Environmental Sustainability and the Rebirth of a Cultural Heritage:  
A Case Study of the Old Neihu Quarry in Taipei, Taiwan

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Abstract

This article uses the Old Neihu Quarry as a case study to discuss design strategy for the recovery and maintenance of a disappearing cultural heritage through the process of rebirth and environmental sustainability. Based on the history research method and fieldwork, this study investigates the history of the construction of the Taipei City Wall and investigates the strategy of environmental sustainability of the Old Neihu Quarry. The design strategy for the reconstruction of the Old Neihu Quarry should include space for expositions; a place within the quarry park for rock climbing, an Eco-museum and experience of the mining activity. The strategy should integrate the landscape layout with the historical stones forming a self-exploratory trail in a natural order, representing its original historical condition as well as showing the later changes. By using historical remains, an Eco-museum should be built through the artistic rebirth of the cultural landscape and heritage.

Keywords: the Old Neihu Quarry; environmental sustainability; cultural heritage; Eco-museum; Taipei City Wall

1. Introduction

Taiwan's architectural conservation emphasizes the single building but lacks the concept of environmental sustainability and the rebirth of cultural heritage. Heritage was not cherished by the people because they lacked the concept of preservation. Consequently, Taiwan's heritage quickly disappeared in the 20th century.

This paper wishes to explore the issue of the preservation of Taiwan's heritage and develop a design strategy1 combining environmental sustainability with the concept of an Eco-museum.

The President's Council on Sustainable Development, established in 1993 by Presidential Executive Order #12852, adopted the definition of "Sustainable Development" defined in the report "Our Common Future" (1987), by the World Commission on Environment and Development as "... to meet the needs of the present without compromising the ability of future generations to meet their own needs".

In 1996 the International Institute for Sustainable Development developed a Sample Policy Framework which proposed that a sustainability index "would give decision-makers the tools to rate policies and programs against each other" (International Institute for Sustainable Development, 1996: 9). Ravi Jain (2005) argued that, "The ability to analyze different alternatives or to assess progress towards sustainability will then depend on establishing measurable entities or metrics used for sustainability."

In Wikipedia, sustainability is defined as "an attempt to provide the best outcomes for the human and natural environments both now and into the indefinite future." It relates to the continuity of economic, social, institutional and environmental aspects of human society, as well as the non-human environment.

A thorough investigation of environmental sustainability should include not only the technological innovation in architecture but also the historical heritage, the cultural landscape, and the provision for environmental preservation. This is especially true when faced with the remains of an industry and heritage that has disappeared and the question of how to approach the revival of this cultural heritage.

In order to discuss the case of the Old Neihu Quarry in Taipei, the concept of sustainable architecture needs to be clearly defined.

Kremers (1995) claims that the term "sustainable architecture,"used to describe the movement associated with environmentally conscious architectural design created ambivalence and confusion. The popular interpretation of the words "sustainable architecture"describes an approach to architectural design that minimizes sustenance or resource
consumption so as to prolong the availability of natural resources.

The definition of sustainable architecture is an approach to architectural design that emphasizes the place of buildings within both the local ecosystem and the global environment. Sustainable architecture, framed by the larger discussion on sustainability, seeks to minimize the negative environmental impact of buildings by enhancing the efficiency of the materials and therefore the moderation of their use and their energy, as well as their developmental space requirements.

Another concept is the Eco-museum. Many museologists have sought to define the distinctive features of Eco-museums, listing their characteristics. Peter Davis (1999), states that the degree to which a museum demonstrates true Eco-museum characteristics could be gauged by the amount of overlap in a three-circle model (community, museum and social, cultural and natural environment) and in its ability to capture a sense of place. Kazuochi Hoara (1998) gives an effective description of the contents of the circles. Maurizio Maggi (2002) defines an Eco-museum as a very special kind of museum based on how a local community takes care of a place. So, an Eco-museum is a museum focused on the identity of a place, largely based on local participation with the aim of enhancing that local community's welfare and development.

2. The Method

The quarry is a type of open-pit mine from which rock or minerals are extracted. Quarries are generally used for extracting building materials, such as dimension stone and are usually shallower than other types of open-pit mine.

The purpose of this paper is to discuss the construction of the Taipei City Wall and the Old Neihu Quarry that supplied the building material for the wall, and to make suggestions for the sustainability of maintaining this disappearing heritage. This study focuses on the Old Neihu Quarry. The Area of the Old Neihu Quarry in the Qing Dynasty includes Jimmian Mountain and Siaojianmian Mountain.

This study uses the historical research method and fieldwork. The process is as follows. First, we collected the primary sources, including the original documents of the Taipei City Wall and the Old Neihu Quarry, construction, transition, time, process, and other important matters. Second, we collected the secondary sources, including any literature on the Old Neihu Quarry and the development of the Taipei City Wall during the Qing Dynasty and its demolition under Japanese rule. Third, we determined the historical features and uniqueness of our case and analyzed the relationship between its environmental sustainability and the rediscovery of the cultural heritage it contains.

This study focused on analyzing the history of the Old Neihu Quarry, how its landscape has been transformed and on discovering the uniqueness of the site. The results helped us provide a historical imagery of this landscape. In addition, it will be useful for creating a sustainable design strategy and for making suggestions to maintain this particular cultural heritage.

Only a few attempts have been made to preserve the history of the Old Neihu Quarry. Most of the literature on the Old Neihu Quarry came from the Taipei City Wall construction. The main documents included Fujisawa (1931), Su (1953), Huang (1953), Taipei City Archives Committee (1979), Chen (1981), Yin (1984), Lee (1995) and Mii (2002).

The first scholar to give much attention to the Old Neihu Quarry was Fujisawa (1931), who wrote a paper to analyze the conditions of the quarries in Taiwan. He studied the problem of the petrologic experiment regarding the quarry and in his work he described the conditions at the Old Neihu Quarry during the Japanese rule. Yin (1984) discussed the origin, the destruction and the history of the Taipei City Wall construction. Lee (1995) first discussed the relationship between the Taipei City Wall and the Old Neihu Quarry, and Mii (2002) carried on from there and analyzed the quarry's historical features and developed a plan to revitalize the Old Neihu Quarry. The author participated in this study and carried out a historical survey in 2002.

In order to determine how to combine environmental sustainability with the original landscape, two similar cases were studied; the Aixoni Theater and the Old Dionysos Quarries, both in Greece.

The Aixoni Sculpture Theater is located on Mount Hymetos, near Athens, and is located at the entrance of an old quarry. The project started in 1984 and took two years to complete. Reinforced concrete was used for the construction of the three levels, including use of the local rock and stone for the leveling of the three stages. These stages have alternative and flexible uses and can house any kind of open-air performance or exhibition. The stages are symmetrically surrounded by the seating areas, made of large rocks and pieces of granite, water fountains, locally grown plants and trees.

The Old Dionysos Quarries are converted by sculptress Nella Gollanda and architect Aspasia Kouzoupis into an environmental sculpture site. It is a single-artist-designed park commissioned by "Dionysos Marbles Ltd." in 1995. Some of the abandoned installations are reused to consolidate visitor's needs. Small hand-made buildings built with the same marble match perfectly with the environment. The stones were picked by the artist and placed by quarrymen. Dry-wall techniques were used to match the wall-construction of the surrounding countryside. The artificial hills were made from the quarried marble accumulated during the years of operation, forming steep slopes that can be visited through sculpted paths.
supported on some of the original installations.

It is evident that the present study must discuss the historical survey of the Old Neihu Quarry in detail. First, the study focuses on the historical relationship between the Old Neihu Quarry and Taipei City Wall construction in the Qing Dynasty. Second, the study discusses the features of the Old Neihu Quarry and the problem of the disappeared landscape. Finally, the study discusses the design strategy of an Eco-museum and sustainable architecture to enhance the historical meanings and preservation.

3. A Survey of the Construction of the Taipei City Wall

The main reasons for the construction of the Taipei City Wall were political and social. In 1874, on the pretext those Japanese fishermen had been killed by Taiwanese aborigines when they drifted along Bayow Bay (Pingtung), the Japanese government ordered a military attack, and the aboriginals of the Peony Community were subsequently massacred by the Japanese soldiers. This became known as the "Peony Community Affair". The Qing government then sent Lord Pao-chen Shen to act as an envoy and negotiate with the Japanese. That same year, a peace treaty between China and Japan was signed, and the Japanese military retreated. After that incident the Qing court changed the way it used to deal with matters regarding Taiwan. They started to select and send officials over to Taiwan, strengthen the coast defenses, manage the forestry, and develop businesses. In 1875, Pao-chen Shen recommended that the court divide Taiwan into Taiwan and Taipei prefectures, build a wall for Taipei City north of Dajia Creek, and establish one prefecture and three counties in northern Taiwan (Yi, 1983; Taipei City Archives Committee, 1979). That same year, on December 20, the "Taipei Prefecture" in Manka was established. It also governed Tamshui County, Xinzhe County, Yilan County, and Keelung Hall. In the beginning Taipei Prefecture was located in Tamshui Hall. In 1880 it was moved to Taipei and Tamshui Hall was changed into Xinzhe Hall.

Because of its important economic and political position, it was decided to build a wall around Taipei City, to ensure the security of northern Taiwan and to protect it against the acquisitive intrusion of Western imperialism. Through the cooperation of Taiwanese officials and local civilians, the Taipei City Wall was completed in 1884 (Huang, 1953; Chen, 1981; Yi, 1983:15). The Taipei City Wall was built in a rectangular shape, the only one of its kind in Taiwan since all others were round or irregular (Chen, 1981). When the Taipei City Wall was in the planning stage, it was recommended by some officials that the location of the wall should be between Manka and Dadaocheng, and the Tamshui River. These three places formed a triangle in which the two old towns of Manka and Dadaocheng were connected. Hence, "Manka", "Dadaocheng", and "Inside the City Wall" became the center of the development of Taipei City.

The Taipei City Wall was 1,506 zhang long and 1.5 zhang high, and had five gates.

At the end of 1993, relics of the Taipei City Wall; some of the foundations, an artillery battery and water gates, were discovered near the intersections of Zhongxiao W. Rd. with Guanqian Rd. and Huaining St. during excavation work for the CN253B underground rapid transit system. In 1994, some old wall stones were found in the Taipei Mass Rapid Transit System (Taipei MRT) construction site. Work was halted immediately and an investigation was carried out by historical preservation experts. The unearthed relics were secured and a team of specialists was set up to
arrange further investigation, preservation, relocation and exhibition. Later, Lee (1995) discovered that most of Taipei City Wall stones came from the Old Neihu Quarry and some from Guanyin Mountain. The amount was about 30,000 stones (Lee, 1995: 44). No detailed information of the suppliers is now available. However, according to the written marks left on the stones, there were at least two suppliers of wall stones (Lee, 1995: 44).

The Old Neihu Quarry officially became a cultural heritage site in 1998 because of its cultural significance in the history of Taipei. According to the author's survey, the wall stones measure about 90 cm long x 24 cm wide x 24 cm high (which is roughly 1 foot x 1 foot x 3 feet). The only wall stones left in existence are those of the North Gate, the old Taipei City Jail and the Peitou Railway Factory in Taipei.

4. A Survey of the Quarry in Neihu

The name Neihu, meaning "inner basin", appeared in 1757 during the Qing Dynasty. Originally the population of the Neihu area consisted of the Litts, Cattaije-Dedan and Cattaije-Bona tribes (Weng, 1998: 35-39; Chen, 2000: 14-16).

These aborigines however disappeared soon after the Han Chinese immigration started in the mid-1600s, when people from Fujian province came for agricultural purposes and stayed.

During the Qing Dynasty, the government wanted to build the Taipei City Wall. For this purpose they mined the quarry in Siaojinmian Mountain in the 1870s and then the quarry in Jinmian Mountain in the 1880s. In the author's survey, the old Neihu Quarry is shown to be quite well preserved. Long, continuous, big or small chiseled holes as well as a stone-carrying slope were clearly visible.

One of the questions often asked is, how the stones were moved to Taipei City from the old Neihu Quarry. The quarry was about 7 kilometers from the Taipei City Wall and the number of stones was about 30,000 (Lee, 1995: 44). The most likely explanation is that the stones were literally slid down the mountain in a shallow ditch dug by the workers. They were then moved by road to the nearby wharf. Workers pushed the carrier on a convenient railway, located along what
on to the Foreigner Ditch in Dalongdong to meet the Tamshui River. Later, the boats sailed in the reverse direction on the Tamshui River to the head of the river near the North Gate. There the stones were unloaded and moved by wagon to the site of the Taipei City Wall.

There is a lot of evidence that indicates that the Old Neihu Quarry was called "Dashii Mountain" and "Beishi Lake" during the Japanese period, meaning "Mining Stone Mountain"by residents who lived there. During the Japanese occupation, the purpose of the quarry was to produce stone for filling up the ditches in Taipei. The stones from the demolished Taipei City Wall were used for public buildings, new military camps and new ditches (Su, 1953: 50-51; Taipei City Archives Committee, 1979: 129; Fujisawa, 1931: 5-9).

Fujisawa writes that stone mining in the Old Neihu Quarry during the period of Japanese occupation covered 297.6 acres and that the type of stone was sandstone (Fujisawa, 1931: 5). Geologists have said that the Old Neihu Quarry was formed by Miocene period sandstone. The composition of the rock is quartz, small rock fragments, cement and feldspar. The Mohs scale is 5-6 degree (Fujisawa, 1931: 18).

Here, sandstone is made up of fragments of quartz and feldspar. One of its features is fine grains of 0.02 to 2 mm, while its overall color is brown, gray, pink or red. It is formed by erosion and granites, and was transported over a relatively short distance. The majority of the sandstones seen are quartz and feldspar sandstone.

Following the end of Japanese occupation, there were only two quarries left in the Jinmian and Siaojinmian Mountains and stone quarrying was infrequent. This place seemed to have been forgotten by later generations until stones were found by workers during construction of the Taipei Mass Rapid Transit System (Taipei MRT). During the time of the Japanese occupation there used to be a lot of stone fragments at the base of Siaojinmian Mountain near Takming College in the Neihu area. The locals carried all of the stone fragments away, mostly by wheelbarrow or pushcart. They used the ground-up stone shards for painting walls or the broken pieces to build walls. The mid-slope of the mountain is now overgrown by weeds. At the foot of the mountain, 20 families have already built dwellings and have taken up residence. All of the original terrain has been altered. The light railway system, and the old wharf have long ago disappeared.

5. Suggestions Regarding Environmental Sustainability for the Old Neihu Quarry

Mii pointed out eight important items that were relevant as historical features of the Old Neihu Quarry (Mii, 2002: 37-38):

(1) Historical remains of the quarry, including seven places in the Old Neihu Quarry.
(2) Slide from mountain to lowland.
(3) Abandoned stone.
(4) Temporary resting place for visitors.
(5) Main stairway into the Old Neihu Quarry.
(6) Discarded stones in the Old Neihu Quarry.
(7) Stone remains of the Taiwan City Wall at the Peitou railway factory and elsewhere.
(8) The disappeared light railway and the old wharfs for transporting the stones in the Neihu area.

The environmental problems are emphasized by the natural weathering, plant cover and adhesion, man-made destruction, mudflows and landslides (Mii, 2002: 52-53).

It is evident from the above that the government should designate Jianmian and Siaojinmian Mountains, the disappeared light railway and the old wharfs as historical heritage sites in order to preserve some of the stone quarrying activities of Taipei's past.

However, this suggestion leaves us with no connection between what's left of our stone quarrying heritage and the landscapes that have disappeared because the sites are so widely separated. It also does not consider the situation of the Taipei City Wall. This study would like to make the following suggestion.

To the above suggestions we should add locations for expositions, such as the historical remains of the quarry, as well as recover and preserve the stone remains of the stone factory at the Peitou railway and turn it into a heritage museum. The disappeared light
Table 1. Strategy and Suggestions Regarding Environmental Sustainability and Revival of the Old Neihu Quarry

<table>
<thead>
<tr>
<th>The mid-slope of Siaojinmian Mountain</th>
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<td></td>
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<td>Create self-exploration trail</td>
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<td>Geological park</td>
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<td>Seven places of historical remains from the quarry, plus the slide for sliding the stones down Jinmian Mountain</td>
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<td>Abandoned stones on Jinmian Mountain and elsewhere</td>
<td>Arrangement</td>
<td>Collect the abandoned stones and move them to the Eco-museum</td>
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<td></td>
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<td>Prevent the stones from weathering.</td>
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<tr>
<td>Demolished stones from the Peitou railway factory and elsewhere</td>
<td>Arrangement</td>
<td>Collect the demolished stones and move them to the Eco-museum</td>
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<td></td>
<td></td>
<td>Prevent the stones from weathering.</td>
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<td>Temporary resting place for travelers</td>
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<tr>
<td>Main stairway of the Old Neihu Quarry</td>
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<td>Create climbing paths for the self-exploration trail.</td>
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<td>Disappeared light railway and old wharfs for transporting the stones</td>
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<td>The disappeared wharfs</td>
<td>Environmental design</td>
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<td>Use existing North Gate, East Gate, South Gate, and Little South Gate to create the image of the disappeared Taipei City Wall.</td>
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<td>Environmental design for the concept of the disappeared old wharfs.</td>
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The quarry has the following characteristics: (1) It is old. (2) It has value as a heritage site. (3) It has its own unique identity. (4) It has a rich history. (5) There are remains of materials and structures. The Old Neihu Quarry is an area where a geological heritage site can be part of a holistic concept of protection, education and sustainable development.

There are seven strategic principles needed for the Old Neihu Quarry: (1) Sustainability. (2) Comprehension. (3) Cross-sectional. (4) Integration. (5) Participation. (6) Process-Oriented. (7) Viability. The present study suggests that the environmental sustainability in this case should take the form of an Eco-museum and a Geopark. Especially in light of the fact that the light railway and the old wharf have disappeared and that the Old Neihu Quarry has become a climbing trail, the strategy should concentrate on these questions:

(1) Which values of the Old Neihu Quarry should be protected?
(2) How can we protect this heritage effectively and make it economically sustainable?
(3) How can we provide activities for visitors in appropriate and safe conditions?
(4) How can we educate the different kinds of visitors, including the regular everyday tourist, purposeful tourist, sightseeing tourist, serendipitous tourist, casual tourist and incidental tourist?
(5) How can we establish a partner-relationship between the museum and the locals for activities which facilitate both parties?

If we take the concept of an Eco-museum, this case should have the characteristic of overlapping three circles comprising community, museum and the social, cultural and natural environment.

The quarry should take into account the whole geographical setting of the region, and should not only include sites of geological significance. Non-geological themes play an integral part, especially when their relationship to the landscape and the geology can be demonstrated to visitors. For this reason, it is necessary to include also sites of ecological, archaeological, historical or cultural value. Preservation of the Old Neihu Quarry should be a bottom-up process. It should be based on a strong multi-task-force concept with political will and long-term financial support, including a professional management structure, which adopts its own territorial policy for sustainable regional socio-economic and cultural development.

The initiative to turn the Old Neihu Quarry into an Eco-museum must therefore come from local communities and authorities with a strong commitment to develop and implement a management plan, whilst protecting the landscape in which they live. Therefore, this project must provide organizational arrangements that involve public authorities, local communities, private interests, and both research and educational bodies in the design and running of the park, and include them in the regional economic and cultural development plan and activities. This cooperation will stimulate discussion and encourage partnerships between the different groups having a vested interest in the area, and will motivate and mobilize local authorities and the local population.

Sustainable tourism and other economic activities within the Old Neihu Quarry can only be successful if carried out in cooperation with local communities. Tourism activities have to be conceived specifically to match local conditions and the natural and cultural character of the area, and must fully respect the traditions of the local population.

It is strongly advised during the preparatory phase, to seek co-operation with local public and tourism bodies, local communities and private interest groups and to broaden the composition of the start-up team in charge of the project. The start-up team should be representative of the scientific, conservation and socio-economic communities of the area.
6. Conclusion

This study investigated the history of the construction of the Taipei City Wall and the Old Neihu Quarry. It discussed the strategy for environmental sustainability of the Old Neihu Quarry and connects the environmental sustainability and the preservation of a cultural heritage in an Eco-museum.

The historical meaning of the Old Neihu Quarry is special for the construction of Taipei City Wall. During the Japanese occupation, the purpose of the quarry was to produce stone for filling up the ditches in Taipei. The stones from the demolished Taipei City Wall were used for public buildings, new military camps and new ditches.

In the author's opinion, the original condition, whatever survived of the quarry; the Taipei City Wall, the landscape and the remaining stones should be combined as naturally as possible.

The sustainabilty of the design must include not only the conservation of the cultural or historical relics but also the environment. The design strategy must take tourists into consideration, and must emphasize the value of education and sustainable use. The sustainable strategy should add meaning by including a self-exploration path on Jinmian Mountain and become an Eco-museum. This heritage park could become an environmental sculpture site, and the old quarry could be converted by sculptors and architects. The design strategy of reconstructing the Old Neihu Quarry can add exposition spots, create a site and quarry park for rock climbing, mining activity and site visiting. The strategy should integrate the design of landscape and the historical stones into the self-exploration trail naturally, in order to represent the space, its original historical condition and later changes. By using historical remains, build an Eco-museum and the artistic rebirth of the landscape cultural heritage.

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