

ECHOES OF DECLASSIFIED INTELLIGENCE SATELLITE PHOTOGRAPHS: THEIR ROLE AND APPLICATION IN THE RESEARCH AND PRESERVATION OF CHINA'S BUILT VERNACULAR HERITAGE

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ABSTRACT:

Vernacular architecture is constructed spontaneously and used by ordinary people, and they have been subject to constant modifications by changes in ownership, functions, and constructions according to people's living demands. In the last two decades, many cases which were constructed in the traditional way and survived China's overwhelming urbanization process have been listed in the preservation list with the increasing interest in cultural heritage. Regarding this type of heritage that is a result of multiple modifications, many restorations aim to recover the changed architecture to traditional formal integrity. Due to the rarity of detailed written or image references, some restorations become a kind of "creation" and fall into the cliché of stylistic restoration, which is posing an artificial risk to their historical values. Facing this difficulty, the authors turn to an important historical record - the DISP (declassified intelligence satellite photographs): since 1995, the US has declassified three batches of satellite photographs that were taken from the 1960s to the 1980s, before China's great change in *Reform and Opening Up*, almost covering all of China. These photographs are an important historical photographic record of the territory as well as the vernacular architecture scattered on it. This paper uses two cases to illustrate the important role of these photographs in China's built vernacular heritage: both as a reference to restoration and as a valuable source for historical research. The authors also discuss the prospect and limitations of this source.

1. VERNACULAR ARCHITECTURE BECOMES HERITAGE: THE DILEMMA IN RESTORATION

1.1 Vernacular Architecture Becomes Heritage

Vernacular architecture is customarily owner- or community-built, utilizing traditional technologies, with available resources, to meet the specific needs of the owners (Oliver, 1999). They are an important "tangible record of what has gone before" (Tolia-Kelly, 2009) so they are receiving increasing attention in the field of cultural heritage as the focus has moved from monuments to historical buildings in the latter decades of the 20th century (Di Biase and Albani, 2019). Finally, the concept of built vernacular heritage is formally proposed in 1999, which was valued as the fundamental expression of the culture of a community, its relationship with its territory, and the world's cultural diversity (ICOMOS, 1999).

In China, the built vernacular heritage refers to those architecture and landscape constructed/formed in a traditional way mainly before the new China (1949), including not only houses but also ancestral shrines, temples, schools, agricultural buildings, and other architectural types which are closely related to people's daily life (Shan, 2009). They are at huge risk due to the fast urbanization process in the last five decades. To preserve and rehabilitate this precious heritage, many settlements and architecture have been included in the preservation lists since the new century, such as the list of *Historical and Cultural Towns and Villages* established in 2003 and the list of *Traditional Villages* in 2012 (Chang, 2016).

1.2 Vernacular Architecture Is Changing

Vernacular architecture has been subject to constant changes, in function, ownership as well as the materials aspect since they are used by people and modified according to people's different demands (Di Biase, 2019).

In recent China, the change is rather considerable because of the rapid social reform from agriculture to industry, and from a feudal society to a socialist one. There are two recent social reforms decisive for changes in the use and construction of vernacular architecture. First, in the *Land Reform* movement (1946-1953), many vernacular architectures which used to be landlords' property were confiscated by the government and were reused for different functions, such as granaries, government offices, schools, and even residential complexes inhabited by low-income families. New users conducted a series of addition, demolish, and alternation activities to adapt them to these different functions. Second, after the *Reform and Opening Up* starting in 1978, many vernacular architectures have been (partly) demolished and replaced by new ones with new materials, structures, and styles.

Therefore, many cases, although survived these overwhelming social reforms, had already been subject to considerable change by the time they were listed as preservation targets (Figure 1). According to the criteria for declaring *Traditional Villages*, once the number of traditional architectures constitutes 1/3 of the total number, the village is qualified to be listed (Ministry of Housing and Urban-Rural Development et al., 2012).



Figure 1. The Guo House in Yunyang is a result of the part remains, demolish, modification, and additions, © the author 2019.

1.3 The Dilemma in the Restoration

To preserve this heritage, many restoration projects are conducted, aiming at recovering the changed architecture to traditional formal integrity, removing all added/changed parts, and reconstructing missing parts. However, since there are few records of the original state of vernacular architecture, this restoration becomes a kind of "creation" and falls into the cliché of stylistic restoration (Chen, 2016).

For example, the Chen House in Wenjiang, Sichuan Province was restored in 2005 and opened to the public as a museum to display the traditional architecture and living culture of a previous gentry family (Figure 2). After the restoration, the house turns out to be an integral and exquisite architectural artwork and is appreciated a lot by tourists. It was listed as a monument at the national level in 2013. This house has been cited a lot, as an example of a gentry's house in the Qing Dynasty (1636-1911), by researchers in art/architecture history who conduct a lot of analysis on its layout, decoration, craft, and other architectural characteristics.



Figure 2. Chen House in Wenjiang was renovated as a museum © the author 2019.

It was until we read an investigation report on this building which was compiled by Z. Liu and based on his investigation in the 1940s that we started to know how naive it is to take it for granted that the restored work is authentic remains of traditional architecture. In Liu's report, there used to be a *Baoting*¹, in front

of the main hall and two *Wugongjia*² in the slender courtyard between the main hall and the back hall (Liu, 2000). But these two structures which were very typical in the traditional construction of Sichuan totally disappear in today's Chen House after the restoration. Besides, there are many inconsistencies in the decoration and tectonics between the restored works and the photographs taken by Liu in the 1940s (Figure 3).



Figure 3. The difference in tectonic under the eave of the Chen House: before and after the restoration, left © Z. Liu 2000, right © the author 2019.

This case reminds us of the big risk that this restoration is posing to the historical value of this precious heritage, but it is still very prevalent in China's restoration practices. Even worse, the conservation plan which might objectively record the whole restoration process is hardly available to the public. On the contrary, they are directly shown the result and are convinced that these restored works are survivals, authentic and integral, from the past.

Thanks to Liu's investigation, we are lucky to have the opportunity to make a comparative reading of the Chen House before and after the restoration, but it is a rare opportunity. Although artists and architects like Liu started the investigation of traditional architecture at the turn of the 19th and 20th centuries, their main interests were paid to high-style architecture - palaces, administrative architecture, official temples, etc. - with very few interests in vernacular architecture. Some anthropologists, socialists, geographers, photographers, etc. had done some investigations on the vernacular community and landscape but the number is very limited, and the records on architecture that can be used as a direct reference for restoration are even rarer.

When researchers started to pay extensive attention to vernacular architecture after the *Reform and Opening Up* (a comprehensive and systematic study began in the 21st century and is still ongoing), those architectures had been modified by changes (the later it is, the greater the degree of modification is). Facing this difficulty, the urgent task is to stop this kind of stylistic restoration that is not based on a definite historical basis and propose an alternative preservation method for this heritage³. Besides, there are still many unfinished efforts deserving to be done to research the change of these architectures - the history of the built environment - which is the basis for real protection. A historical source that accurately recorded the land surface before the 1980s - the satellite photographs taken by the US during the cold war period - is of great importance to this minor architecture and deserves bigger attention and wider application.

2. DECLASSIFIED INTELLIGENCE SATELLITE PHOTOGRAPHS: A HISTORICAL RECORD

2.1 Declassified Intelligence Satellite Photographs

From the 1960s to the 1980s, the US operated its CORONA program, launching reconnaissance satellites and obtaining

many imageries on the surface of America's adversary countries. All these images have long been held in a highly private setting due to military and national security concerns.

Since 1995, three batches of these satellite photographs have been declassified separately in 1995, 2002, and 2011 and are available via USGS (U.S. Geological Survey) *Earth Explorer* website⁴. CORONA, the first batch of satellite imagery declassified in 1995 and made available to the public in 1998, was composed of 6 increasingly sophisticated cameras and included 145 missions between 1959 to 1972. At the same time, a program called GAMBIT was able to return high-resolution images of locations and characteristics that CORONA had previously identified, and GAMBIT imagery was declassified in 2002. HEXAGON was the follow-on satellite program to the first-generation photo-reconnaissance satellite system, which was in operation between 1971 and 1986. And the photographs captured by HEXAGON were also declassified in 2013 (Mi et al., 2014).

2.2 Significance To China's Built Vernacular Heritage

Those photographs are an important historical record of the territory from the 1950s to the 1980s. They play an important role in the historical research of the environment and have been widely used in landscape archaeology (Ur, 2013). They are also paid attention to by Chinese scholars and used in the historical research of the urban environment (Dong et al., 2019).

For vernacular architecture, they are more than worthy of attention. On the one hand, these satellite photographs almost covered all of China. The larger suburban and rural areas, which have been long ignored by researchers and architects, had been equally recorded (Figure 4). Some photographs are even the only image record of many rural landscapes and vernacular architectures before the 1980s. On the other hand, although the *Land Reform* movement caused a total change in the ownership of lands and houses (ownerships were transferred from former landlords to ordinary people), the biggest physical change happened after the *Reform and Opening Up* with the influx of new materials and construction systems. Therefore, the satellite photographs taken before the 1980s could reflect, to an extent, the physical aspect of the vernacular architecture and landscape which were formed in a traditional way. Besides, many architectures were photographed more than once, and those photographs taken at different times could reflect the evolution of architecture and landscape in this critical period of social transition.

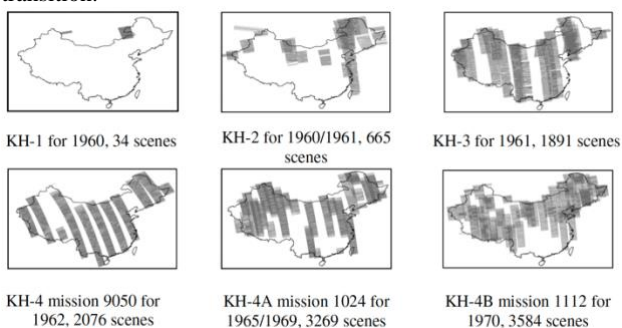


Figure 4. CORONA images coverage in China © H. Mi et al. 2015.

3. ROLES AND APPLICATION

3.1 As a Reference to Restoration

Some DISPs captured vernacular architectures when they had not been contaminated by industrialized construction systems and were still consistent with traditional ones, they are the direct reference for some restorations.

Here is a case, the Chen House in Jiangjin, Chongqing used to be the house of a local gentry surnamed Chen. In the *Land Reform* movement, this house was confiscated and allocated to over 20 peasant families, so it has been modified a lot by each family according to their own demands, with many demolitions and additions. With more people moving to the city in recent decades, the house was gradually abandoned and now occupied by only three families, in a worse situation. It was until 2014 this house was listed as a provincial monument because of the relatively complete architectural survivals (Figure 5).

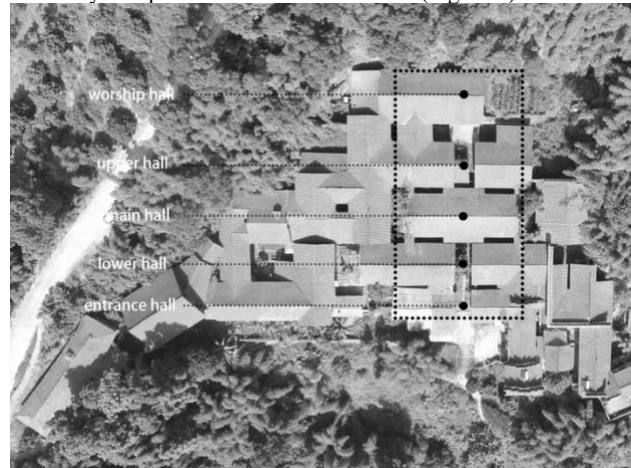


Figure 5. The remains of the Chen House in Jiangjin © the author 2019.

Based on the construction traces and interviews with left residents, we could know that the roofs of the entrance hall, lower hall, and upper hall, as well as the four *Baoting* above the small courtyards between those halls along the main axis, were removed in the last century (Figure 6-1).

Therefore, it is a priority to research the structure and forms of these removed parts in the restoration work.

Based on the interviews and using other vernacular buildings in the surrounding area as a reference, we propose that the eaves of *Baoting* are higher than the eaves of the halls that they connect and formulate the hypothesized recovery design of the roof (Figure 6-2)

However, this design is different from the one shown in the official conservation plan for this house, proposed by Chongqing Tianyi Design Institute (CTDI) and approved by Cultural Heritage Administration in 2014. In this plan, the eaves of *Baoting* are of equal height with and directly connected to the eaves of the halls they connect (Figure 6-3).

These two possibilities for the recovery design of the *Baoting* and roofs both seem reasonable according to all the evidence assembled so far. But once the disputable recovery design was put into practice, the restoration becomes a kind of creation and runs the risk of producing fake heritage and misleading people.

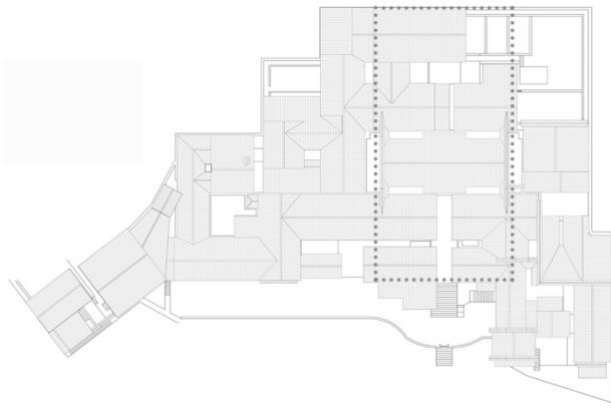


Figure 6-1. The current roof plan © CTDI 2014.

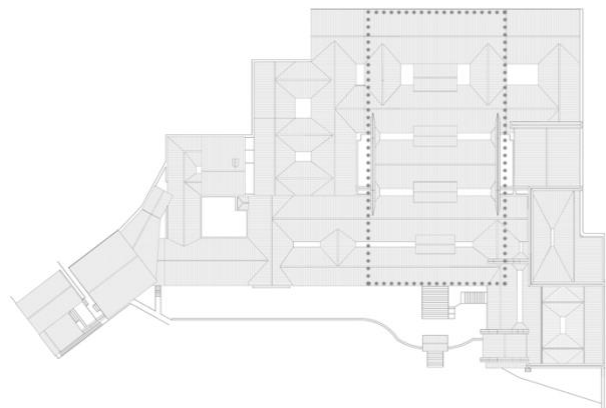


Figure 6-2. The hypothesized recovery design of the roof plan proposed by © the author 2021.

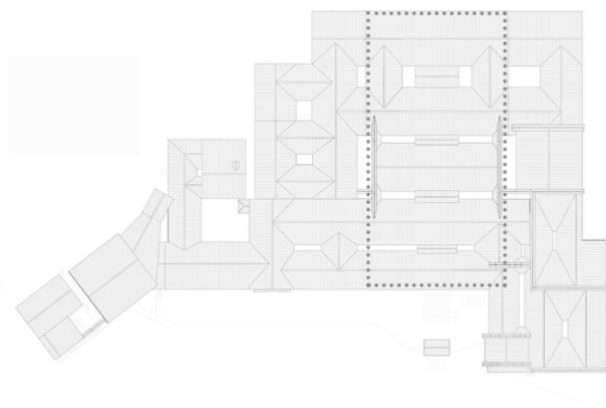


Figure 6-3. The hypothesized recovery design of the roof plan proposed by © CTDI 2014.

We are lucky to find the satellite photograph of the Chen House which was taken on 17 July 1972 in the USGS image database. As we can see, *Baoting's* roofs partially overlap with the roofs of the halls they connect (Figure 7). This implies that the eaves of the former were higher than those of the latter. Thus, it can serve as strong proof that the hypothesized recovery design of *Baoting* in the conservation plan is wrong.

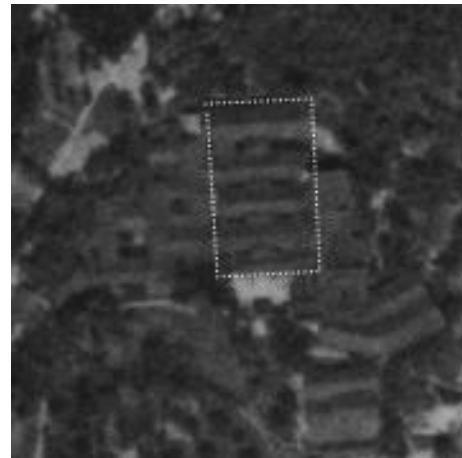


Figure 7. The satellite photograph of Chen House © USGS image database 1972.

This is a small case to show the role of DISPs in providing reference to the restoration of some architecture. It reminds us of the existence of these photographs which we can refer to when there is difficulty in finding a reliable basis for restoration. Many cases face similar situations. In the Shipaifang village of Luxian, Sichuan, many vernacular houses have experienced big changes as different families who own different parts of the house have different adaptations and additions to suit their needs (Figure 8-1). The DISPs taken in 1979 provide a possible route to track their historical condition if there is a need for restoration (Figure 8-2).



Figure 8-1. Current situation of several vernacular houses in Luxian © Google Earth 2023.



Figure 8-2. Historical satellite photographs of several vernacular houses in Luxian © USGS image database 1979.

More importantly, it opens up the possibility of objectively evaluating some restoration works. The results of these restorations might be “wrong”, and they only reflect the restoration philosophy and methods in a specific context. But we could not mistake them for history itself.

3.2 A Source of Historical Research

These historical satellite photographs constitute an important source for historical research.

In the research of architectural history, there are two main sources: documentary sources such as historic maps or documents mainly used by historians, and the direct investigation of architectural remains adopted by architects⁵. The former are based on historical facts but they are usually a result of artificial processing in the form of text or drawing and

are sometimes very abstract and even subjective. While the latter are conducted in recent decades and the remains are a palimpsest of multiple layers. Considering changes over time, the remains are sometimes inconsistent with the original state recorded in documentary sources, this difference often results in some confusion and ambiguity in historical research.

The DISP are historical records produced by cameras, so they are more objective than documentary sources and could eliminate the subjectivity of the draftsman's hand. Besides, they contain more historical information than contemporary surveys. For example, Qingyang Temple is one of Chengdu's most famous Taoist temples. Although it is in the center of nowadays Chengdu territory, it was in the suburb of this city, outside of the city wall, before the new China. It was transformed into a large market in the Republican period (1912-1949) and suffered from the *Cultural Revolution* (1966-1976) after the new China, with architecture destroyed, gods' statues knocked down, and monks driven away. It was until 1983 this temple was recovered and used as a temple again.

The layout of Qingyang Temple has been frequently analyzed by many researchers in Taoism culture since the layout of Chinese traditional architecture is read as an institution reflecting the rituals and social relationships from the perspective of anthropologists (Jones, 2016). But all this analysis is directly based on the current condition, and no one pays attention to its inconsistency with the one documented in historical maps.

In the contemporary remains, along the axis lies the main gate with Lingzu Hall behind, Hunyuan Hall, Bagua Pavilion, Sanqing Hall, Doulao Hall, Yuhuang Hall, and Tangwang Hall (Figure 9).



Figure 9. The current layout of Qingyang Temple, left © Google Earth 2023, right © the author 2023.

However, in a historical map drawn in 1903, there was another gate in front of the Lingzu Hall, separated by a courtyard, and one less hall at the back (Figure 10).

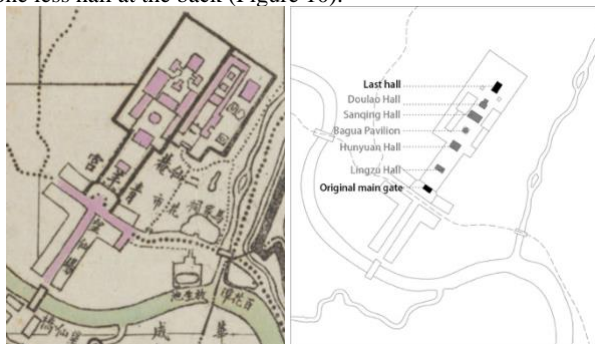


Figure 10. The historical map of Qingyang Temple © C. Cen 1903, right © the author 2023

It is difficult to tell whether this inconsistency lies in the wrong documentation of the draftsman or the actual change of the

architecture itself. It is possibly a result of the mistake in compiling the map since this temple drawn in different versions of maps within a similar period has different layouts (Figure 11).

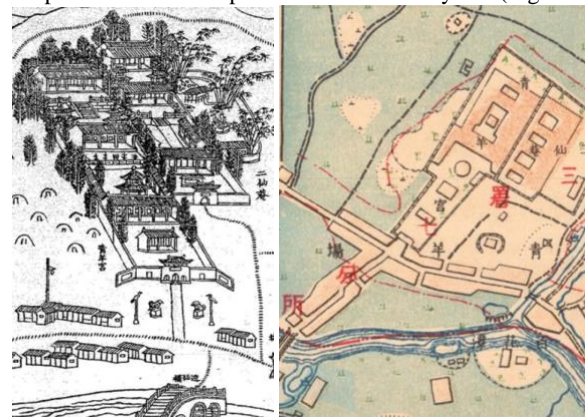


Figure 11. The historical maps of Qingyang Temple, left © S. Wu 1894, right © Sichuan Land Survey Office 1933.

A further question is proposed: what was the original layout like and how did this architecture evolve?

Through a historical satellite photograph taken in 1974, we could find the clue. First, a new north-south road was built crossing the front part of the temple and it resulted in the removal of the original main gate and attached courtyard, with only a small part of the entrance square remaining (Figure 12-left). Second, the last hall depicted in the 1903 map is actually two adjoining halls which were simplified into one in the drawing. Third, the current gate was newly built, attached in front of Lingzu Hall. Since there was still no new gate in the 1974 satellite photograph but it had appeared in an investigation report published in 1992, we could speculate that the new gate was built during this period (Figure 12-right).

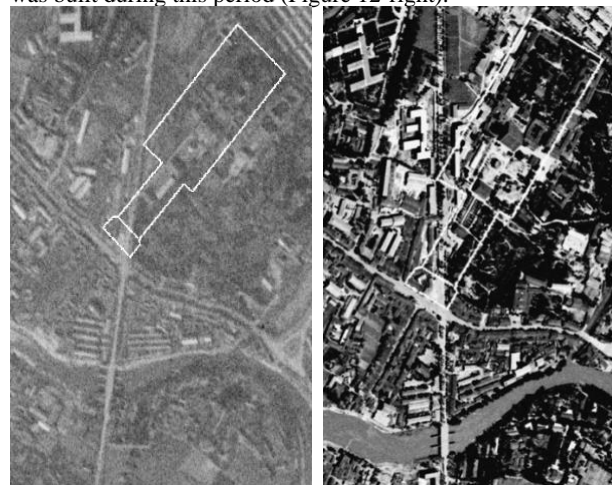


Figure 12. The historical maps of Qingyang Temple © USGS image database 1968, 1974.

The DISPs are a very important source to research the history of the built environment. They are a bridge to the documentary and material sources. These photographs are more reliable than hand-drawn maps and have bigger historical significance than current investigations.

Besides, although there could be some investigation conducted in the early period which left important investigation reports of the architectural and landscape remains, the DISPs are more integral since the satellite recorded all the information on the land at the time, without any selection.

For instance, X. Zhang started to research small towns back in the 1980s (Zhang, 1985), but his attention was more on the entity and space. He only investigated and recorded those towns and their surroundings. With the increasing interest in rural landscapes since 2017, the rural settlements are read in a broader scope of the landscape system (ICOMOS-IFLA, 2017), so his investigation, despite being extremely important, is not enough for this research perspective. Since the larger surroundings have evolved a lot in the past fifty years, the DISPs are irreplaceable sources for historical research on the rural landscape (Figure 13).

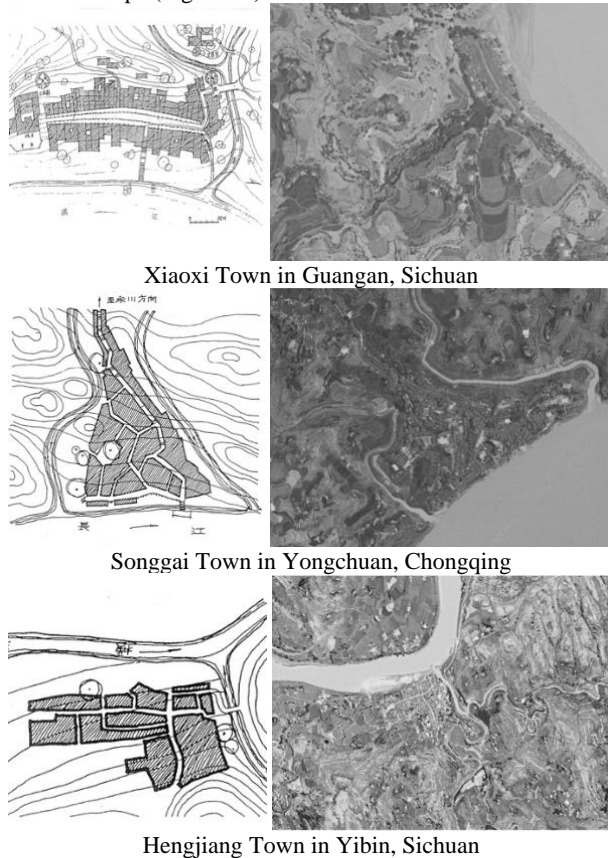


Figure 13. Left: the investigation of small towns © X. Zhang 1985, right: the small towns in a larger landscape system © USGS image database 1975,1972, and 1969.

4. CONCLUSION AND DISCUSSION

The DISPs are a historical photography documentation of the territory and they play an important role in the history research of the built environment, which is the basis of the preservation. After this large-scale satellite photography on the land surface of China's territory, it was until the new century that clearer and wider-coverage satellite photographs were taken and widely available among the public and researchers. Therefore, this series of historical photographs deserve to be systematically archived and cataloged for an easier and wider application in the study of vernacular architecture. However, an apparent limitation of this source lies in its nature as a satellite photograph. First, they can only reflect the overhead view of the territory: land patterns, and roof's relationships. Second, there is the limitation of the time period since these photographs were taken from the 1950s to the 1980s. Besides, some photographs were not in very high resolution or obscured by dark clouds, and some with a greater degree of distortion.

Thus, this source by itself is inadequate for history research and should interact with other sources. Thanks to its not-so-distant age, many other sources, such as the current remains, historical documents, and contemporary interviews with residents, are still available and can be mutually verified, to promote more convincing history research.

NOTES

1. *Baoting* 抱厅 refers to the structure in Chinese traditional architecture, which is situated above the small courtyard between the main halls and turns the courtyard into a semi-outdoor space to keep people from getting wet on rainy days when they cross the courtyard.
2. *Wugongjia* 蜈蚣架 refers to the two wooden structures situated in the long-narrow courtyard and they separate the long courtyard into three smaller ones.
3. An article by the author Pan Jiang discussing this topic has been accepted by the journal *Territorio* and will be published soon in the coming issue.
4. <https://earthexplorer.usgs.gov>
5. This idea is motivated by Prof. Francesca Albani in the Ph.D. course that she holds in the program of Preservation of Architectural Heritage at Politecnico di Milano.

REFERENCES

- Chang, Q., 2016. Structure and Prospective Of Chinese Vernacular Architectural Pedigrees: An Objective Based On A Systematic Study Of Sample Preservation And Holistic Regeneration. *Architectural Journal*, 10: 1-9. DOI: 10.3969/j.issn.0529-1399.2016.10.001.
- Chen X., 2016. Academic Origins And Characteristics Of The Chinese Stylistic Restoration. *Frontiers of Architectural Research*, 5(3): 353-359. DOI: 10.1016/j.foar.2016.04.004.
- Di Biase, C., 2019. The Life of Things: Conservation and the Investigation of Architectural Palimpsests. In: Xu, Y., Coomans, T., Zhang, J. (eds) *Essence and Applications of Building Archaeology in China and Europe*: 164-181. Beijing: China Architecture and Building Press.
- Di Biase, C., Albani, F., 2019. The Teaching of Restoration at the Architecture School of the Politecnico di Milano. Traditions and Perspectives. In: Di Biase, C., Albani, F. (eds) *The Teaching of Architectural Conservation in Europe*: XVII-LXXV. Maggioli, Sant'Arcangelo di Romagna.
- Dong, Y., Han, D., Shen, Y., Bao, Y., 2019. The Making and Application of Typological Map Adaptive to Conservation and Regeneration of Historic Districts in China: A Case Study of the Xiaoxihu Area in Nanjing. *Architectural Journal*, 2: 81-87.
- ICOMOS, 1999. *Charter On the Built Vernacular Heritage*. Adopted by the 12th ICOMOS General Assembly, Mexico.
- ICOMOS-IFLA, 2017. *Principles Concerning Rural Landscapes as Heritage*. Adopted by the 19th ICOMOS General Assembly, New Delhi.
- Jones, P., 2016. *Architecture And Ritual: How Buildings Shape Society*. Bloomsbury Publishing.

Liu, Z., 2000. Sichuan Residential Buildings. In: Liu, Z., Wang, Q. (eds). *A Brief History of Chinese Residential Architecture: Cities, Houses, Gardens (Second Edition)*: 248-366. Beijing: China Architecture & Building Press.

Mi, H., Qiao, G., Li, T., & Qiao, S., 2015. Declassified Historical Satellite Imagery from 1960s and Geometric Positioning Evaluation in Shanghai, China. In: Bian, F., Xie, Y. (eds) *Geo-Informatics in Resource Management and Sustainable Ecosystem. GRMSE 2014. Communications in Computer and Information Science*, vol 482. Springer, Berlin, Heidelberg.

Ministry of Housing and Urban-Rural Development, Ministry of Culture, Cultural Heritage Administration, Ministry of Finance, 2012. *Notice on the Investigation of Traditional Villages*.

Oliver, P., 1997. *Encyclopedia of Vernacular Architecture of The World*. Cambridge: Cambridge University Press.

Shan, J., 2009. Xiangtu Jianzhu Yichan Baohu Lilun Yu Fangfa Yanjiu [Study On The Theory And Methods Of Conservation Of Vernacular Architectural Heritage (Part 2)]. *City Planning Review*, 253(01): 57-66+79.

Tolia-Kelly, D., 2009. Material Culture. *International Encyclopedia of Human Geography*, Vol. 6: 500–504. Elsevier Ltd. <https://doi.org/10.1016/B978-008044910-4.00971-8>.

Ur, J., 2013. Spying on the past: Declassified intelligence satellite photographs and near eastern landscapes. *Near Eastern Archaeology*, 76(1), 28-36.

Zhang, X., 1985. *Chuan Dongnan Qiuling Diqu Chuantong Changzhen Yanjiu [A Study of Traditional Towns in the Hilly Areas of Southeast Sichuan]*. Master's thesis, Chongqing University.