The Refurbishment and Management of Aboriginal Dwellings: The Traditional Paiwan Slabstone House

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ABSTRACT

The highly variable and unpredictable alpine climate of Taiwan's mountain region causes unstable soil conditions there. This, coupled with strong shocks of the 1999.9.21 earthquake, threatened the irreplaceable historical slabstone house sites of the prehistoric indigenous Paiwan people. The earliest Paiwanese houses are located in the central southwest portion of Taiwan's central mountain range. The call to rebuild after the calamity utilized the overall idea of community development to be shared among the Paiwanese, causing the awakening of the community's consciousness committed and devoted to looking for one's ethnic roots, as well as encouraging the Paiwanese to return and rebuild their homes.

Results from NSC97-2221-E-165-004 'To Restore and to Revitalize Aboriginal (Vernacular) Dwellings: Traditional Paiwan Slabstone House' are the basis for this research with objectives in rebuilding from their remaining slabstones and foundations, establishing a characteristic policy for housing and management, and working closely with the ecology in refurbishment methods of the slabstone house. The study will be according to the CBR (Case-Based Reasoning) and the CSBME (Code System for Building Material and Equipment) in investigating the present state of the north Paiwan slabstone house. In addition, the study uses CSBME and CBR to establish the ecological methods of refurbishment, building materials, actual construction, and provision of precise technical standards for the slabstone house's environmental management and refurbishment.

KEYWORDS

Housing Refurbishment, Slabstone House, North Paiwan, Management

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1. INTRODUCTION

The highly variable and unpredictable alpine climate of Taiwan's mountain region causes unstable soil conditions there. This, coupled with strong shocks of the 1999(921) earthquake, threatened the irreplaceable historical slabstone house sites of the prehistoric indigenous Paiwan people. Reconstruction activity following the 1999(921) quake gave little or no consideration to the preservation of the historical slabstone house. Although the 1999(921) quake served as a catalyst for rebuilding the village, the villagers lacked the technical building and managerial skills to restore the slabstone houses. Instead, they actually accelerated the deterioration and the destruction of these historical landmarks.

The project housing council's first priority for the reconstruction is to solve the Paiwanese housing problem. The secondary priority is to improve the quality of the surrounding of the Paiwanese village noted a large impact from foreign technology and modern science on Paiwanese culture. This gradually led to the loss of the Paiwanese identity as evidenced by the disappearance of the original characteristics of slabstone house. Despite many destroyed or abandoned houses in the mountain area, there still exist local enthusiasts who are committed to improving their living space maintaining traditional building methods in repairs, reconstruction even new construction. This is a notable achievement.

The purpose of this project is to develop a refurbishment model that defines creation of needed modernized living quarters while preserving the surrounding environment. Within these sustainable and environmentally conscious parameters, the definition of refurbish in this paper is not to rebuild, disassemble and remove, or even to cover the house with modern material so that it can not breathe. Refurbish here means a system of construction decreasing the amount of wasted material and effectively utilizing recycled products. This study will investigate the original ecology and past building techniques to develop sustainable designs and systems to lessen the environmental impact, and to reduce energy use. The early Paiwanese people used indestructible slabstone to construct the walls and foundations and designed their living space according to their needs in harmony with their environment. Thus, this study uses the wisdom of the early Paiwanese people as the fundamental groundwork to conduct the assessment research and develop an ecological refurbishment model.

2. RESEARCH BACKGROUND

The traditional slabstone houses of the northern Paiwanese cluster on a gentle slope of the southwest side of the central mountains. The use of the primary natural resource, slate, in these houses has come to characterize Paiwanese architecture. The 1999 (921) earthquake, local disasters, torrential rain, and resultant mudslides damaged many traditional houses. In spite of not having a proper conservation policy for these houses, the walls and foundations of many dwellings survived and represented a unique construction style.

These architectural examples also reveal to future generations the successful usage of local material to adapt to this challenging environment. The rapid economic development, periodic natural disasters, ongoing property development, and vanishing woodlands awaken the Paiwanese people’s increasing land stewardship responsibilities. This, in addition to an emotional attachment to their family lands, calls the local people to return to their homeland and restore their community. After so many catastrophes, one must be very cognizant during the restoration to not waste existing material, to be environmentally sensitive, and to retain the
traditional value. If rebuilt without these considerations and massive changes in the structure and usage of non local materials; the harmonious relationship with the surrounding environment will be destroyed. This is an ideal stage to provide comforts to the Paiwanese people. There is an urgent need to provide the Paiwanese aboriginal people with modern a living space and to restore their homeland. It is the right moment to commit to the sustainable utilization of natural resources and original structure to protect the cultures of indigenous people.

The case study NSC97-2221-E-165-004 'To Restore and to Revitalize Aboriginal (Vernacular) Dwellings: Traditional Paiwanese Slabstone House' is the basis for the majority of the current research. Though an attempt to improve the Paiwanese living quality and residential safety, the case study findings were an unacceptable contrast of new modern construction applied to traditional housing structures. The current policy concentrated only on repairing the damaged roofs and unstable structures without regard to traditional local architecture. The new construction continually appears like bamboo shoots after a spring rain. Utilizing the existing foundation and bearing wall to construct a new framework covered with modern materials results in an uncomfortable living space for the original inhabitants. The current policy of conservation planning lacks continuity between areas, therefore, this study recommends a thorough investigation and assessment to develop a systematic approach to evaluate and refurbish Paiwanese dwellings.

State policy regarding these valuable houses lacks a united plan to demolish or refurbish the few surviving traditional slabstone houses. Utilizing local materials should reduce the amount of time necessary to rebuild as well as increase the comfort level of the elderly within their familiar surroundings. The ideal refurbishment should utilize the existing site, use any viable surviving walls and foundation, address modern living demands and improve the quality of the surrounding environment, while retaining its valuable and unique architectural style.

3. RESEARCH METHOD

There were 38,935 collapsed houses and 45,320 damaged houses resulting from the (921) earthquake. The (921) earthquake caused tremendous social problems and massive construction demands. 23 aboriginal villages were reconstructed, 17 projects utilized local materials. These 17 projects were part of a united overall community conservation plan that allowed residents to participate at a grassroots level. Many of the younger generation, recognizing the traditional value of their unique dwellings, returned to their villages to assist in the rebuilding and reconstruction of the slabstone housing. Particularly exciting is the creation of several modern slabstone architectural buildings utilizing traditional construction in the mountain area.

This research arranges the slabstone houses of the North Paiwanese into three categories: (1) Areas where the village and residents have never been relocated such as Wu-tai. (2) Areas where the village and residents have been relocated to a new area and they continue to live there such as Da-lai, Fa-wan , Chi-ka. (3) Area where residents have been relocated but, are currently abandoned such as Tai-wu, Li-lee, Lai-yi.
The research tasks are as follows:
(1) Investigate the North Paiwan environment, collect information about the relationship between the surrounding environment and the existing slabstone houses, and establish standards for a refurbishment model that best coordinates the villages’ unique architectural style, transportation needs, geographical location and surrounding eco-system.
(2) Evaluate the currently completed slabstone houses. In order to create an efficient management model capable of analyzing the variable degree of the refurbishment projects, it is necessary to collect information regarding village location, quantity of houses rebuilt, changes in the original structures, and the adaptation of the living space to meet needs of the inhabitants.

The management of aboriginal dwellings will focus on the enhancement of the quality of the living space and how to simultaneously preserve the ethnic, cultural, and ecological characteristics of the village site. The refurbishment process needs to consider North Paiwan’s ecosystem, which uses primitive materials and traditional construction methods. The slabstone is a most unique primitive material and it is used in the construction of the bearing wall, which supports the main structure of house. The massiveness and durability of the slabstone will sustain the tradition dwelling and original character forever. Regarding the structure of the slabstone house, each outer wall of the dwelling is 60 cm to 100cm thick. If the slabstone can be perfectly constructed, the slabstone house will be able to endure the weight of any newly designed roof. By overlapping the slabstones, the house becomes more energy efficient because the house is well insulated by the slabstone. The thickness of the slabstone wall allows the interior newly-built walls to flawlessly coexist with the outer wall. The structure of dual wall efficiently retains heat and ventilates humidity, which is the perfect energy-saving structure for mountain area provinces, and is also environmentally friendly. The material and structure of the slabstone house are important factors relative to the ecological environment and are also used in recycling unwanted waste material from the social environment, which benefits the ecosystem.

Therefore, this research will address the continuity of Paiwanese architectural integrity through the study of ecological refurbishment. To successfully refurbish the Paiwanese dwellings, the slabstone must be efficiently used to support the bearing wall and this study will propose enhancement of the standard of the architectural function assessment for the future development projects. According to ‘Construction Material and Equipment Classification’ in CSBME (Code System for Building Material and Equipments) the construction materials and framework of Paiwanese slabstone dwellings can be categorized by: existing slabstone houses, the relocated village positions, the quantity of housing, the degree of destruction of slabstone houses, and evaluation of adaptation for the modern living space. In addition, CBR (Case-based Reasoning) will guide the development plan for the various regional slabstone houses for suitability and durability. The study will analyze the CBR data and the results of each case and then propose a more complete solution for the refurbishment model.

4. CODE SYSTEM FOR BUILDING MATERIAL AND EQUIPMENTS ANALYSIS (CSBME)

By utilizing the existing field study data and the CSBME (CODE SYSTEM FOR BUILDING MATERIAL AND EQUIPMENTS ANALYSIS), the structures of slabstone houses are grouped into the following categories:
Group A: The main structure and façade maintains its traditional slabstone characteristics but the interior partitions of the secondary structure reinforced with steel frame, thus increasing the living area space. Currently these dwelling are non-inhabited and not for private use.

Group B: The main structure maintains its traditional slabstone characteristics with slight changes on the outside façade, but the secondary structure is replaced with different materials and structure; decorative structure utilizes modern wooden window casings and a metal main entry door.

Group C: The main structure is replaced with steel or brick, which increases the interior space for multi-purpose use. The secondary structure is replaced by different materials and construction. The decorative structure is completely replaced by using modern wooden window casings and a metal main entry door.

Group D: The main structure is replaced with different building materials and non traditional design. The secondary structure is replaced by different materials and construction. The decoration structure is completely remodeled using modern windows and a metal entry door.

Group E: The main structure is incomplete. The secondary and decorative structure has been destroyed

Group F: The main structure is incompleed, but, however, parts of the foundation and wall segments still exist.

According to the CSBME assessment, this study will review the feasibility of the refurbishment model. The refurbishment model will be based on the guidelines of the sustainable housing development concepts, “Ecology, Nature, No Mortar”, and use traditional building materials and methods. Based on the concept of “Reuse”, the study proposes an easier and more manageable refurbishment model that the government should take to meet their commitment to sustainable development for Paiwanese people. Below is a list of different types of slabstone dwellings.

4.1 AREAS HAVE NEVER BEEN RELOCATED SUCH AS WU-TAI.

Table 1. Rebuild flagstone houses

<table>
<thead>
<tr>
<th>Group D : Wu-tai</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main structural</strong>: bearing wall combine slabstone and concrete structure.</td>
</tr>
<tr>
<td><strong>Secondary structure</strong>: steel frame, lay roofing slabstone.</td>
</tr>
<tr>
<td><strong>Decoration structure</strong>: steel sash, wood board.</td>
</tr>
</tbody>
</table>

| **Main structural**: bearing wall combine slabstone and concrete structure. |
| **Secondary structure**: steel frame, lay roofing slabstone. |
| **Decoration structure**: steel sash, wood board. |
4.2 AREAS HAVE BEEN RELOCATED AND CONTINUE TO LIVE SUCH AS DA-LAI, FA-WAN, CHI-KA.

Table 2. Repaired slabstone houses and Refurbish slabstone houses

<table>
<thead>
<tr>
<th>Group C: Da-lai</th>
<th>Group D : Fa-wam</th>
<th>Group A : Chi-ka</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main structural</strong>: slabstone of bearing wall, steel structure.</td>
<td><strong>Main structural</strong>: slabstone of bearing wall, brick wall with cement.</td>
<td><strong>Main structural</strong>: slabstone of bearing wall, wooden bean.</td>
</tr>
<tr>
<td><strong>Secondary structure</strong>: steel frame, lay roofing slabstone.</td>
<td><strong>Secondary structure</strong>: lay roofing slabstone.</td>
<td><strong>Secondary structure</strong>: wood studding, tin roofing, tinplate wall.</td>
</tr>
<tr>
<td><strong>Decoration structure</strong>: frame for fittings.</td>
<td><strong>Decoration structure</strong>: frame for fittings.</td>
<td><strong>Decoration structure</strong>: frame for fittings.</td>
</tr>
<tr>
<td><strong>Main structural</strong>: concrete structure, wooden bean.</td>
<td><strong>Secondary structure</strong>: wood studding, timber partition, lay roofing board.</td>
<td><strong>Main structural</strong>: slabstone of bearing wall, wooden bean.</td>
</tr>
<tr>
<td><strong>Secondary structure</strong>: lay roofing board, lay roofing slabstone, wood siding wall.</td>
<td><strong>Secondary structure</strong>: lay roofing board, lay roofing slabstone, stand up front wall.</td>
<td><strong>Secondary structure</strong>: lay roofing board, lay roofing slabstone, wood siding wall.</td>
</tr>
</tbody>
</table>
4.3 AREAS HAVE BEEN RELOCATED BUT ABANDONED SUCH AS TAI-WU, LI-LEE, LAI-YI.

Table 3. Repaired slabstone houses and Refurbish slabstone houses

<table>
<thead>
<tr>
<th>Group A : Tai-wu</th>
<th>Group B : Li-lee</th>
<th>Group A, Group F: Lai-yi</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Tai-wu House" /></td>
<td><img src="image2" alt="Li-lee House" /></td>
<td><img src="image3" alt="Lai-yi House" /></td>
</tr>
</tbody>
</table>

Group A, Group F: Lai-yi

| Main structural : slabstone of bearing wall, wooden beam. | Main structural : slabstone of bearing wall, wooden beam. |
| Decoration structure : lay slabstone flooring. | |
5. ACCORDING TO THE CBR (CASE-BASED REASONING) ANALYSIS

Following the categorization in the CSBME, the study relies on the refurbishment model to restore the existing slabstone houses. According to the flow chart, the study will collect the field data, compile statistics, determine the original housing construction system, and search for similar cases to find the proposed solution. The assessment of the refurbishment model for the aboriginal dwelling must be based on the original construction system and the changes of the past construction styles to establish a guideline for future projects.

![Figure 1: The process of refurbishing slabstone houses](image)

**Retrieve:** From the existing slabstone site, the village transformation, and the field study data material shows that in the Ma Chia Village, new migrants and old residents exist together in one location whereas typical villages are segregated into living areas based on the amount of time residing in that community. The land from the old village originally belonged to the aboriginal people and was transferred into a national owned special group collective property (before the Japanese Occupation, during the Japanese Occupation, and after the KMT retreat) to be transferred into private property then returned to the original aboriginal owners or publicly owned by the town center or partially owned by the village. Due to transportation issues, the aboriginals find it difficult to manage their property and are often willing to forfeit their property. This study tries to categorize village conditions to search for similar case studies. The villages were categorized into three groups.

1. Areas where the village and its residents have not been relocated. Chi-Ka Village has a unique terrain, a self contained ecosystem, untouched natural resources, and limited government influence regarding living quality improvements on safety reinforcement and village safety policy. To restore the Chi-Ka Village is truly to return to its original culture and lifestyle.

2. Areas where the village and residents have been relocated and continue to live. The culture of the old Dai Lai Village was influenced by previous foreign occupation and still offers a self sufficient agricultural lifestyle. The utilization of natural resources is continually expanded thus stimulating economic activity and developing a tourism business to evoke the spirit of the aboriginal culture. The old Fa Wan and old Dai Lai village both show tremendous improvement as result of the government guidance upon living quality, village safety, and community planning. Ma Chia village combines the old and new village styles. The relationship of the economically and socially intertwined villages of Ma Chia and Fa Wan is reflected in their remodeling construction work in which the old and new structures coexist side by side.

3. Areas where residents have been relocated and are currently abandoned. From the study, the majority of the mountainous slabstone sites have been deserted and the agricultural land is depleted. The nature resources are unused and the old village has ceased to exist while the site is being reclaimed by nature.
Reuse: The reuse of sustainable refurbishment is based on the assessment of the village study. For example, in old Chi-Ka Village (where the residents have never been relocated), there is a close relationship between the existing slabstone houses and their surrounding environment. The village residents still maintain a self-contained village agricultural lifestyle. The area has never been developed, which is a key element to a successful sustainable refurbishment model. Both Old Dai Lai and Fa Wan Villages have a smattering of returning villagers, who resume their agricultural lifestyles and repair their ancestral homes. The entire village maintenance is shouldered by the few returning villagers. Relocated and continue to live there in MaChia Village the original village style is invaded by overzealous and unplanned development. This village’s sustainable model should be based on moderate and controlled development principles. The areas where residents have been relocated are currently deserted. This current study is concentrated on Tai Wu, Li Lee, and Lai Yi villages; these villages are deserted because of the treacherous transportation routes that must be used to access these area. The dilemma of reusing these sites in the future will be complicated by these continuous transportation problems. However, old Li Lee’s pristine condition makes it an ideal case study for the conservation of the natural environment with controlled development.

Revise: The revision process enables problem solving by adjusting or modifying previous solutions. For a successful refurbishment five critical areas must be addressed. These are the sustainability of slabstone housing, geographical site location, quantity of remodeled houses in that area, stage of building development, and adaptation for the client’s changing space needs. The realistic goal of sustainable slabstone housing must achieve a modern living standard and maintain appropriate living space dimensions. In addition, the key components to a complete refurbishment model will also need to include the assessment of the existing slabstone houses’ structure, the scrutiny and analysis of the collected field study data and the contingent plan upon the various local conditions.

Retain: Confirm the new solution and add to the cumulative database for use in future projects. The success of sustainability in the refurbishment project depends on how well the material and structure are combined. The unique construction system of the North Paiwanese slabstone house can be divided into two different structure systems. The first system is the overlapping stacks system, which is ordered by the main structure first, followed by the secondary structure, and then followed by the decorative structure. This kind of refurbishment model will differ if using the one part integration system. Regarding to utilize construction materials, the combination of local slabstone and timber is able to reveal massiveness of the primary feature. This can perfectly achieve the balance of the structure and material.

Figure 2: The process of refurbish slabstone houses

6. CONCLUSION AND SUGGESTION

This study investigates and develops a refurbishment management model that concentrates on the three major categories of slabstone houses delineated earlier in the Research Method. In an attempt to establish a workable refurbishment model, this research includes field studies, interviews, and the compilation and analysis of existing village construction data including information regarding existing slabstone house structures. By examining the relationship
between social and cultural perspectives as well as the environmental impact of slabstone, this study strives to create a systematic refurbishment management model.

6.1 Cultural and Social Perspective

New housing construction attempts to coordinate current needs with the government’s aboriginal sustainability development project. The governmental guidelines regarding the reuse of the village site and the slabstone housing is incomplete thus hampering the successful completion of village reconstruction as well as dampening the community’s enthusiasm for the entire project. According to the study results, the abandoned village Lai-Yi consists of 200 slabstone houses which have been carefully protected by preservationists of traditional culture and aboriginal policy. Using metal doors and stone fencing to isolate the old village site while effectively preserving the slabstone houses for the next generation, raises questions about the purpose of the preservation. The village chief and some of the villagers intend to turn old Lai-Yi into a tourist destination using government development funds to restore some of the slabstone houses so that tourists can experience the culture and a way of life from a past era. Enclosing the remaining slabstone sites prevent further destruction or removal of slabstone. Some of relocated villagers move their ancestral homes’ construction materials piece by piece to rebuild and to live in a traditional slabstone house structure in close proximity to modern housing.

One of the cases from the field study concerns villagers relocated to Da Lai where access to their homes is contingent upon bridges. Due to the ability to limit access to the mountain area, the village environment can return to its pristine state unsoiled by excessive human influence. Another case concerns Fa-wan village, one member of the “Paiwanese Development association,” Mr. Yuan, reconstructed his ancestors’ house and upgraded the interior structure with modern facilities turning the old slabstone house into an inhabitable but incongruent space. Lack of a definitive refurbishment standard led to many people following Mr. Yuan’s example (i.e. metal door and the use of concrete on the slabstone) which resulted in a colony of newly rebuilt houses discordant with the surrounding village. Like bamboo shooting up after a spring shower, these rebuilt houses continue to proliferate.

In summary, the findings based on the social and cultural factors of our field investigations are:

1. Villagers still residing in original slabstone houses as a result of either never relocating or relocating to other traditional slabstone houses seem to increase their cultural awareness and the importance of preserving their ethnic identity. These villagers tend to restore their slabstone houses using modern building techniques and materials to produce a functional space. However, the concept to “Reuse” the old slabstone site must further be joined with the refurbishment management process in order to obtain a product that brings the old traditional spirit and values into the new living space.

2. There are two situations resulting from uninhabited dwellings. In the first situation, there has been no effort to preserve the existing slabstone houses thus they are quickly dilapidated. In the second situation, there is a tendency to overprotect the abandoned slabstone dwellings resulting in the slabstone coexisting with the natural environment. Since the dwellings are uninhabited, maintenance management is difficult resulting in secondary damage although extreme preservation measures have been taken, therefore, further evaluation of this preservation policy is recommended as the natural environment is reclaiming the site.
6.2 Sustainable Management of the Ecosystems

A key characteristic of slabstone dwellings is the utilization of the following locally available materials: timber cut from nearby mountains, vegetation grown to stem soil erosion, and slabstone naturally formed by wind and years of rainfall. When a large piece of rock falls from the mountain, it is broken into smaller pieces, which the local people can use for construction. Nowadays, the village ecosystem is unable to meet the demand for slabstone thus the restoration has two problems. First, there is a shortage of natural materials, which includes natural stone and wood. Secondly, the skills needed to craft the slabstone and local timbers are severely limited because the localized construction knowledge is rarely passed down to the younger generation. In one of the case studies, village chief Hong and local villager Mr. Shin, both reconstructed houses by using their old slabstone materials and purchasing additional slabstone from their villagers. Recognizing the value of the slabstone, the villagers secure their remaining slabstone with metal wires.

Regarding the construction material, the use of natural and local resources is advantageous to local architects. The slabstone and mountain timber are more accessible and their use may eliminate some of the common labor and transportation problems found on most construction sites. These materials also provide adequate protection against the mountain climate and terrain. To support the weight of the main structure and create an interlocking horizontal and vertical structure, the traditional construction method utilizes a variety of different sized slabstone in both the main and secondary structure. In the secondary structure, especially in abandoned houses, the wooden horizontal roof beam and the wooden framework are prone to rot. Also, the decorative structure is typically an easily replaced wooden material. The proposed refurbishment model should dictate the replacement of the easily damaged wooden material with light weight steel or reusable material, especially in one span beam houses. It can reinforce the one part formation and gravities of the slabstone to fit the requirements of the stability. It is very urgent to establish a refurbishment management model that will stress the importance of meeting the need of safety issue.

The refurbishment management model must take into account the structure as well as the materials utilized in the slabstone house in order to maintain the ecosystem’s natural cycle. Some goals of a successful refurbishment management model are:
1. To have the minimal environmental impact and to reduce the new material usage by reusing existing material or recycled material.
2. To reduce the amount of building material by maximizing efficiency through the use of natural resources, especially to insulate and control ambient temperature.
3. To extend the life span of slabstone of houses by avoiding additional demolition of buildings, choosing the least invasive modifications, or doing partial remodeling.
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