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CONSERVATION OF HISTORICAL BUILDINGS: A SUSTAINABLE APPROACH IN THE EARTH HOUSES OF FUJIAN CASE STUDY

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ABSTRACT

This paper has been developed in the framework of a larger research program, in which the University of Rome "Tor Vergata", the University of Fuzhou and the Academy of Science of China are jointly involved to study how to preserve historic centers. Cultural heritage is the intangible and tangible attributes of a society, including the natural heritage that are inherited from past generations, preserved in the present and granted for the next generations. Nowadays we consider the cultural heritage as a world heritage belonging to all the people of the world, irrespective on which territory they are located. This paper presents a model and a methodological approach on how to conserve cultural heritage in a sustainable way, by showing the case study of the Earth Houses (tulou) of Fujian (China), one of the most interesting type of Chinese rural dwellings, that could become an example for other cultural sites around the world, connecting the environmental and socio-economical aspect to the tourism development.

Key words: Historical buildings, Sustainable conservation, Fujian tulou, Earth houses, Sustainable tourism.

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Introduction

The World Tourism Organization defines the sustainable tourism development and management practices applicable to all forms of tourism in all types of destinations, including mass tourism and the various niche tourism segments. Sustainability principles refer to the environmental, economic and socio-cultural aspects of tourism development. Long-term suitable balance must be established between these three aspects for several reasons. First of all, it promotes both in public and private sectors the globally generation of social, economic and cultural benefits for host communities. Furthermore it reflects global development interests, for ensuring the supply of quality tourism products and avoiding or reducing negative impacts upon the natural and socio-cultural environments;

Sustainable Development steps in the last 20 years were as follow:

- 1987 Runtland Commission and Declaration on Sustainable Development.
- 1992 The Rio de Janeiro Declaration on Environment and Development - Agenda 21.
- 1998 UN preparation of Sustainable Tourism issue.
- 2000 UN Millennium Development Goals (up to 2015): Environmental Sustainability.
- 2001 UNESCO Universal Declaration on Cultural Diversity. / Rimini Charter on Sustainable Tourism.
- 2002 WSSD (World Summit on Sustainable Development) in Johannesburg. / Cape Town Conference on “Tourism against poverty”.
- 2004 International Year of Ecotourism.
- 2008 European year of Intercultural Dialogue.

This paper aims at presenting a possible model and methodological guidelines to conserve cultural heritage in a sustainable way throughout the case study of Earth Houses of Fujian. The examples we presented can be emblematic case studies valid for other cultural sites around the world, and give some suggestion on how to connect the environmental and socio-economical aspect to the tourism development.

Methodology

Preservation of cultural heritage in a sustainable way requires four main aspects to be considered, i.e. environmental, economical, socio-political and conservation aspects carried out properly. In this part we will discuss each of the aspects, in order to build a schedule-model of sustainable preservation.

Environmental Aspects

The environmental impact is the first problem that needs to be analyzed when conserving cultural heritage in a sustainable way. In this field we can differentiate: the promotion of environmental sensitivity, the use of the local materials, the analysis of the architectural compatibility and the endorsement of the use of the renewable energy. After a strict examination of the environmental impact, it is essential to consider the existing problems connected to the environment, e.g. the transportation system and the mobility of the area in general and the natural conditions (climate, morphological aspects of territory, human resources). In this way, it is easier to improve the results obtained, relating to the natural and cultural world of the region and in respect of the environmental system.

Economical Aspects

There is a mutual dependence between tourism and cultural heritage: while heritage resources play a key role in tourism development, tourism has the power to generate funds that make conservation possible and to provide funding for the preservation of a cultural or natural area. Moreover, tourism development can give birth to economic revitalization of the whole area. It can also generate employment opportunities and improve life conditions. Therefore a correct approach should move in the direction of increasing tourism benefits and decreasing negative effects [1]. A careful feasibility study must evaluate whether and how tourism can be developed because without sustainable oriented management tourism loses its potential for growth. In this sense, it should be identified and analyzed tourism market trends to develop long and short term tourism and economic forecasts, in order to increase and disseminate knowledge on specific market segments and generating markets [2].

On the other hand, in the area of tourism promotion it is important to develop benchmarking between the national tourism administrations or organizations and the local economic institutions that could define together some strategies to maximize the effectiveness and the return of tourism promotional activities.

In conclusion, the mission of the economic sector should be to create guidance, a national harmonization and recognition of best practices, minimum requirements, standards and management systems intervening in the quality of tourism activities, in order to finalize the tourism contribution to the local economic development [3].

Socio-political Aspects

Sustainable conservation of cultural heritage requires considering socio-political situation of the area where the monuments are. In order to do so, sociological research is needed. The research should include at least two stages. First stage should start with

gathering data on basics of history as well as political situation of the country where the heritage is. Essential information on the society structure should be also gathered.

The information on political situation and society should include:

- The definition of political system (e.g. What kind of political system has the country? Is it open for foreign relation or not? In what level?);
- Basic statistics on population (e.g. number of people, sources of income, average income, unemployment rate);
- Language;
- Information on ethnic groups;
- Information on religion (religious minorities);

The above information enables building a proper schedule for any further actions to be taken. Socio-political situation determines, whether it is possible to plan a sustainable developing of tourist infrastructure, or only sustainable conservation is possible. In order to collect above information, a technique of desk research should be applied.

In the second stage of research, detailed information on community where the cultural heritage is needs to be collected, e.g.:

- The knowledge of the community on the cultural heritage;
- The meaning the heritage for the people;
- Attitude for foreigners;

To investigate the above issues, qualitative research needs to be applied, e.g. In Depth Interviews (IDI) or if possible Focus Group Interviews (FGI) with local community leaders (e.g. political leaders, religious leaders) and representatives of different age groups. The research must be conducted with a usage of standard scenario (separate version for each group). The IDI should be recorded and transcribed for further analysis.

The research should end up with preparing a report containing all the information gathered, useful for investigating other aspects of sustainable preservation of cultural heritage.

Conservation Aspects

In the framework of a conservation program a multidisciplinary approach is needed. It should include the contribution of engineering, archaeology, chemistry and geology, and innovative techniques, which seem to give an impulse to the conservation problems. After a classification of architectural and/or structural typologies and performing typical materials analysis, such as for example carbon dating analysis to asses the age of the architectural objects for instance, it seems useful to assess static

and seismic risk, in order to evaluate the condition of the object, as well as its potential life. Environmental vibration techniques seem also profitable, in this case, to evaluate the current static situation of historical buildings without damaging the monument with more invasive investigation. The analysis will consider the dead load effect, mostly related with the construction technique and to the soil-structure interaction. The analysis will focus also on the assessment of the risk due to earthquake, or other dynamic actions (wind, traffic), and due to the decay of the material.

Local evaluation with geologists/mineralogists/chemists experts can be carried out in order to analyze chemical and mechanical parameters of the building materials. This is an important base for the evaluation of the current status of the structures to study the decay parameters (chemical and mechanical) and the pathologies related with masonry material. To this scope chemical and mineralogical composition, micro-structure, pore size distribution and density will be evaluated. In order to investigate the mechanical behavior of the buildings material could be useful to perform some laboratory test with the goal to obtain some information about the behavior of the materials.

In this framework only a multidisciplinary approach can provide a useful base to plan an efficient conservation action [5].

Case study: Earth Houses of Fujian: Sustainable Conservation and Enhancement

The *tulou*, or earth buildings, are to be found in Fujian, a province in the southern part of the People's Republic of China, whose name perhaps not by chance signifies "happy architecture". They have a very particular construction technique, unique in all China. It has evolved, in a way that is still not clearly understood, into a single building in the two primary forms of the square and the circle that encompasses the entire daily activities of a community. These simple buildings consist of a high wall in rammed earth surrounding a central area protected by a large tiled roof. Inside, wooden structures built against this wall constitute the sequence of dwellings, connected by stairs and access ways and facing onto a courtyard. For a long time, minor architecture is almost entirely ignored by official Chinese historiography and still practically unknown in the west.

It was only about ten years ago that the Chinese started to become aware of this exceptional heritage and of the need to protect it. Because these buildings are a rare testimony to a construction technique lost in the dawn of time but which, for very particular conditions, has evolved without any radical changes. The *tulou* are the prototype of an architecturally perfect system, a synthesis of house and city with their central courtyard for social aggregation and their ideal relationship with the environment, as well their two pure and opposite forms of the circle and the square.

But these constructions can also be used to reflect on the meaning of progress and quality in architecture. These simple and beautiful buildings, never identical but never in conflict with each other and with the environment, offer an important lesson for us architects or engineers, anxious inventors of transient fashions and new trends but inevitably in search of the same eternal values and emotions [4].

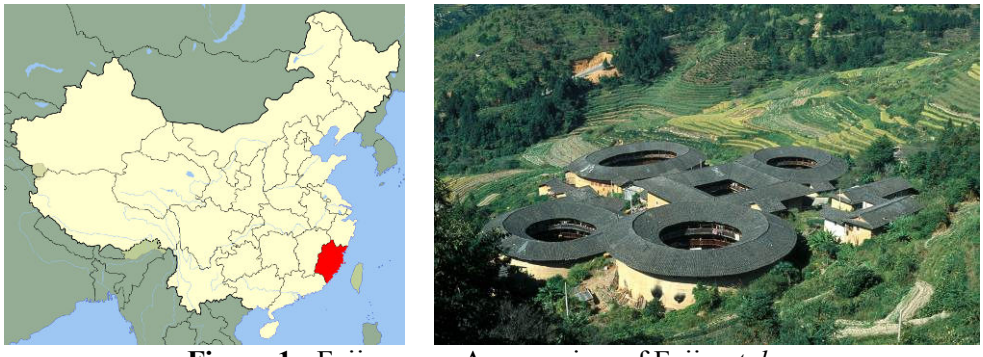

Figure 1 : Fujian area. An overview of Fujian *tulou*

Materials and Construction

Rammed-earth buildings represent the earliest type of construction in almost all civilizations. The buildings of Fujian are made with this technique, but they are unique in their great dimensions. They can achieve diameter of almost 70 meters and a five stories high. They have an incredible state of preservation with earthquake-proof houses still in good condition that were built over 500 years. The earth, mixed with a certain quantity of vegetable fibers to increase its resistance is tamped by hand with wooden tools into special forms that are gradually pushed along the perimeter as the building progresses. The single blocks of earth are reinforced with knurled branches for better adherence and linked by bamboo elements that protrude from holes drilled in the edges which is sunk into the ground to provide a strong base for the building.

The earth construction generally starts with a gravel foundation, about 70 to 200 cm high, of the forms. A layer of bark is laid on top of the foundation floor to stop the damp rising and to act as a filter to prevent the earth placed on it from breaking down. Once the first story is completed, the internal wooden support structures are begun. The future inhabitants help to construct the first stage, since it only requires a great many willing hands, but the subsequent stage requires workers skilled in timber constructions. The ground supports and the first board frame are made with traditional Chinese building techniques, with simple joints and without nails.

Typologies

The rammed-earth constructions still standing in Fujian constitute a rich and extremely varied architectural heritage. The first studies undertaken on this kind of building have however shown that those presented here form a subset with clear and homogeneous architectural features concentrated in some regions once inhabited by ethnic minorities. These tribes were the Kejiaren (Hakkas) from the north of Yongding province and the Minnanren from the south who, after a long history of persecutions and migrations, took refuge in some mountainous provinces in south-east Fujian. However these studies are still at an early stage and since there are few historical documents available the reason why the two basic types of square and round building were chosen is still not clearly understood.

The basic typology is that of two or more series of rooms built on top of each other around a central yard, connected by stairs and access ways and completely closed to the outside by an earth wall. On the ground floor are kitchens and washrooms, served by a drainage canal. The women, children and old carry on their daily life in the courtyard and festivals and it is here that community meetings and religious ceremonies take place.

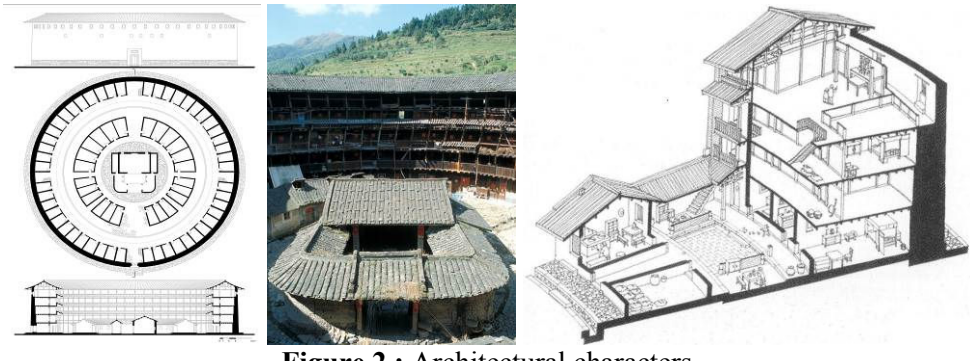

Figure 2 : Architectural characters

The main entrance is generally in the middle of the south-facing side and on the opposite side there is a larger area on the ground floor, often repeated on the first floor, for sacred rituals and the ancestral shrine.

This basic structure became more complex with the gradual addition of rooms and concentric rings, sometimes creating private yards or even filling up the central space with a ritual construction.

Deterioration and Protection

As far as we know, there have been no new buildings for some years. The civilization of communication has now reached these remote valleys and has triggered a process of individualization and modernization that has not only put an end to the millenary history of this culture but has even started slowly to destroy it. The one-family dwellings built around the big earth buildings, originally copying the old forms using local materials, are now rapidly becoming anonymous houses made with industrially produced materials.

Fortunately, thanks to some systematic studies in recent years, the value of these buildings is now widely recognized and they are now starting to be protected. In March 2001 the Ministry of Culture published the first official document for the improvement and protection of the Fujian earth buildings, defining eleven sites with varying levels of protection.

Over the last three years, this protection has led to interventions with positive outcomes, although some ambitious schemes for opening up this heritage to tourism have unhappily caused further deterioration. The local authorities and experts seem to be aware of the problems but their good intentions risk being swamped by the publicity and marketing process underway. To achieve a really sustainable and innovative protection that could also become a model for the future there has to be a total inversion of trend, not only with regards to protection and publicizing but also for tourism development. Resources and interventions should aim simply at providing the locals with better living conditions while preserving their traditions and distinctive features. The big earth houses should not become "museums" but simply places for communicating a millenary construction technique and at the same time emphasizing the relevance of an "popular and economic architecture" that is ecological and really respects the environment.

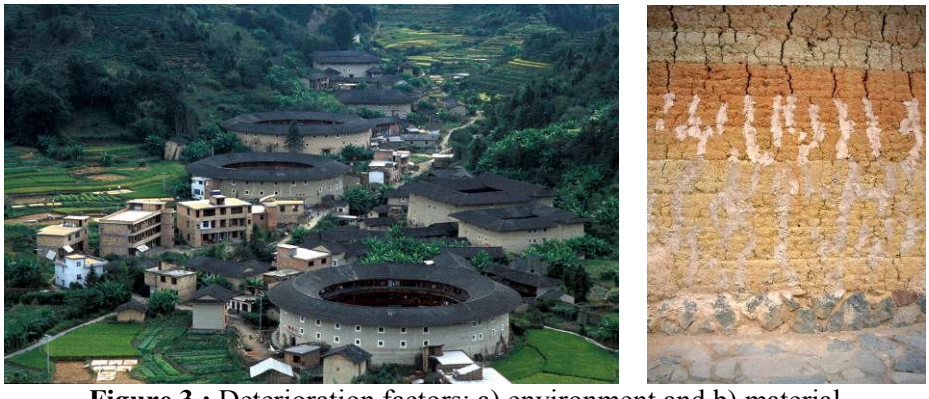

Figure 3 : Deterioration factors: a) environment and b) material

Proposal for a Sustainable Development

Based on more detailed study and analysis of ecological, socio-political and economical aspects discussed above it, a research team from University of Rome "Tor Vergata", leaded by one of the author [4], introduced a plan for a possible sustainable development, of Shi Qiao village, considering also strategies to move toward sustainable tourism, i.e.:

- Avoid new buildings construction and focus on conservation and rehabilitation of heritage resources;
- In case of new building construction, promote environmental sensitivity, the use of local materials, architectural compatibility with existing buildings and dwellings;
- Avoid large tourist settlements and encourage little resorts in the heart of community dwellings, so that foreign can truly experience inhabitants way of life;
- Sustainability requires that human activities only use nature's resources at the rate at which they can be replenished naturally;
- Promote the use of renewable energy;
- Information and awareness of the community concerning the importance of local cultural heritage;
- Give some indications to the local administration about how to protect and how to enhance local cultural heritage as well as natural beauties;
- A workshop involving students and professors;
- Set up some emblematic project as prototype for other projects;
- Produce some guidelines in order to help preservation and protection of the environment, the architecture and the "intangible heritage";

Each above listed statement must be considered carefully, taking into account the fact that specific expert of single aspect should be involved in the planning process. Then economists are definitely required to participate in the team, but also historians and sociologists, as well as local representatives of the population.

The proposed developing plan considers the use, or the re-use, of the old and almost abandoned *tulou*, as residential house, guest house, small hotel, for instance, which could be run the residential families. The communications network should be improved in order to encourage new visitors, but the most "preserved" area of the villages should be taken separated from the parking areas or the roads for buses and cars.

Under these considerations, in master plan of the project it can be recognized three main (but even more secondary) different areas, with different attribute of architectural value and related conservation level. For instance, in the most protected area will be forbidden any demolition of the existing buildings and also any new

construction, and roads will be considered only for conservation and maintenance according to traditional techniques. In this area only conservation projects can be considered and special careful maintenance of the existing buildings.

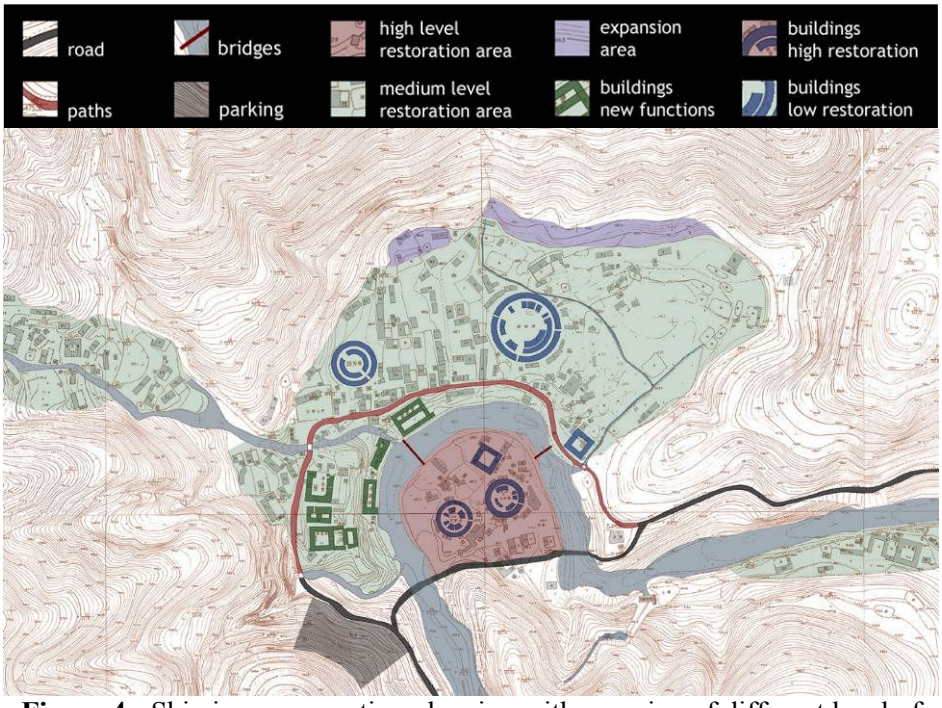

Figure 4 : Shi qiao conservation planning with mapping of different level of conservation areas

In all the "protected" area, on the other hand, any conservation project should be approved by a special committee of the County in order to prevent disordered maintenance, conservation and even restoration activities. This special Committee, in fact, should be composed by different experts and then it should be a multidisciplinary committee. Economists, technicians (engineers, chemists, architects), archeologist, local representatives will control a balanced and *sustainable* development of the village, trying to take into account all the aspects necessary to conserve the past and develop the future.

Conclusion

Cultural heritage is a bridge between population and economic source for sustainable development. If we want local and global community and future generations to benefit from the cultural heritage, this must be preserved properly. Ecological, socio-political, economical and also conservation aspects need to be considered carefully.

As a result, sustainable tourism may appear, bringing positive and negative benefits. It is expected that the internal conflict between the various competing goals, involving the simultaneous pursuit of economic prosperity, environmental quality, social equity and respect/preservation of cultural heritage will be solved avoiding the transformation of the culture in a mere source of market but indeed a great chance to enhance the historical values.

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