.

3.2. Analysis of Successful Urban Regeneration Factors in Abandoned Mine Areas. In the case of abandoned mine areas, it was abandoned and degraded due to changes in energy resources, but it has improved the environment, improved regional characteristics, and adopted and developed new cultural resources [64]. Successful cases can be divided into cultural content creation through the historical preservation of industrial heritage and sustainable cultural content creation [65].

The three examples of cultural content creation through historical preservation include the Zollverein Coal Mine, the Wieliczka Salt Mine, and the Calico Silver Mine. This case is a good example that can give an example of Korean urban development, which promotes development with economic logic. Korean urban development has so far been redeveloped by demolishing old facilities [39]. This development method destroyed the long-standing local culture and traditional structure and did not maintain its identity sufficiently. Rather, in terms of successful cases, cities that preserve history and create culture are designated as world heritage sites and have tremendous economic effects [66]. Also, the other group is the creation of sustainable cultural contents. The group has examples of the Eden Project, Hay-on-Wye, and Bilbao. This case uses bottom-up development

that participated with local residents. The development of cultural contents made it a sustainable culture, and it attracted the local economy and local job creation through differentiation from other regions. Common points could be found through these examples, such as sustainability, culture through preservation, differentiated local culture, and participation of local residents. Through this concept, it was possible to derive successful factors and keywords for urban regeneration in abandoned mine areas. If you look at the successful urban regeneration cases in the abandoned mine areas earlier, there are two main similarities. It can be inferred that the “creation of cultural contents through the preservation of local history” and “creation of sustainable cultural contents with the participation of local residents” were able to succeed with this concept of urban regeneration.

3.3. Implications of Taebaek city That can be Derived from the Successful Factors of Urban Regeneration in Abandoned Mine Areas. The implications of the successful urban regeneration factors in six abandoned mine areas for Taebaek city are as follows: First, the existing abandoned mine resources and the natural environment should be regarded as industrial heritage, and urban regeneration should be attempted using it. Second, it is necessary to change the concept of the city by planning cultural and artistic contents using heritage inside industrial heritage. Third, it is necessary to contribute to revitalizing the local economy by planning cultural contents that can increase visitors from other countries and regions and attracting visitors from outside. Fourth, sustainable cultural contents that can be achieved by participating not only in the administrative departments of local governments but also in local residents should be formed. Currently, Taebaek city has registered coal facilities only as “modern industrial cultural heritage registered cultural properties” without such consideration and has not made any urban regeneration efforts using them [12]. At the same time, Taebaek city’s local governments are currently worried about a decrease in population, hollowing out the city and slumming the city center [10], and have not been able to find a sharp number. Therefore, Taebaek city needs to prepare a future urban regeneration strategy using the implications derived along with the success factors of the previously investigated overseas cases. The analysis of success factors is shown in Table 8.

4. Results of In-Depth Interviews with Stakeholders

In-depth interviews with stakeholders were conducted based on the results of literature reviews on the successful factors of urban regeneration in abandoned mine areas in other countries. This is because the purpose of in-depth research is not only to establish a simple urban regeneration strategy but also to find out whether the established strategy is feasible. To do so, the researcher judged that in-depth interview procedures are needed by recruiting local government officials who make actual urban regeneration policies, including urban regeneration experts and participants.

TABLE 6: Result of urban regeneration in Wieliczka Salt Mine, Poland.



Wieliczka Salt Mine	
	
Urban regeneration results	Contents of Urban Regeneration Project
Cultural and artistic complex	- Conservation of the harsh environment left behind by workers in the past and turning them into tourism resources - Activated as a diverse cultural and artistic space

TABLE 7: Result of urban regeneration in Calico Silver Mine, the United States.



Calico Silver Mine	
	
Urban regeneration results	Contents of Urban Regeneration Project
Historical and cultural complex	- Develop creative content so that past and present coexist and experience

TABLE 8: Analysis of success factors for urban regeneration in Western abandoned mine areas.

Analysis success factors	
Creating cultural contents through preservation of local history	Zollverein Coal Mine, Wieliczka Salt Mine, and Calico Silver Mine
Creating sustainable cultural contents with the participation of local residents	Eden Project, Hay-on-Wye, Bilbao Guggenheim Museum
Urban regeneration keywords	
Sustainable/resident participation/preservation of local culture	

Therefore, this study conducted in-depth interviews with stakeholders. In-depth interviews with stakeholders were conducted with a total of 9 people, including 3 public officials from Taebaek city Hall, 3 local urban development scholars, and 3 local residents, who comprehensively manage the coal plant in Taebaek city.

As mentioned earlier, three public officials in Taebaek city were selected as candidates for the interview to ask whether the realization of urban regeneration strategies according to literature research, local residents, and urban regeneration experts could be implemented in a policy

manner. Three local urban development scholars were set as interview subjects to establish a rational strategy for sustainable urban regeneration. Lastly, since local residents are the subjects of the sustainability of established urban regeneration strategies, their participation is paramount. Therefore, local residents were set as subjects for interviews as actual subjects for the sustainability of urban regeneration.

The study participants were a total of nine in three groups. The interview was not conducted by the group but was conducted in the form of a focus group interview with 4-

6 stakeholders in three groups that were conditional. There are various opinions on the composition of the focus bowl, but it was not appropriate to form a group of at least four to a maximum of 12 people, as it was difficult to give participants a chance to express their opinions evenly during the conversation [67]. The small group of less than 4 had the disadvantage of being able to obtain relatively poor information because the number of participants was small, although there were many opportunities to present ideas to the participants [68]. Therefore, it consists of 4 to 10 people. Therefore, this study conducted interviews with 4 to 6 people at a time to collect a lot of opinions and various pieces of information from a total of 9 stakeholders, especially since public officials are actual policymakers and urban regeneration experts are urban regeneration authorities using industrial heritage.

Specifically, it was asked whether the results derived from literature studies were applicable to Taebaek city, what factors were needed to apply, what problems should be solved first, and where the targets were if collaboration targets were needed for problem solving and development. First of all, detailed factors were questioned by setting two concepts derived from literature reviews, cultural content creation through local history preservation and sustainable cultural content creation through local residents' participation.

The small category corresponding to the detailed factors asked what efforts should be made in terms of social, economic, environmental, historical, and cultural aspects, which are urban regeneration factors, to create sustainable cultural contents with the participation of local residents.

As a result of the in-depth interview, to create sustainable cultural contents through the preservation of history and participation of local residents, first, the need for national and national branding is emphasized, and public officials and urban planning experts expressed the need to form a practical image through hands-on communication.

Second, in terms of economics, it emphasized the need to develop community-tailored stay-type content that allows outsiders to spend a lot of money in Taebaek city. In particular, local residents and Taebaek city officials emphasized the need to develop economically expendable content that can only be done in Taebaek city because tourists are lost to casino facilities located in the "Gohan" area of Gangwon-do.

Third, in terms of the environment, the necessity of developing content that can be harmonized with the co-existence of humans and nature was emphasized. In particular, they expressed the opinion that it is necessary to develop strategies that can implement diversity, stability, independence, and circulation by making local space, function, and lifestyle experienceable.

Fourth, in terms of history and culture, it emphasized the need to develop content that can revive the atmosphere of an urban space that only Taebaek city has. Local government officials and urban development scholars in common say that Taebaek city should actively utilize the unique gloomy atmosphere of the coal mine, and detailed opinions are shown in Table 9.

4.1. Implications for In-Depth Interview with Stakeholders. The implications derived through in-depth interviews with stakeholders on urban regeneration in Taebaek city can be largely divided into three categories.

First, it is necessary to develop sustainable cultural contents using the urban atmosphere that only Taebaek city has. Taebaek city has a "dark" urban atmosphere that other regions do not have [69]. This is an atmosphere that is possible because the abandoned mining village facilities have not been demolished [40]. If coal mines and abandoned mining facilities had been demolished like general urban development in Korea, the current atmosphere would not have remained. Therefore, Taebaek city needs to actively utilize the dreary atmosphere of Taebaek city space as an intangible amenity to urban regeneration.

Second, it is necessary to develop stayable content that can increase the willingness to pay. Taebaek city has to go through the "Gohan" area with casinos and ski resorts due to its geographical location. Therefore, most tourists spend money in "Gohan" and do not come to Taebaek [14]. Therefore, it is necessary to develop content that must be in Taebaek city. The most likely content is leisure sports. Leisure sports content is representative of stay-type content [70]. Leisure sports should be separated from the general city center and with nature, and long-term stays are possible according to personal preferences [71]. Due to its geographical characteristics, Taebaek city has the highest road elevation in Korea [39]. Also, because it is surrounded by mountains, it is possible to enjoy leisure sports in the alpine region that only Taebaek city can do [40]. Therefore, if the area that spends money on entertainment is "Gohan," it is necessary to specialize in the image that Taebaek city can spend money healthily through sports.

Third, it is necessary to develop an experience culture that can be passed down between generations and stay-type content. It is necessary to develop content that can be passed down through generations, not one-time experience culture and stay-type content [72]. In addition, it should be content without gender and class restrictions. Representative examples are experience tourism contents such as culture and art and making local specialties [73]. Through this experience, you should be able to instill a positive memory of Taebaek city. Also, these positive memories should be established as local brands [74], which should serve as an opportunity to revisit Taebaek city through future generations.

5. Urban Regeneration Strategies Using Culture and Leisure Sports

Taebaek city carried out large-scale projects such as Seohak Complex Resort and Natural History Museum under the slogan of "Highland Tourism Leisure Sports City" [40], but it is on the opposite path to the previous seven successful cases [37]. The common features of successful cases include sustainability, cultural preservation, differentiated local culture development, and local residents' participation, and through successful cases, Taebaek city tried to present ways to achieve sustainable urban growth.

TABLE 9: Results of in-depth interview with stakeholders.

Key item	Local government official	Urban development scientist	Local resident
Society	- It is necessary to exchange cultural contents with the metropolitan area, and furthermore, it is necessary to establish a channel to attract tourists between cities (China, Japan, and Southeast Asia) in a specific country	- Taebaek City needs its own local branding - A social community is needed to create a sustainable and attractive local, and a communication system, business structure, and competency development system in the community must be prepared	- Content that can allow new generations to flow into urban areas where most of the elderly population resides is currently needed
Economy	- The budget for urban renewal is sufficient from state subsidies and casinos located in "Gohan" area - Contents that can expect a virtuous cycle of income and consumption and multiplier effectiveness are needed	- It is necessary to induce the city's commercial districts to spend money through the development of stay-type tourism contents - It is necessary to regularize stay-type content and to expand accommodation where you can stay	- Coal mine villages turn into abandoned mine villages and need to develop regional economic food - It is necessary to establish a window to promote local specialties, special products, etc
Environment	- Development of cultural contents using coal fields and abandoned mining villages is necessary - Through MOU with broadcasting stations and performance agencies, it is necessary to increase the utilization to survival venues, drama sets, and concert halls	- Development of leisure sports contents that can utilize geographical characteristics located at a high altitude is necessary - It is necessary to prepare strategies for differentiation from other regions by providing tourists with cost savings for public transportation (train and bus)	- It is necessary to convert to dynamic resources that can earn economic profits by utilizing the resources, not static spaces such as museums and memorials - Specialization as an off-season training ground using the fact that physical training is possible at a high altitude
History and culture	- It is necessary to develop contents that can utilize local resources such as coal museums and coal mines as cultural resources	- The need to plan a performance that can take advantage of the "dark" local atmosphere that Taebaek City has - The need for urban regeneration as a complex cultural space that provides an opportunity for various generations to flow in	- It is necessary to prepare contents that can contribute to urban development by participating directly by local residents - It is necessary to prepare measures to enhance the utilization of local residents by forming historical and cultural tourist attractions, such as fostering guide to abandoned mining villages

5.1. Revitalization of Taebaek City as a Cultural City. For the continuous development of Taebaek city, regional cultural development must be activated, and policies that residents voluntarily and subject themselves must be implemented [75]. In order to create a culture that is differentiated and characterized from other regions, it is necessary to discover the amenity of the local image representing the region [76]. Amenity began to be used in rural development planning in Western Europe in the 1990s [77]. Amenity resources are used as tourism resources for wild animals and plants, rural landscapes, historical monuments, cultural traditions, and food in rural areas [78]. Taebaek city has set the coal that has made Taebaek city exist so far as an amenity [40]. However, the current image of coal is negative and stigmatized as the main cause of environmental pollution. And due to the importance of the environment and the development of resources, Taebaek city, which was a coal city, is stagnating with a negative image [79]. Therefore, this study attempted to solve local problems by sublimating the negative elements of coal in a positive direction and to pursue the direction of a cultural leisure sports city by utilizing the amenity of

Taebaek Bay. The cultural city aims for amenity, which integrates aesthetics, the environment, and culture and aims to make local cultural contents a sustainable driver of regional development as a city rich in local cultural and artistic resources [51, 53]. Above all, efforts to revitalize the city are required by building an urban identity, improving the quality of life of residents, and enhancing the image of the city [79]. Cultural cities have the meanings and directions of the contents of Table 10.

Currently, Taebaek city has the basic conditions of a cultural city as abovementioned, and this study selected the abandoned coal-mine village as Taebaek Bay Amenity. Representative ways to use the abandoned coal-mine village as a cultural resource are the creation of the Taebaek EDM Festival and Cheoram Music and Lighting Walking Road. Taebaek EDM Festival can provide sufficient resources for the direction that cultural cities want to pursue. First, the Taebaek EDM Festival is a means of forming a creative production city. The EDM Festival is a world-wide enthusiastic music [80]. Since the 2030 generation accounts for the majority [81] and the overseas enthusiasts are thickly formed

TABLE 10: Meaning and direction of culture city.

City of creative production	City where one wants to live	City of communication and cooperation
<ul style="list-style-type: none"> - A cultural city is a city that can secure artistry, aesthetics, economic feasibility, etc - One source multiuse strategy - Attracting creative enterprises to revitalize the local economy 	<ul style="list-style-type: none"> - Improving the welfare and quality of life of residents by establishing urban infrastructure and public facilities - The pursuit of a city where residents can develop their own efforts and pride 	<ul style="list-style-type: none"> - The whole city is formed into a community - Residents' self-participation and autonomy are recognized as basic concepts
Urban vitality + promotion of balanced regional development + improvement of urban landscape and cultural environment Improving the quality of life of residents		

[82], it is possible to attract various ages and multinational tourists to Taebaek city. The most important thing here is the atmosphere of the coal-mining village [14]. One similar case to Taebaek city is the Melt Festival in Germany [83]. The Melt Festival in Germany is an electronic music festival held in Ferropolis, called the Iron City, that preserves coal-mining facilities as cultural facilities and uses them as a stage [84]. The festival is used as a venue for festivals involving teams of various genres, from electric DJs to indie rock bands. Taebaek city, under similar conditions, can attract music festivals and achieve urban regeneration through the influx of various populations by utilizing the coal mine facilities owned by Taebaek city.

The old coal mine, Golpa-Nord in Ferropolis, was an industrial center until it was closed in 1991 [85]. Today, the Central Peninsula, a lake, and five giant excavators simultaneously form museums, monuments, and modern venues. As a sustainable use of the old coal mine Golpa-Nord, the hosting of the Melt Festival has become a venue for festivals involving teams of various genres, from world-famous electronic DJs to indie rock bands, and has become an annual attraction for EDM enthusiasts around the world [86]. The Melt Festival is a role model for Taebaek city, which is in a similar situation in that it is a sample of hardware recycling and software development. Table 11 shows similar situations between Taebaek city and Ferropolis.

Second, Taebaek EDM Festival and Cheoram Music and Lightning Road can be a means of forming a city to live in. The regular hosting of the Taebaek EDM Festival is an opportunity for a new population inflow, which can revitalize abandoned mine cities. Currently, Taebaek city's population is 40,488 as of February 2022 [85], and the number of people is plummeting over the years, raising concerns over the future urban hollowing out. Therefore, it is necessary to prepare more population inflow measures, especially for the influx of young people [86]. Therefore, the regular attraction of the Taebaek EDM Festival will enable the introduction of new cultural contents and the influx of new young people.

Ferropolis, where the Melt Festival is held, is located in Gräfenhainichen, Germany. Similar to Taebaek city, Gräfenhainichen also closed the mine, leaving the city with a majority of the population. However, on December 14, 1995, the Minister of Finance of Saxony-Anhalt launched an urban regeneration project, and one of the many renewable contents is the Melt Festival. As a result, Gräfenhainichen attracted EDM enthusiasts from around the world every



year, and the old coal mine, Golpa-Nord, where the event was eventually held, was designated as a European industrial heritage in December 2005. Therefore, if the EDM Festival is successfully attracted by actively utilizing the Sunanjang, the industrial heritage of Taebaek city, it will be able to revitalize the city using cultural contents by attracting EDM enthusiasts at home and abroad.

In addition, in Cheoram-dong, one of the coal-mining villages in Taebaek city, the commuting routes of miners when coal-mining was active are still preserved. Therefore, it is possible to create a music and lighting working road for the Cheoram section using this. On the Music and Lightning Walking Road, it is possible to form an image through 3D light along with music by storytelling the commuting path of miners in the Cheoram section, which will create a synergy effect with the Taebaek EDM Festival. Most importantly, the influx of the population through the introduction of such cultural contents enables the expansion of social overhead capital [87].

Third, attracting cultural contents such as the Taebaek EDM Festival and Cheoram Music and Lightning Walking Road enables the formation of a city of communication and cooperation [76]. By holding regular cultural events (regularization), there is a function of enhancing the awareness of existing local residents to participate in local events along with the influx of new populations [88]. Currently, Taebaek city has no new events to revitalize the city since it was abandoned [10]. This causes local residents to decrease their awareness of participation in community events [89]. Therefore, cultural contents such as Taebaek EDM Festival and Cheoram Music and Lightning Walking Road can be alternatives in situations where new engines are needed to induce awareness of community participation [90].

However, there are also two negative aspects. First, the current age group of Taebaek city residents is 45.8% of the total population in their 50s and late 60s as of July 2021 [85]. On the other hand, the EDM Festival and Cheoram Music and Lightning Walking Road are relatively preferred contents by the younger generation. In the end, to induce voluntary participation of local residents in revitalizing cultural content, local governments need to make efforts to reduce cultural gaps resulting from age differences. Second, if a large number of people visit, it is a question of whether there are enough accommodations or restaurants to accommodate them. The average number of participating visitors to the Melt Festival reaches 10,000, and local governments in Germany ask local residents for active

TABLE 11: Urban regeneration strategies for Taebaek city as a cultural city.

Taebaek City EDM Festival and Melt Festival	
	
Taebaek city	Ferropolis

cooperation to accommodate them during the event. However, Taebaek city currently has about 45 lodging establishments and 104 restaurants in operation, and local residents lack experience in hosting large-scale events and responding to explosive demand for accommodation and food. Currently, it is difficult to attract many visitors due to the number of lodging and food businesses owned by Taebaek city, and if the problem of accommodation and infrastructure in the region is not resolved, it will be difficult to attract additional large-scale cultural events. Therefore, Taebaek city needs to hold small concerts in addition to mega-event events such as the EDM Festival or try to narrow the cultural gap between the elderly and the younger generation in the region by developing cultural education contents for the elderly. At the same time, efforts to expand infrastructure to solve accommodation and accommodation for participants in large cultural events are also needed.

5.2. Revitalization of Taebaek City as a Leisure Sports City.



Taebaek city is located at Taebaeksan Mountain (1,567 m above sea level), and the entire city is surrounded by beautiful sceneries such as Maebong Mountain, Cheonuibong Peak, Baekbyeong Mountain, Hambaek Mountain, and Geumdaebong Peak. In addition, it is a city located in the highest area in Korea with an average road elevation of 704 m, an altitude of 900 m above sea level in the state, a regional average of 965 m, and a mountain peak average of 1,255 m [85]. Such geographical conditions show that Taebaek city is in the middle of a high mountain, unlike ordinary cities, so it is difficult to attract many tourists unless there is a new cultural content [39]. However, if we change our minds and introduce the concept of a leisure sports city, these geographical conditions can be a new resource [71]. The aforementioned case of Essen's Radschnellweg Road provides an opportunity to see the possibility of Taebaek city as a leisure sports city. The Radschnellweg Road is a bicycle-only highway and is the result of the establishment of a bicycle-only lane network that can clean the city center and restore citizens' health at the same time [91].

Taebaek city also needs to open a bicycle lane around Taebaek city, such as Radschnellweg Road, to open it to

citizens. The representative leisure sports content in Korean society is the road cycle, and there are currently about 1,200 road cycle clubs alone [92]. In addition, there are about 50 amateur road cycling competitions alone [93], and Tour de Korea Special competitions are held regularly. The Tour de Korea competition is a world road cycling competition, including Elite competition with professional athletes and Special competition with amateur athletes [94]. For bicycle lovers, the Tour de Korea Special has become a dream competition because even amateur athletes can ride the Elite competition course [94]. Taebaek city needs to open a bicycle-only road to host various road cycling competitions, including the Tour de Korea competition, for two reasons.

First, this is because the economic benefits of the community through the expenses spent preparing for the bicycle competition are significant. Bicycle competitions are not held overnight, but they are events that require a considerable period of preparation [93]. In addition, accommodation, food, and leisure expenses spent by participants and officials in Taebaek city to explore the course where the competition is held in advance are significant [94]. According to the Korea Sports Promotion Foundation's report on the effectiveness of the Tour de Korea Special Competition, the production ripple effect is 2,000,660,747 won, the value-added ripple effect is 708,377,816 won, and the employment ripple effect is 15.5 people [95]. Not all the profits from hosting the competition flow into the community [94]. However, a significant amount will have a positive effect on the community economy, which can have a positive effect on urban regeneration through economic effects [96]. Second, bicycle competitions that pass through coal-mining villages in Taebaek city can induce residents' participation in social aspects of urban regeneration and can help strengthen urban competitiveness through place marketing [97]. Among the various road cycling competitions held in Korea, there is no bicycle competition that penetrates the coal-mine village. In addition, coal, the symbol of coal-mining villages, is the main cause of air and water pollution [52]. However, if the bicycle competition, a representative low-carbon means of transportation, is held in the main cause of environmental pollution, it will have a positive effect on the change to a clean city image.

TABLE 12: Urban regeneration strategies for Taebaek city as a leisure and sports city.

Taebaek City Color Run	
	
Color course using coal-mining furnace	Color Run

One of the leisure sports contents using Taebaek Coal Mine Village is the hosting of the Taebaek O2 Color Run. The Color Run, which is widely held around the world, is held at Taebaek Coal Mine Village. Color Run is currently being implemented worldwide and is a global festival of the concept of FUN RUN using color powder [98]. It is the world's largest global festival content as a single event, with more than 5 million participants from more than 35 countries around the world. Color Run is a representative leisure sports festival where you can walk about 5 km and enjoy the scenery and atmosphere of the region through various sections such as the red zone, blue zone, yellow zone, and green zone while running [99].

The picture on the left of Table 12 is a coal-mine village located in Sodo-dong in Taebaek City, and the length of the Sodo Coal Mine is about 6 km, so it has a suitable distance to hold the Color Run. There are no restrictions on the participating classes of Color Run [98]. However, most of the participants are young in their 10s and 30s, mainly because of the large number of participants in the family unit, which is positive for attracting local visitors [100]. Unlike the bicycle competition, Color Run, which runs next to the coal mine, has the characteristic of observing the lives of local residents directly from the side and enjoying leisure sports while viewing the old coal-mine village as a cultural heritage. In other words, in terms of history and culture, which are important parts of urban regeneration, outside visitors can rediscover the value of local life and culture [101–111], and local residents can feel proud of their residential areas [75]. In addition, urban marketing using leisure sports can promote Taebaek city's unique cultural differences internally and externally [72] and contribute to revitalizing Taebaek city's local economy through participation, job creation, and population inflow [87, 97].

On the other hand, there are obstacles to attracting this. It is the problem of expanding infrastructure. This also includes the problem of expanding the accommodation and food infrastructure, which is the problem mentioned in the first "Taebaek city Revitalization Plan as a Cultural City". However, a bigger problem is the expansion of safety facilities. In the case of road cycles running at high altitude, driving safety accidents frequently occur [11]. In general, for

road cycle driving, there must be no obstacles, such as a barrier installed for safety on the road [112]. Since roads are used by cars, it is necessary to prepare measures for safety accidents. In order to solve these safety problems and increase the number of visitors to road bicycle driving at the same time, it is necessary to expand some sections of general roads to create bicycle lanes. The Radschnellweg Road introduced earlier is a bicycle-only road, so it is impossible to enter at the discretion and there are no obstacles on the road [91]. On the other hand, Taebaek city is located in the highlands, so it is difficult to open a separate bicycle-only road. Therefore, considering the characteristics of road bicycle driving, such as uphill, downhill, and straight roads, it is necessary to expand the general road to suit the characteristics of road bicycle driving and course it to induce continuous visits by road bicycle lovers.

6. Conclusion

Due to the change in the energy paradigm, coal has remained an outdated relic, and coal-mining cities in Korea have been neglected. Therefore, this study investigated and analyzed the cases of other countries that have experienced these problems before Korea. Through the successful cases of urban regeneration in seven coal mine cities, it was possible to present problems and solutions to the current coal mine development policy in Korea. The characteristics of countries that successfully carried out coal-mining town urban regeneration projects largely revealed that differentiated regional identity strategies through "creation of cultural contents through the preservation of local history" and "creation of cultural contents involving local residents" were the main success factors for continuous urban regeneration.

Urban development, which has only pursued economic feasibility, has caused urban decline [74], and to overcome this, it is necessary to break away from physical urban development to find and utilize the cultural value of the city's unique resources. To this end, it is necessary to develop the local culture of the city [51] and to propose a strategy for regeneration into a sustainable city by utilizing the abandoned mining village environment in Taebaek city and the natural environment used as the

background. As for a specific plan, first, it is a plan to utilize Taebaek city as a cultural city. It is a plan to revitalize the region by fostering the culture and arts industry and giving aesthetics to the city by opening the EDM Festival and creating Cheoram Music and Lightning Road by utilizing the coal mine that remains intact as an amenity resource. Second, it is to hold a bicycle competition and a color run by utilizing the coal-mine village along with the natural environment of Taebaek city located in the mountains. Through this, it will be possible to attract overseas visitors and to achieve the influx of the younger generation into the community. In conclusion, Taebaek city's amenity can be reborn as Taebaek city as a culture and leisure city if it can continue to attract the inflow of external population by utilizing local resources such as coal yard facilities, city's natural environment, and coal-mining villages.

On the other hand, two major limitations of this study can be mentioned. First, the strategy presented in this study is a strategy specialized in the Korean situation because it is derived based on specific urban regeneration cases in countries other than Korea. Urban regeneration must consider various factors such as society, culture, population, and infrastructure, but the situation in other countries and Korea is different. Therefore, it may be difficult to apply the results of this study in countries other than Korea. Second, this research strategy is difficult to generalize the strategy from the perspective of urban regeneration using industrial heritage, which is an abandoned facility. Waste mining facilities are huge hardware, and urban regeneration using industrial heritage means urban regeneration centered on the hardware. Therefore, it is bound to be different from general urban regeneration. Instead, in the abandoned mine city, which is in a similar situation to Taebaek city, it is judged that meaningful results can be produced if the results of this study are partially used.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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