Improving Social and Economic Sustainability with Rammed Earth Building in Rural Areas of China

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THAME 5.2: HERITAGE REVITALISATION AND VALUARISATION

Summary
China has been undergoing tremendous development and implementing construction projects in rural areas over the past decades. Under the conventional rural modernization development model, numerous vernacular buildings, such as rammed-earth buildings, are being replaced by brick-concrete buildings. However, this endeavor shows that brick-concrete building is not a good solution, particularly in mountainous rural areas, such as Southwest China. The social and economic value of rammed-earth construction has been neglected in the course of rural development. The Ma’anjiao Village post-earthquake reconstruction project shows that an innovative rammed-earth building can provide a safe and comfortable living environment, as well as improve social and economic sustainability, which is significant for sustainable rural development.

Introduction
As early as the 1970s, critiques of rural modernization were already emerging in Europe and other developed regions. Numerous scholars and practitioners determined that social and economic sustainability is important in sustainable rural development. Social and economic sustainability is also important in the post-earthquake reconstruction of rural areas in Southwest China. After the 2008 earthquake in Sichuan Province, the villagers encountered several challenges during the reconstruction process, including increased prices of construction materials, poor transportation facilities, low income, and low educational level (Figure 1).

Methodology and results
The reconstruction process and result of the Ma’anjiao reconstruction project were compared with those of the nearby Jujiang Village reconstruction project, which is a typical project that followed the rural modernization model. The benefit and achievement of the Ma’anjiao project in terms of social and economic sustainability are highlighted through the following cross comparison.

1. During the early stage of the Ma’anjiao project, site investigation and surveys were conducted to completely understand the local condition and needs of the residents. Based on the investigation, the villagers were provided with a reconstruction DIY manual involving 12 prototype housing designs that they could refer to according to their respective needs (Figure 3).

2. In the Ma’anjiao project, local and recycled materials from the seismic zones were utilized to rebuild houses in situ. Therefore, the reconstruction cost was significantly reduced. Moreover, the original pattern and special structure of the community were retained to keep the sense of belonging of the residents. Instead of in-situ reconstruction, the Jujiang project rebuilt the village on a new parcel of land using bricks and concrete. The reconstruction cost of the brick-concrete houses is higher than that of the rammed-earth buildings. The community outdoor space was also boring and lacked greenery (Figure 4 and 5).

3. In the reconstruction stage, residents from each family were organized to build the prototype house (Figure 6). The innovative anti-seismic rammed-earth building technology was transferred to the villagers by doing and predicting together. The villagers learned the technology immediately because they are familiar with earth-building construction. Furthermore, the innovative method was easy to understand and follow using simple tools.

4. In Ma’anjiao Village, good thermal performance with passive design of daylight and natural ventilation resulted in low energy consumption that is, low operational costs were indicated during the operation stage. By contrast, the brick-concrete houses in Jujiang Village had considerably lower thermal performance. These houses required additional cooling energy during the hot summer months. Therefore, the operational cost was significantly high (Figure 7).

5. In the community improvement stage, a village center was built by hiring the villagers. This strategy increased their income and provided public service facilities and a center for the community (Figure 8). The villagers could enjoy the public communication space and celebrate their traditional festivities in the courtyard. By contrast, Jujiang Village lacked public spaces and service facilities.

Conclusions
After the reconstruction, the community was socially empowered because of the development of new social skills that enhanced their future employment opportunities. The villagers also learned to show considerable respect for their culture and heritage. Moreover, the villagers did not need to become migrant workers in the cities to afford reconstruction cost or to search for an improved living environment. Hence, their lives were not destroyed by the disaster but became convenient and comfortable.

The Ma’anjiao reconstruction project showed that apart from the benefits of low environmental impact, rammed-earth buildings have immense social and economic benefits, particularly for poor rural areas, such as Southwest China. The reconstruction strategy could mitigate the disadvantages of rural modernization model with a bottom-up manner and exogenous development. To improve socio-economic sustainability, the objective should be clarified in the beginning and the entire construction process needs to be organized systematically and strategically.