Conservation Key points and management strategies of historic villages: 10 cases in the Guangzhou and Foshan Area, Guangdong Province, China

Yi Huang*, Erwei Li† and Dawei Xiao‡

*School of Architecture, State Key Laboratory of Subtropical Building Science, South China University of Technology, Guangzhou, Guangdong Province, China; †Gemdale Group Co., Ltd, Guangzhou, Guangdong Province, China

ABSTRACT
Historic villages form a nonrenewable part of our cultural heritage that is being affected by changes in modern production methods and lifestyles. Historic villages require various conservation measures, and their performance requires post-planning evaluation. An evaluation system and its criteria for the conservation of historic villages has been established, and 10 historic villages in the Guangzhou and Foshan Area, Guangdong Province, China, have been used as examples to quantify the performance of their heritage conservation. Furthermore, the evaluation results are compared with the conservation measures to determine key points and strategies that facilitate improvement of conservation performance and to provide a technical reference for future conservation work.

1. Introduction

With the progress of globalization, urbanization, and industrialization, human civilization has undergone tremendous changes in production methods and lifestyles. The traditional culture represented by historic villages has been deeply affected by this wave of change (Zhang, Xiao, and Zhou 2015). Historic villages comprise a part of our cultural heritage and are precious and non-renewable resources (Zhao, Zhang, and Li 2006). Historic villages that reflect the context of historical culture and social development are true portrayals of traditional culture, folk customs, and architectural arts in various places. The international community has issued a series of charters concerning the conservation of historic small towns and ancient villages and has formulated corresponding theories, principles, and methods of conservation (Zhao, Zhang, and Zhang 2005).

Traditional houses are at risk of demolition and may vanish due to zoning stress, changing lifestyles, and a lack of legal protection (Bilgin 2019; Gil-Mastalerczyk, Gil, and Modrzewski 2017; Jackson-Stepowski 2015). To save traditional villages and traditional buildings, scholars from various countries have conducted a number of investigations of the characteristics of traditional buildings (Maligari and Corniello 2016), analyses of village value characteristics (Zhang 2015; Wang 2015; Alshehri 2018), simulations of physical environments (Tang, Nikolopoulou, and Zhang 2014; Tang et al. 2012), and conservation methods, mechanisms, and case studies (Shi and Liu 2015a, 2015b; Ahunbay et al. 2014; Campolo 2014; Mitchell and Randle 2014).

For example, to determine the function of these buildings in a completely new cultural and spatial context, a study of the characteristic features and ways of traditional 19th-century wooden architecture was undertaken in southeastern Poland (Gajdek 2019). An information and communication technologies method was applied to evaluate the conservation status of wooden still-houses in Caneiras, Portugal, to highlight preservation and enhancement strategies (Virtudes and Almeida 2016).

Turkish researchers have carried out detailed investigations of local traditional villages to study the causes of building decay and conservation issues, and recommendations have been made for survival and conservation of traditional houses and urban patterns (Bilgin 2019). Many rural buildings in China have been abandoned due to rapid urbanization. The number of historic villages is huge, but many villages are in endangered conditions, and their conservation is urgent (Ling 2018; Long et al. 2018; Liang and Wang 2013).

The inheritance and development of an intangible cultural heritage are important aspects of the conservation of historic villages, including the revival of traditional industries such as folk festivals and handicrafts. The festival memory of grassroots villagers was self-constructed and came mostly from traditional festival landscape elements, whereas top-down interventions in the festival landscape constructed an official memory for citizens and migrants that differs from that of the villagers (Chen and Tao 2017). Traditional crafts should be incorporated into local economic
development strategies and the promotion of e-commerce and tourism (Fois et al. 2019).

A few studies have addressed the evaluation of historic village conservation, including environmental characteristics and satisfaction evaluation (Jia et al. 2017). Luo found a lack of implementation details in the three phases of investment funds and insufficient attention to the needs of residents in China (Yubin 2017). Radzuan assessed the communities’ views of the implementation of tangible and intangible heritage conservation programs and the effect of the implementation of an incentives policy in Malaysia (Radzuan and Ahmad 2017).

In China, many studies over the past 10 years have sought to evaluate the conservation of historic villages. The focus of evaluation has shifted from value evaluation for the selection of various types of historic villages by the government, or for the purpose of making conservation plans (Zhao, Zhang, and Li 2006; Zhao, Zhang, and Lu 2008; Zhou, Huang, and Wang 2011), to performance evaluation of post-planning (Yang and Liu 2017; Li et al. 2018; Yang et al. 2018). The evaluation factors have also shifted from the evaluation status of tangible or intangible cultural heritage conservation (Shao and Fu 2012) to a multifactorial evaluation of heritage conservation, implementation control, and socioeconomic development status (Huang and Xiao 2018).

As a result, most studies of the conservation of historic villages have discussed measures from the perspective of individual cases. In recent years, evaluations of conservation measures have also emerged, and the actual effects of historic village conservation have been reported. However, evaluations of the conservation performance of historic villages rarely pay attention to the correlation between various conservation performance evaluation levels and various measures. This paper establishes an evaluation system and criteria, evaluates 10 villages with various conservation performance levels selected from the Guangzhou and Foshan Area, Guangdong Province, China, analyzes the relationship between their conservation measures and performance, and summarizes the optimal conservation measures.

2. Methods

2.1. Evaluation system

The performance evaluation system of historic village conservation using the big data analysis method of expert thesis text is used (Huang and Xiao 2018). The data source in this study is the literature on the relevant aspects of the development of traditional villages authored by experts in all professional fields in China. To download and analyse this expert data, the self-developed Built Environment Evaluation Big Data Analysis System (soft registration number 2018SR1047116 in China) and Built Environment Evaluation Big Data Analysis Background Acquisition System (soft registration number 2018SR1047128 in China) were adopted. The data were downloaded through the Tansi Thinktank website (http://tsktk.arch.scut.edu.cn/) developed by the research group. The system uses keyword retrieval and automatically downloads documents from the China National Knowledge Infrastructure according to the input keywords; it then extracts the titles of these documents and performs word segmentation. To eliminate titles with low relevance, the vocabulary data are cleaned and de-noised using intelligent semantic analysis. Then, the term frequency–inverse document frequency (TF-IDF) method is used to further process synonyms. Finally, vocabulary entries deemed invalid are excluded to obtain the effective vocabulary entries and their frequency of occurrence.

For the present analysis, the keyword “historic village conservation” was queried on 8 January 2019. The resulting search of the full text of the literature published in all academic fields yielded 11,870 related papers. Word segmentation of the titles of these papers, extracted by the software, yielded 32,523 words. After excluding words occurring less than 1% and those with low relevance, 81 words remained. Further, 37 common words, such as ‘region’, ‘city’, ‘stratage’, ‘design’, ‘mode’, ‘conservation’ and ‘village’, were excluded. The final 36 words were classified based on the reference literature and the evaluators’ subjective experience; for example, “ecology” and “environment” were placed in the “environment” category.

The first-, second- and third-level factors are denoted by k, i and p, respectively, and the sequence, word frequency and priority of the etymology are denoted by j, N and T, respectively. That is, Ni represents the word frequency of i in the total number of documents. The frequency of a second-level evaluation factor is calculated as the sum of the frequencies of all related words (Formula 1). The priority of an evaluation factor is determined as the ratio of the frequency of a second-level factor to the sum total frequency of all factors at that level (Formula 2). The priority of third-level factors is calculated similarly (Formula 4). Accordingly, the priority of a first-level factor is obtained as the sum total of the priorities of the encompassed second-level factors (Formula 3). Table 1 presents the resulting evaluation system.

\[
Ni = \sum_{i=0}^{n} N_{ij} \quad \text{Formula1}
\]

\[
T_i = Ni / \sum_{i=0}^{n} N_{ij} \quad \text{Formula2}
\]
Table 1: Performance evaluation system for heritage conservation of historic villages.

| First-level factor | Second-level factor | Third-level factor |
|--------------------|---------------------|--------------------|
| Factor             | Priority(Tk)        | Factor             | Priority(Ti) | Factor                  | priority(Tp) |
| A Heritage conservation | 1.000               | B1 Environment     | 0.184       | C1 Environmental coordination | 0.062 |
|                    |                      | B2 Planning        | 0.339       | C2 Ecological integrity    | 0.124 |
|                    |                      | B3 Building        | 0.265       | C3 Pattern integrity      | 0.091 |
|                    |                      |                    |             | C4 Landscape richness      | 0.129 |
|                    |                      |                    |             | C5 Planning authenticity  | 0.093 |
|                    |                      |                    |             | C6 Building coordination  | 0.026 |
|                    |                      |                    |             | C7 Building scale ratio    | 0.079 |
|                    |                      |                    |             | C8 Architectural richness | 0.036 |
|                    |                      |                    |             | C9 Building integrity     | 0.079 |
|                    |                      |                    |             | C10 Architectural authenticity | 0.072 |
|                    |                      |                    |             | C11 Intangible richness   | 0.141 |
|                    |                      |                    |             | C12 Intangible continuity  | 0.048 |
|                    |                      |                    |             | C13 Intangible participation | 0.024 |

\[
Tk = \sum_{k=0}^{n} Nkj
\]

Formula 3

\[
Tp = Np/ \sum_{i=0}^{n} Npj
\]

Formula 4

Then the evaluation system can be got (Table 1).

2.2. Evaluation criteria

Table 2 lists the meaning and data sources for the evaluation factors of historic village conservation. They are adjusted with a combination of the Chinese historical and cultural towns (villages) evaluation index system and the traditional village evaluation index system, both of which are promulgated by China’s Ministry of Housing and Urban-Rural Development. Each third-level factor is evaluated. Each factor is divided into 10 points, and the number or quality is divided into five grades – Excellent, Good, Medium, Worse, and Poor, respectively – corresponding to scores of 9–10, 7–8, 5–6, 3–4, and 0–2.

2.3. Case study of 10 villages

Guangzhou and Foshan are located in southern China, have tropical and subtropical ocean monsoon climates, and are rainy all year. Their natural ecological conditions are favorable. They are located along a river in the plain area and have developed foreign trade. As a result, the buildings have incorporated foreign architectural decorative elements to form a unique style.

The application reports of historical and cultural villages in the 16 jurisdictions of the area were analyzed, and field surveys of representative villages were conducted. Ten national-level historic villages, with three levels of performance conditions (good, medium, and poor), were selected for classification and quantitative evaluation. Each has a long history and cultural tradition and a similar morphological profile. Table 3 lists the basic data of the 10 villages, and Figure 1 shows representative photos. In recent decades, due to differences in conservation strategies and methods adopted, the status quo of conservation performance has varied.

3. Results

Figure 2 shows that Langtou and Daqitou do the best in terms of heritage conservation and that Xiaozhou and Bijiang have the lowest comprehensive scores.

3.1. Environment

Figure 3 shows the 10 villages’ evaluation scores for environmental factors. Daqitou, Liantang, Qiangang, and Langtou had the highest scores, and Bijiang and Huangpu had the lowest scores.

Because Daqitou, Liantang, Qiangang, and Langtou are located in relatively remote areas, the surrounding natural environment has not been greatly damaged, so they have retained a high degree of ecological and environmental integrity. The development of these four villages has also been less affected by industrialization and shows a greater degree of harmony with the natural environment. Daling, Shawanbei, Xiaozhou, and Songtang are in the suburbs, so they have been greatly affected by industrial development and the natural environment has undergone partial damage. Because of the earlier economic development and the restriction of residential land, the internal structures of many houses and villages have been changed. The worst is Bijiang, which has convenient transportation and whose main economic activity is secondary industry. Many factories are located around the village, and the traditional texture has degenerated.

3.2. Planning

Figure 4 shows the 10 villages’ evaluation scores for planning factors. Langtou, Qiangang, and Daqitou had the highest scores, whereas Shawanbei, Xiaozhou, Huangpu, and Bijiang had the lowest scores. The core areas of Daqitou, Langtou, and Qiangang are relatively
Table 2. Meaning and data sources of evaluation factors of historic village conservation.

| Evaluation factor | Evaluation indicator | Meaning                                                                 | Data source |
|-------------------|----------------------|------------------------------------------------------------------------|-------------|
| **B1 Environment** | C1 Environmental coordinate investigation of the natural environment and the status of the environment in planning | Closeness of villages harmoniously coexisting with the surrounding beautiful natural landscape environment | Field       |
| **C2 Ecological integrity** | C2 Ecological integrity | Completeness of ecological environment conservation around the village | Field survey of street and lane pattern integrity |
| **B2 Planning** | C3 Pattern integrity | Degree of conservation of traditional street-lane patterns in the village | Village planning site selection, environment creation in village planning documents |
| **B3 Building** | C4 Landscape richness | Number of types of existing historical environmental elements (such as ancient river channels, city gates, docks, pavilions, ancient trees, etc.) | Field research on the number of existing building functions in village |
| **B3 Building** | C5 Planning authenticity | The scientific, cultural, and historical value reflected in the site selection, planning, and construction of villages | Field survey of the existing traditional buildings and architectural details in the core area of the village and the original appearance of the surrounding environment |
| **B3 Building** | C6 Building coordination | Coordination between new village and town buildings and the original village and town pattern | Area of traditional buildings as percentage of total area of village |
| **B3 Building** | C7 Building scale ratio | The proportion of the floor space of traditional buildings relative to the total area of construction land in the village | Field research on building shape, structure, materials, and decoration |
| **B3 Building** | C8 Architectural richness | Number of building functions, such as defense, residence, and shrine | Field survey of the existing traditional buildings and architectural details in the core area of the village and the original appearance of the surrounding environment |
| **B3 Building** | C9 Building integrity | Aesthetic value of existing traditional buildings in terms of building structure, modeling, and decorative materials |         |
| **B3 Building** | C10 Architectural authenticity | Existing traditional buildings in the core area, their architectural details, and preservation of the surrounding environment |         |

(Continued)
Table 2. (Continued).

| Evaluation factor | Evaluation indicator | Meaning                                                                 | Data source                                                                 |
|-------------------|----------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------------|
| B4                | C11 Intangible richness | Number of types of intangible cultural heritage                          | Number of intangible cultural elements in the application                  |
|                   | C12 Intangible continuity | Status of residents continuing traditional customs in village          | Field survey of villagers’ production lifestyle and dress                  |
|                   | C13 Intangible participation | Inheritance scale                                                    | Number of participants in intangible cultural activities in the government work report |

Table 3. Basic data of the 10 villages.

| Number | Village name | Location | Address | Group number | Village formation age | Village area (km²) | Household population |
|--------|--------------|----------|---------|--------------|-----------------------|--------------------|----------------------|
| a      | Daling       | Guangzhou| Shilou Town, Panyu District | 1 | Before Yuan Dynasty | 3.74 | 2432 |
| b      | Shawanbei    | Guangzhou| Shawan Town, Panyu District | 2 | Before Yuan Dynasty | 1.90 | 1784 |
| c      | Langtou      | Guangzhou| Tanbu Town, Huadu District | 2 | Before Yuan Dynasty | 6.25 | 2400 |
| d      | Xiaozhou     | Guangzhou| Huazhou Street, Haizhu District | 2 | Before Yuan Dynasty | 4.50 | 6383 |
| e      | Qiangang     | Guangzhou| Taiping Town, Conghua District | 3 | Ming Dynasty | 387.8 | 2177 |
| f      | Huangpu      | Guangzhou| Pazhou Street, Haizhu District | 2 | Before Yuan Dynasty | 1.50 | 3582 |
| g      | Liantang     | Guangzhou| Jiujiang Town, Luogang District | 2 | Before Yuan Dynasty | 6.51 | 2461 |
| h      | Daqitou      | Foshan   | Leping Town, Sanshui District | 1 | Ming Dynasty | 1.27 | 1690 |
| i      | Songtang     | Foshan   | Xiqiao Town, Nanhai District | 1 | Before Yuan Dynasty | 0.11 | 1620 |
| j      | Bijiang      | Foshan   | Beijiao Town, Shunde District | 1 | Before Yuan Dynasty | 8.90 | 14,376 |

*The first, second, and third groups of China’s national historic and cultural villages were identified in 2003, 2005, and 2007, respectively.

intact, and the comb-type layout is fully reflected in these three ancient villages. Liantang, Songtang, Shawanbei, and Daling had an average conservation status, whereas Xiaozhou, Bijiang, and Huangpu had the lowest scores.

The historic landscape of a village refers to environmental elements such as ancient channels, commercial streets, public buildings, characteristic public event venues, fortresses, stone steps, gates, docks, archways, pavilions, ancient trees, ancient wells, walls, ancient bridges, and ancient towers. The evaluation index for landscape richness is the quantity of such elements that have been preserved. Bijiang, Daling, Shawanbei, Langtou, Xiaozhou, and Qiangang had the highest scores for landscape richness, Liantang and Daqitou had medium scores, and Huangpu and Songtang had the lowest scores.

Daling, Langtou, Daqitou, Qiangang, and Liantang had the highest scores for planning authenticity. The planning patterns of these five villages had significant features and were well preserved, including the “four treasures of study” in Daqitou, “half-moon-shaped ancient village” in Daling, and “back to mountain, facing water, left and right enclosure by hills” in Liantang. Shawanbei, Xiaozhou, and Bijiang had the lowest score, and the ancient feng shui pattern of Bijiang – called “five beasts passing the gate and nine loongs entering the cave” – is incomplete.

In terms of the coordination of old and new buildings, all 10 villages had low scores. The earlier development of tourism in Shawanbei has led to the transformation and reshaping of the new houses in the core conservation area, and the materials and colors have echoed the ancient building. Its overall appearance does not seem to be particularly abrupt,
so it has the highest score. Due to the late introduction of management measures, the management organization is not perfect, and villagers have added construction haphazardly. As a result, the style of Xiaozhou has been greatly damaged in recent years. The traditional buildings are dotted around the village, so it has the lowest score. The situations of other villages are not promising. There are two rough models. In the first, the
old village is small and has a lot of land for new construction, but the new village has been built near the old village, and a small number of new houses have even been built in the old village. Most of the styles and materials of the new houses are not coordinated with the ancient buildings, which destroys the integrity of the old village, such as in Qiangang. In the second, the old village is near a city; therefore, its construction area was small and the villagers had to demolish the old houses to build new ones, so only the temple is preserved. The large number of new buildings and illegal buildings blocking alleys has damaged the spatial scale and integrity of alleys, such as in Bijiang.

3.3. Building

Figure 5 shows the 10 villages’ evaluation scores for building factors. Shahwanbei, Langtou, and Daqitou had the highest scores; Daling, Xiaozhou, Huangpu, and Bijiang had medium scores; and Qiangang, Liantang, Songtang, and Liantang had low scores.

Daqitou, Shahwanbei, and Langtou have a relatively high proportion of traditional buildings. Xiaozhou and Qiangang have many types of historic buildings, but the other villages have few.

The ancestral hall always has the highest artistic value and building standards in a village. The ancestral halls in Huangpu, Daqitou, Bijiang, Daling, and Shahwanbei are large, have decorative details, and are well restored and protected. Liugengtang at Shahwanbei has a reputation as “Lingnan’s Comprehensive Art Palace”; it has the longest history, the largest area, the clearest structure, and the greatest architectural art value in Panyu District, and it is the best preserved of the central Guangdong ancestral halls. The group of ancient buildings in Langtou has a long history, highly valuable cultural relics, exquisite
workmanship, and on a large scale and is well preserved; its completeness is rare in the Pearl River Delta, reflecting the authenticity and continuity of history. Daqitou has the most unique architectural style of the villages built during the Qing Dynasty. The five home temples in the village are in the typical central Guangdong style and have stele for record and idols for worship. Most existing ancient buildings in Bijiang were built during the Ming and Qing Dynasties. It has many types of buildings and could be called a museum of folk
architecture. Architectural materials such as oyster shell walls, dry bases, and various precious hardwood materials can be seen. Architectural decorations such as wood carvings, stone carvings, plasters statues, brick carvings, and murals are represented, and many of them are masterpieces from various periods.

The historic buildings in the core areas of Langtou and Daqitou have the greatest authenticity. In Daqitou, a group of people live in a cluster of houses, residential buildings commonly use the traditional Guangdong architectural layout of “three rooms and two corridors,” and the village has many ancestral halls and home temples. Excellent cases of ancient village conservation are inseparable from the maintenance performed by previous villagers and the attention of governments. Langtou was identified in the first group of historic villages in Foshan, and a considerable sum of money was used to collect lost cultural relics. The historic buildings in the core areas of Daling, Bijiang, Xiaozhou, Huangpu, and Songtang have average authenticity. Although many repairs have been carried out in these five villages, many are inconsistent with the original state.

3.4. Folkways

Figure 6 lists the 10 villages’ evaluation scores for folkways factors. Shawanbei, Langtou, and Huangpu had the highest scores, and the other villages had average scores.

Shawanbei, Langtou, and Huangpu have the richest intangible cultural heritage species; each village has eight or nine types. For example, Shawanbei has the third birthday of Northern Emperor in March, Piaose Parade, Loong Dance, Lion Dance, Dragon Boat Race, Turtle Dance, Cantonese Music, Nammyam, Cantonese Opera, Orchid Culture, Sculpture Art, Private Kitchen, and Milk Products.

The elderly in the village are usually the inheritors of the intangible cultural heritage, and most of the villages’ traditional customs are retained by them. In Qiangang, during the Qingming and Chongyang seasons, the villagers gather for ancestral worship in the home temple. Everyone in the clan keeps in mind the ancestral motto “Loyalty and Filial Heir” and inherits the integrity of their ancestors. In most of the villages’ folk custom activities, the entire village takes part, whereas some folk custom activities in Liantang and Bijiang have been attended by fewer than 10 people.

4. Discussion

4.1. Environment

The landscape and environment of the site have great value in the cultural heritage of Chinese settlements. They include not only the relative positional relationship among mountains, rivers, and settlements in the general sense, but also the symbolic meaning brought by the sight corridors between mountains and rivers and the natural defensive barriers formed by them. This relationship has been accompanied by the site selection and development of villages and has continued to strengthen this pattern. Conservation measures focus mainly on the protection of mountains, waters, sight corridors, and ecological restoration of important geomantic elements such as geomantic forests.

4.2. Planning

With the rapid advancement of new rural construction, the conservation of cultural heritage and
features of historical villages faces challenges such as weak supervision, weak control, and lack of enforceability. Villages’ traditional layouts are historical records of their development and changes, and their conservation should include the outlines of ancient villages, the patterns of alleys, important buildings, and the richness of environmental elements. The key points of conservation should include rational limitation of the size of a village and of the transformation of traditional alleys. Large changes in alley structures and spatial scales should be strictly controlled. For landscape elements with vivid life scenes such as ancient wells and ancient trees, not only should the heritage itself be protected, but its surrounding areas should also be maintained and repaired. When conditions permit, this could be combined with leisure facilities to enhance the living atmosphere. Plants and trails can be used to improve the space on both sides of a river system, and hydrophilic platforms and leisure facilities can also improve environmental quality.

4.3. Building

The conservation performance of historic villages should be included in the local economic and social development evaluation indicators. Responsibility for conservation work must also be delegated to leaders at all levels, and funding should play an important role in the work. Various methods of protection should be used for ancient buildings of different values. Cultural relics can be restored to their original state, historical buildings can be repaired but not rebuilt, and traditional buildings can be maintained. It must be ensured that important cultural protection sites do not collapse and have no hidden dangers, and traditional buildings should be classified and protected step by step. Corresponding technical methods must be used to repair various components such as roofs, walls, doors and windows, and decorative components.

4.4. Folkways

The conservation of intangible cultural heritage requires the ingenious fusion of culture with the modern life of local residents to maintain their vitality. If it is protected only for the development of the tourism economy, it cannot be sustained. The development idea should be that heritage conservation is the purpose and that economic construction is the driving force. The development and use of historic and cultural heritages can be used as an opportunity to organically integrate cultural industries into villages’ economic development.

5. Conclusions

This study proposes a quantitative evaluation method to evaluate the heritage conservation performance of historic villages, including four secondary evaluation factors of environment, planning, architecture, and folkways and 13 three evaluation factors. Ten villages in Guangzhou and Foshan, Guangdong Province, China, were used as examples. The evaluation results show that Langtou and Daqitou are the best protected and that Xiaozhou and Bijiang are the worst. Langtou Village has high scores in all factors, and Daqitou also has high scores except for the folkways factors. Xiaozhou has low scores in all factors, and Bijiang also has low scores except for the folkways factors. In terms of environmental factor evaluation, Daqitou, Liantang, Qiangang, and Langtou scored the highest, and Bijiang and Huangpu scored the lowest. In terms of planning factor evaluation, Langtou, Qiangang, and Daqitou scored the highest, and Shawanbei, Xiaozhou, Huangpu, and Bijiang scored the lowest. In terms of building factor evaluation, Shawanbei, Langtou, and Daqitou scored the highest, and Qiangang, Liantang, Songtang, and Liantang scored the lowest. In terms of folkways factor evaluation, Shawanbei, Langtou, and Huangpu scored the highest, and the other villages generally had moderate scores.

Quantitative evaluation and analysis of the heritage conservation performance of historic villages was used to compare the evaluation results with the conservation measures of each village, and management strategies for heritage conservation that should be recommended or prohibited were determined. As for the environment, attention should be paid to the conservation of landscape patterns and sight corridors and to the maintenance and restoration of the ecological environment. For planning, villages should be reasonably controlled, the texture and scale of alleys should be protected, traditional alleys should not be unreasonably transformed, landscape elements should be maintained and restored, and the original living and cultural functions should be brought into full play by combining with living facilities. Various conservation measures should be adopted for historic buildings of different values, and various levels of repair technology should also be used for buildings and their components. For folkways, records of the intangible cultural heritage should be strengthened, endangered heritages should be rescued, and the safeguard mechanism for the intangible cultural heritage inheritors should be strengthened.

Disclosure statement

No potential conflict of interest was reported by the author(s).
**Funding**

This work described in this paper was sponsored by National Key R&D Program of China (Monitoring System of Protective & Utilization and Management System apply to the Value System of Traditional Villages), grant number: 2019YFD1100903. Any opinions, findings, conclusions, or recommendations expressed in this paper are those of the authors and do not necessarily reflect the views of the sponsoring committees.

**Author contributions**

L.E. (Erwei Li) conducted investigation and data analysis. H.Y. (Yi Huang) proposed the original concept and methods and wrote the first draft of the manuscript. X.D. (Dawei Xiao) took part in the original concept discussion and modified the manuscript.

**References**

Ahunbay, Z., Ayrancilar, T., Polat, A., & Uray, A. 2014. “Conservation of the Vernacular Heritage in the Villages of Bursa, Turkey.” *Signals and Systems: A Primer with MATLAB*(2015): 39.

Alshehri, A. 2018. “Documenting the Traditional Architecture of Khatbah Village in Saudi Arabia (Poster).” *Proceedings of the Seminar for Arabian Studies* 48: 7–11.

Bilgin, E. A. 2019. “Rural Architectural Characteristics and Conservation Issues of Aladdinbey Village in Bursa, Turkey.” In *Conservation of Architectural Heritage*, 161–178. Cham: Springer.

Campolo, D. 2014. “The Cultural Landscape of the ‘Grecanic Area’ and the Recovery of the Genius Loci of Its Historical Centres.” *Advanced Engineering Forum*. Trans Tech Publications Ltd., 11: 464–469.

Chen, H. L., and W. Tao. 2017. “The Revival and Restructuring of a Traditional Folk Festival: Cultural Landscape and Memory in Guangzhou, South China.” *Sustainability* 9 (10): 1767. doi:10.3390/su9101767.

Foix, F., M. Woods, Y. Yang, X. Zheng. 2019. “Recovering Tradition in Globalising Rural China: Handicraft Birdcages in Da’ou Village.” *Sociologia Rurals* 59 (4): 661–687. doi:10.1101/soru.12266.

Gajdek, A. 2019. “Functioning and Protection of Traditional XIX-Century Wooden Architecture in the Capital of South-Eastern Poland.” *IOP Conference Series: Materials Science and Engineering*. IOP Publishing 471 (11): 112013.

Gil-Mastalerczyk, J., R. Gil, and A. F. Modrzewski. 2017. “Stanisław Rey’s ‘Manor House’ and ‘Palace’ in Sieciechowice, Investigations into the Cultural Heritage of Poland.” *IOP Conference Series: Materials Science and Engineering*. IOP Publishing 245 (4): 042036.

Huang, Y., and D. W. Xiao. 2018. “Exploration of the Evaluation Factor Selection Method Based on Paper Text Big Data Mining.” *South Architecture* 6: 10–14. (In Chinese).

Jackson-Stepowski, S. 2015. “Ensuring Survival of Vernacular Buildings in Rural Towns (NSW).” *IOP Conference Series: Vernacular Architecture: Towards a Sustainable Future*, 353–358. CRC Press.

Jia, M., X. Zhuang, H. Jin, Y. Wei, and X. Li. 2017. “Study on Environmental Characteristics of Hong Village in Huizhou and Its Environmental Satisfaction Evaluation.” *IAP Conference Proceedings*. AIP Publishing LLC, 1794 (1): 030007.

Li, B. H., J. R. Yang, P. L. Liu, C. Chen, Y. M. Liu. 2018. “Landscape Value Perception and Evaluation of Residents on Traditional Villages—a Case Study of Zhangguying Village.” *Journal of Central China Normal University (Natural Science Edition)* 52 (2): 248–255. (In Chinese).

Liang, Q., and G. H. Wang. 2013. “The First Exploration to Traditional Style Protection of the Historic Villages and Towns.” In *Applied Mechanics and Materials*. Trans Tech Publications Ltd, 357: 1832–1835.

Ling, L. 2018. “Research on the Historic Preservation of Zhaojiashan Village.” In *IOP Conference Series: Earth and Environmental Science*. IOP Publishing, 128 (1): 012191.

Long, Y., Yang, J., Liu, P. Chen, C., Liu, Y. 2018. The Development Status and Protection of Traditional Qiang Ethnic Minority Villages. AIP Conference Proceedings. AIP Publishing LLC, 2018, 1944 (1): 020018.

Luo, Y. 2017. “Research on Evaluation of Conservation Planning Implementation of Nanshe Historic Village in Dongguan City.” *IOP Conference Series: Materials Science and Engineering*. IOP Publishing 245 (5): 052001.

Malqiari, A., and L. Corniello. 2016. “The Unesco Site of Berat in Albania: The Protection and the Enhancement of the Heritage.” In 14th International Forum of Studies, *World Heritage and Degradation: Smart Design, Planning and Technologies*. Scuola Pitagora Editrice, 2016:1708–1717.

Mitchell, C. J., and K. Randle. 2014. “Heritage Preservation and the ‘Differeniated Countryside’: Evidence from Southern Ontario.” *The Canadian Geographer/Le Géographe Canadien* 58 (4): 429–442. doi:10.1111/cag.12131.

Radzuan, I. S. M., and Y. Ahmad. 2017. “Revisiting the Incentives Policy in Safeguarding the Heritage Village: The Case of Melaka, Malaysia.” *Advanced Science Letters* 23 (7): 6213–6217. doi:10.1166/asl.2017.9238.

Shao, Y., and J. Fu. 2012. “Research on Value-based Integrated Evaluation Framework of Historical and Cultural Towns and Villages in China.” *City Planning Review* 2: 82–88. (In Chinese).

Su, Y. N., and J. P. Wang. 2015a. “Study on Architectural Structure Restoration in Historic Village Conservation – A Case of Historic Village Conservation of Tuncheng Village.” In *International Conference on Computer Science and Communication Engineering (CSCE)*, 150-155. Suzhou: Destech Publications.

Su, Y. N., and J. P. Wang. 2015b. “Study on the Strategy of Historic Village Conservation – A Case of Historic Village Conservation of Tuncheng Village.” In *International Conference on Computer Science and Communication Engineering (CSCE)*, 150-155. Destech Publications.

Tang, L., M. Nikolopoulou, F.-Y. Zhao, N. Zhang. 2012. “CFD Modeling of the Built Environment in Chinese Historic Settlements”. *Energy and Buildings* 55: 601–606. doi:10.1016/j.enbuild.2012.09.025.

Tang, L., M. Nikolopoulou, and N. Zhang. 2014. “Bioclimatic Design of Historic Villages in Central-Western Regions of China.” *Energy and Buildings* 70: 271–278. doi:10.1016/j.enbuild.2013.11.067.

Virtudes, A., and F. Almeida. 2016. “Status of Historical Buildings Conservation: ICT Method Results in Caneiras Village.” *Procedia Engineering* 161: 1915–1919. doi:10.1016/j.proeng.2016.08.760.

Wang, R. W. 2015. “Culture Heritage and Identity—Some Cases in Taiwan on the Protection of Cultural Heritage.” *International Archives of the Photogrammetry, Remote Sensing & Spatial Information Sciences*, 40.

Yang, L., Long, H., Liu, P., Liu, X. 2018. “The Protection and Its Evaluation System of Traditional Village: A Case Study of
Traditional Village in Hunan Province.” *Human Geography* 33 (3): 121–128+151. (In Chinese).

Yang, L., and P. Liu. 2017. “The Inheritance and Its Evaluation System of Traditional Village Culture: A Case Study of Traditional Village in Hunan Province.” *Economic Geography* 12: 203–210. (In Chinese).

Zhang, C. 2015. “Study on Value Characteristics of Traditional Village and Its Protection Strategy.” In *2015 International Conference on Economics, Social Science, Arts, Education and Management Engineering*, 263–266. Atlantis Press.

Zhang, D., H. Xiao, and H. Zhou. 2015. “Research Summary of Conservation and Development of China’s Historic and Cultural Town.” *Urban Planner* 32 (S2): 152–158. (In Chinese).

Zhao, Y., J. Zhang, S. Lu, and Z. H. Liu. 2008. “Further Study on the Evaluation Index System for Historic Villages and Townships Taking the Second Group of Chinese Historic Townships (Villages) as Example.” *Architectural Journal* 3: 64–69. (In Chinese).

Zhao, Y., J. Zhang, and J. H. Zhang. 2005. “Research on the Content and Method of the Conservation of the Historic Cultural Towns & Villages in China.” *Human Geography*, no. 1: 68–74. (In Chinese).

Zhao, Y., J. Zhang, N. Li, and L. Liang. 2006. “The Study on Conservation Evaluation System and Method on the Historic Cultural Towns & Villages – A Case Study of the First Group Historic and Cultural Famous Towns & Villages in China.” *Geographical Science*, no. 4: 497–505. (In Chinese).

Zhou, T. J., Y.T. Huang, and X. S. Wang. 2011. “An Analysis of the Conservation System of Historic Towns and Villages in Southeast China.” *Urban Planning Forum* 109–116. (In Chinese).