

# Proposal to Revitalize **Zhenfu Lou (振福楼)**

Xia Nanxi Village, Hukeng Town (湖坑镇), Yongding County, Fujian Province

- **Historical RecoFit+Natural Capitalism** for sustainable redevelopment, south China  
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1: Zhenfu Lou, on Nanxi River is a stand-alone tulou, with row house, gardens & ecotourist facilities

A) **Introduction:** This revitalization plan for Zhenfu, respectful of its cultural and historical heritage, is a unique opportunity to resuscitate the past, retrofit the present and be ready for the future, as an international prototype for sustainable redevelopment of historic monuments (and villages) without forced retirement into static museums. This generic approach to save and rehabilitate Hakka villages is a privately-led partnership with Government and industry to demonstrate a new model or paradigm for a sustainable future. Zhenfu and its land, can be reborn as a dynamic, living, breathing, leading-edge Centre for Sustainable Living, Learning & Natural Capitalism <sup>1</sup> and Centre of Appropriate Technology <sup>2, 3</sup>, as the first RecoDevelopment project in a future **Hakka BioSphere Plan** <sup>4</sup> for Fujian, Guangdong, Guangxi and Jiangxi, based on the data, vision and recommendations below.



**B) Context:**

Tulous in this region were built from ~769 (Fuxing Lou, the oldest) to 1979 (Shanqing Lou, Chuxi, the newest). All Hakka Tulou World Heritage Sites are located in western Fujian province, although there are good reasons to expand this limited location to other equally worthy sites in other provinces especially in the Meixian (Meizhou) area of Guangdong province, just west of the present sites, since people were not confined by artificial boundaries at that time. Eventually, a regional **Hakka Biosphere** may be created to encompass all major outstanding Hakka villages in south east China, all linked together by a **Hakka Heritage Trail**, as proposed elsewhere. <sup>4</sup>

**C) Historical Note:**

There is very little information on Zhenfu from the English internet, literature or other sources. The best source of information comes from small Chinese and Japanese books <sup>5,6</sup>. The best English information comes from UNESCO <sup>7-13</sup>.

Zhenfu is of recent vintage. It is not ancient, old or contemporary. Its architecture is east and west. It was built in 1913 by a businessman to house workers for his tobacco business. Offices were located on the ground floor. This vision of a business person, prosperity from agriculture and the allocation of space, giving life to a community and building, are ideas worthy of replicating in the modern age. This part of the tulou story can be recycled into a new foundation for hope and the transformation of a static museum into a dynamic, flourishing, vibrant and prosperous community.

**D) Specifications (site & buildings):** Note: “(?)” indicates information in need of (off/on-site) verification.

- 01) site area: ~3 ha (1.56 ha <sup>8</sup>) containing land, water and buildings; resources, flora & fauna
- 02) legal description: NA (?), title owned by Su family, since 1913 <sup>15</sup>
- 03) water frontage along Nanxi River: estimated at ~700 m (not including island frontage) <sup>9</sup>
- 04) Zhenfu Lou: 3 stories, 10 m (?) high, rammed earth, south facing gate, round plan ~43m ø <sup>9</sup>, wood interiors, 96 rooms <sup>14</sup>, “mixture of Hakka & western architectural style” <sup>10</sup>, 4,000 m<sup>2</sup> <sup>10, 14</sup>
- 05) row house: 40 m L (?), 10 m W (?), 10 m H (?), gable roof (see Fig. 1)
- 06) location: Xia Nanxi Village, Hukeng Town, on Nanxi River, 24°38’06” NL, 116°56’59” EL <sup>8</sup>
- 07) status: 2008, UN World Heritage Site <sup>7</sup>; 1998: County Preservation Building of Historical Relic <sup>15</sup>



2: Map of **Zhenfu** (red) with river, ponds, waterwheel, tea house, restaurant, gardens & tourist facilities

E) **Policies:** This property (site) has 2 major assets (some well used, and some not used at all):

- 1) land (gardens, fishing pond, landscaping, paths, island, trees, river edge, picnic area, hills)
- 2) buildings (Tulou, row house (apartment), ruins, enclosed yard, restaurant, tea house, toilets)

It is recommended that an integrated approach should be used for site planning, architectural design, consulting, reconfig, construction, implementation, programs, education and transit, to uphold, advance, enhance and diversify the historical, cultural and architectural legacy and opportunity.

**Sustainability** is the overarching policy that should guide and permeate all aspects of ecological redevelopment of Zhenfu, including the following 12 aspects of a revitalized property:

- historical archives of the family and its home
- site plan & architectural program and design
- engineering (i.e. structural, mechanical, electrical)
- choice of building materials, colours and textures
- construction process
- cultural, educational, youth and career programs
- operations: heating/electrical/office
- marketing: international and national
- waste disposal: biological, consumer
- transportation: to and on the site
- land use: gardening & farming practices
- water and energy use and consumption



3: Ancestral Records



4: repair (Chaoyang, Hongkeng)



5: structural/wall upgrade, Chaoyang

F) **Vision** (purpose, goals, opportunities, constraints):

- 01) historical archive: further cataloguing of information & clan books (Fig. 3) in digital format
- 02) Heritage Preservation: physical upgrade of tulou to uphold/strengthen its heritage (Figs. 4, 5)
- 03) Cultural Celebrations: Hakka food/music/mountain songs/dance/festivals (Figs. 6, 61, 68-73)
- 04) Education: learning centre for credit courses, conferences, tours & retreats (Figs. 7, 90-92)
- 05) Live-in Community: convert row house into modern flats for people, and tulou into multi-use centre for sustainable development, with learning on the ground floor, rooms on other floors
- 06) Repopulate: alive+dynamic with children+families, students+scholars (Figs. 7, 8, 62-63, 90)
- 07) Economic Diversification (cottage industries): new livelihoods/work/jobs: ecotourism, permaculture, clean energy, history & education as revenue generators for optimum local benefit
- 08) EcoPark: further development of public park & facilities as “head” of hiking trail linking all major regional Hakka villages (Figs. 9-12, 87-89, 96-97) to bring sustainable jobs, income & tourists
- 09) Self Sufficiency: independence in most food, income & all energy (solar, mini-hydro, methane)
- 10) Energy Plus: make site a prototype in the production & export of surplus energy to power grid
- 11) Renewable Energy: mini-hydro should be harnessed at 2 specific sites (shown in Figs. 15, 16)
- 12) Modern Technology: upgrade buildings to post modern conveniences/technology (Figs. 17-19)
- 13) Village Scale: expand successful strategies & technologies from tulou to all of Chuxi (Fig. 20)
- 14) promotion: web site/internet advertising of amenities/attractions for ecoTourists/package tours
- 15) optimization: of entire site for appropriate uses to honour existing heritage and to secure a sustainable future for the Su family, property, hinterland and all buildings for short & long term
- 16) Centre of Appropriate Technology as at Wales United Kingdom<sup>2</sup> and Ontario Canada<sup>3</sup>
- 17) Constraints (possible): apathy, poverty, government, museum, disenfranchisement, lack of modern conveniences, not enough tourists & income, lack of leadership & vision





6: Lion Dance, LuoRuiHe Lou



7: students, Sheung Yiu Museum



8: home study in village



9: Yuan Yuan Lou



10: Sheung Yiu, HK



11: Fuyu, Honkeng



12: near Yujing



13: mini-hydro beside Yanxian Lou



14: Yanxian Lou



15: beside Zhenfu



16: Zhenfu potential



17: satellite dish in Shenqing Lou



18: modern hotplate in Yucheng Lou

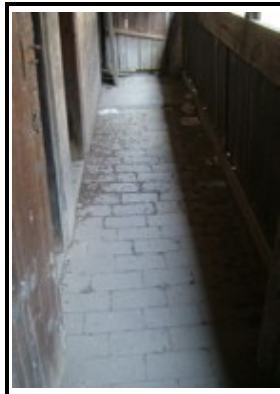


19: DHW tanks, Shuncheng





20: Chuxi from Buddhist Temple



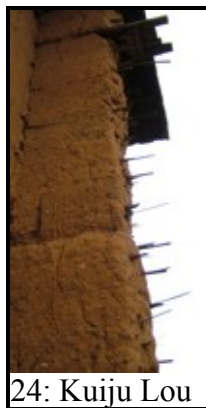
21: Yuan Yuan Lou



22: Fuyu Lou brick floor



23: Zhencheng Lou



24: Kuiju Lou



25: tulou N of Fuyu



26: Wuyun Lou



27: Yucheng Lou

G) possible **Architectural Imperatives, Opportunities & Features** for Zhenfu Lou:

- 01) structural/safety: repairs if needed, to ensure structural integrity & personal safety (Figs. 4, 5)
- 02) fire separation: between rooms (Fig. 5) & floors (Figs. 21, 22) to increase fire ratings
- 03) roof upgrade: to eliminate all leaks & protect building below and for rain water collection
- 04) new wall finish: new durable, clear, interlocking new parging/stucco over rammed earth wall  
Note: there is a universal problem with traditional parging staying on walls (Figs. 23-27)
- 05) fresh gate decoration: new facelift according to tradition with new couplets (Figs. 28-30)
- 06) composting toilets: at north end of rowhouse for both buildings, quiet & no smell (Fig. 33)
- 07) mini-hydro: there are 2 high potential mini-hydro opportunities (Figs. 15 & 16)
- 08) main floor: reception, offices, class/common/handicapped rooms, dining, medical clinic,
- 09) 2<sup>nd</sup> floor: rooms for elderly & physically challenged, & storage
- 10) museum wing: educational displays (Figs. 34, 74-79, 85-86)
- 11) bridge between tulou & flats: for utilities, toilets, (water) elevator, open below for movement
- 12) solar collectors (Figs. 35, 41-42): instant hot water heaters (Fig. 36)
- 13) library: collection of historical records for international research, students, scholars & public
- 14) recycling centre: for tulou community & Chuxi
- 15) furniture: refurbishing of authentic well designed antiques remain unused (Figs. 37, 100-102)
- 16) Ancestral Hall: purpose to be maintained (Figs. 38-39)
- 17) water: a) rainwater collection into cistern, 2) greywater recycling into outdoor EcoMachines
- 18) heating strategy: use of radiant heating below floors (Fig. 40), preheated by solar (Fig. 39)
- 19) thermal energy: 1) conservation, 2) primary: solar, 3) backup: electric (mini-hydro) (Fig. 42)
- 20) electrical energy: mini-hydro (Figs. 13-16, 43)
- 21) conservation: retractible radiant barrier over courtyard in winter with reducing daylight (Fig. 44)
- 22) daylighting: SunPipes (Fig. 45) to funnel natural light into darker interiors, especially stairs
- 23) stairs: increased safety features: handrail, lighting & proper landings
- 24) courtyard optimization: planter fruit bearing/fragrant trees to enliven & beautify (Figs. 46-58)



28: Qiaofu Lou entry



29: Huanji Lou entry



30: Shanqing Lou



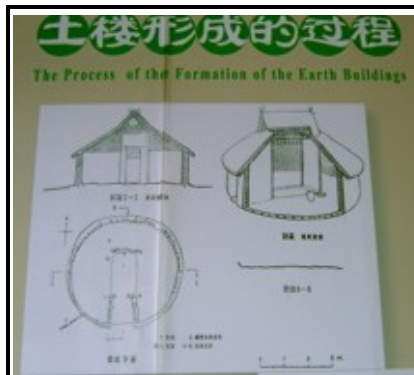
31: Fuyu Lou



32: Zhenfu Lou



33: compost toilet



34: Display, Zhenfu Museum



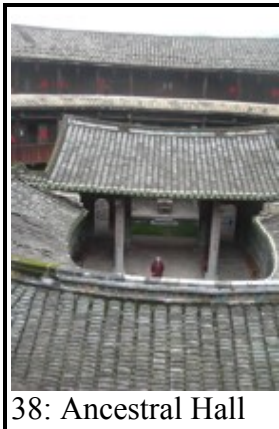
35: Danguihu



36: in-line hot water heater



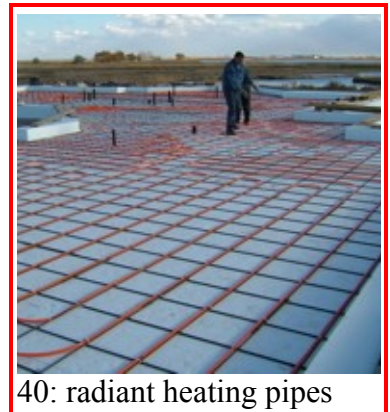
37: Bridal bed, LuoRuiHe Lou



38: Ancestral Hall



39: Ancestral Hall



40: radiant heating pipes



41: Solar



42: passive solar collector



43: mini-hydro



44: cover



45: 2 SunPipes





46: Wuyun



47: Yucheng



48: Fuyu courtyard, Yongding



49: Chongquin Di



50: Chongquin Di House courtyard



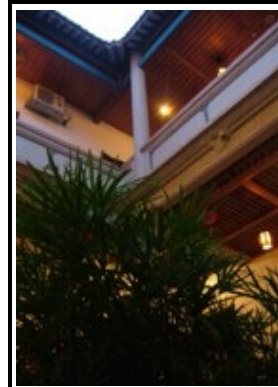
51: Ji Shan Lou



52: Zhencheng Lou central courtyard



53: Xie Family, Song Kou Town



54: Wanqiu Lou



55: Yijing Lou courtyard, Yongding



56: Yucheng Lou, courtyard



57: Wengongci



58: Zhencheng, side courtyard





59: medicinal herbs, Wengongci



60: Chinese medicine



61: typical Hakka food



62: Hakka Research Institute, Jiaying



63: Jiaying University



64: Fuyu roof lines, Honkeng village



65: Fuyu ceiling



66: Chengqi



67: Chuxi Zodiac Figures



68: Toronto 2008 Hakka ReUnion



69: Xibei Tianhougong



70: Xi'an, 22 World Hakka Conference





71: Xi'an Hakka Conference



72: Xi'an, World Hakka Conference



73: Toronto 2008 Hakka Conference

**食用植物 Food Plants**  
**龍眼及量天尺 (霸王花)**

新界的村民喜於村旁種植樹木，除可美化環境外，樹陰亦的，龍眼及量天尺便常見於鄉間。  
 Trees and shrubs are common on village fringes in the providing shade in summer, many plants also bear Night Blooming Cereus (*Hylocereus undatus*) and

**龍眼**  
 原名龍眼，因曾進貢皇帝而得龍眼，屬無患子科，原產於中國南部、中南半島及印度。  
 Longan was originally known as *guiyuan*. The word *Lung* implies an imperial status, as the fruit once was a tribute gift for emperors. It is a Sapindaceae native to Southern China, Indo-China and India.

- 龍眼樹一般壽命極長，可活400年之久，產果期達80餘年，可謂產量豐富。  
 Longan trees are remarkably long-lived, often growing for some 400 years and bearing fruit for more than 80 years. It is a very productive plant.
- 龍眼樹於每年7月至8月結果，果實可新鮮食用，亦可將果肉曬乾，用作煲湯或沖茶。龍眼有藥用價值，具滋補強壯、治健忘及神經衰弱等作用。  
 Longan trees bear fruit in July and August. The fruit can be eaten raw or sun dried to make soup and herbal tea. It has health benefits as a tonic for the body, enhancing physical well being and treating amnesia.

74: Longan, fruit for "treating amnesia", Sheung Yiu

**and Night Blooming Cereus**

所種植的植物不少更是可食用  
 greening the environment and in (*Dimocarpus longan*) and

**量天尺**

攀援在龍眼樹上的植物叫量天尺，屬仙人掌科。莖有圓稜3條，稜邊波瀾形，氣根攀於其他物體上。  
 The vine creeping on the Longan is a Night Blooming Cereus. It is a Cactaceae with three wave-edged angular stems. Its aerial roots creep along neighbouring plants and objects.

- 量天尺的花亦稱霸王花，花萼黃綠色，花瓣白色，只在夏秋間的晚上開花，翌晨即閉合。  
 Flower of the Night Blooming Cereus is called Bawanghua. Featuring lime green calyx and white petals, it blooms only at night in summer or autumn, and closes before the sunrise.
- 昔日的村民多採霸王花，將其曬乾後，配肉煎湯服，可止氣痛，亦有化痰止咳之效。  
 In the old days, villagers would sun dry Bawanghua to make soup with meat. It is an effective remedy for gastric pain, sputum and cough.

75: Cereus for "gastric pain, sputum and cough"

**林地的發展 Forest Development**

附近的林地生長了許多不同種類的植物，有樹木、灌木及蕨類等，當中你認識多少呢？  
 The nearby forests are home to many different types of plants - trees, shrubs and ferns. How many do you know?

其中一種最容易被認及為人熟悉的，應該是紅膠木，此樹並不是香港的原生植物，而是由外地引入的。  
 The most widely known species is Brisbane Box (*Logostemon confertus*). This is not a native species of Hong Kong.

為什麼要從其他地方引進樹木呢？  
 Why was it necessary to introduce exotic plants?

- 於四十年代，受戰爭的影響，本地資源極度短缺，不少上山伐木，利用木材作為燃料，使本港的原生林差不多完全消失，現在的森林都是次生林。森林減少水土流失，改善土壤及景觀等因素，一些生長迅速的外來品種，便被選為補植林。
- In the post-war 1940's, Hong Kong was extremely short of resources - including fuel. People gathered firewood in the hills, so deforestation destroyed almost all of Hong Kong's native woods. The richly vegetated country we see today is a result of reforestation, mostly made up of secondary forests. In early plantations, fast growing introduced species were chosen to reduce loss of moisture, improve soil and enhance the overall landscape.
- 現在我們對保護這些森林較重視，但每年的山火亦會破壞不少樹林，因此仍需在有關地點種植生長迅速的外來品種。
- Today, although awareness for protecting vegetation is much greater, many trees are still destroyed by hillfires each year. To quickly restore our forests, fast growing exotic species are still needed in suitable areas.

76: Forest Development, The Story of Reforestation

**Bamboo**

方便取用材料，村民更會在居所附近或風水林種植各類型的竹，並用以製造竹筷子、竹撐及竹蓆等生活必需品，而竹筍更成為他們的糧食。  
 Many villagers plant different species of bamboo near their homes or in nearby *feng shui* woods. They provide raw materials for many different household utensils, such as chopsticks, brooms and mats - and bamboo shoots are sought after as a delicious food.

77: Bamboo: food, Feng Shui and may other uses





78: Hakka rammed earth walls, Zhenfu museum



79: traditional Hakka forms/tampers, Zhenfu museum



80: rammed earth construction, 1990, ASH-Inc.



81: Alberta rammed earth construction, ASH-Inc.



82: central beam, Ancestral Hall

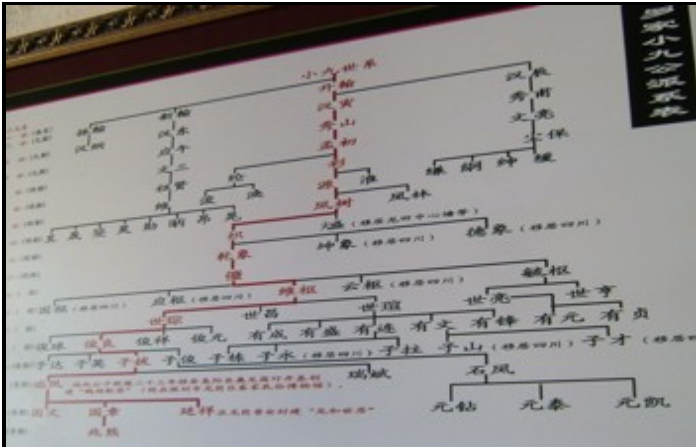


83: Yin Yang



84: 8-diagram Li Village, Dapeng





85: genealogy of Lou family, LuoRuiHe Villa



86: founding fathers of LuoHuiHe Villa



87: Sheung Yiu Hakka Village



88: Sheung Yiu Hakka Village



89: SamTung Uk Hakka Village



90: SamTung Uk Hakka Village



91: World Hakka Conference, 2008



92: Hakka Research Institute



93: biodiesel bus, Toronto, 2008

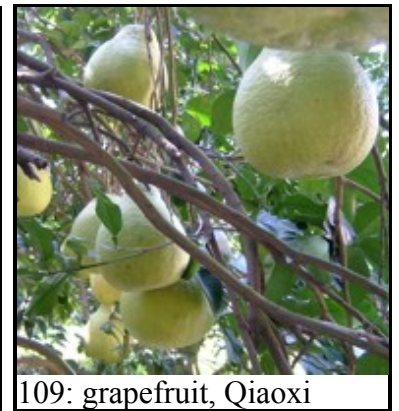
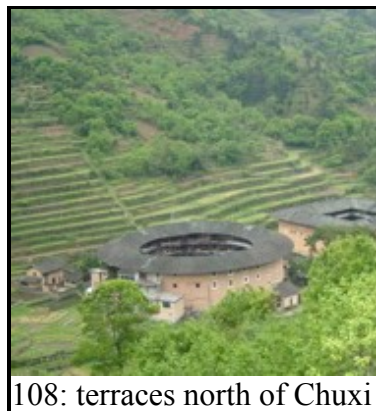
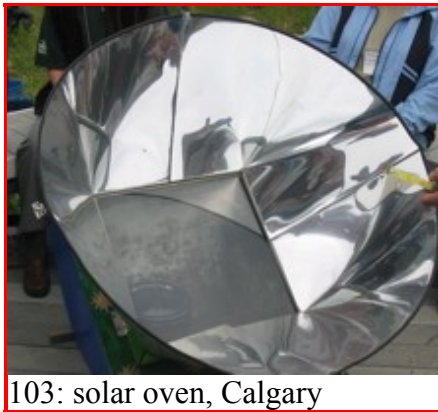


94: electric mini bus, Yongding, 2007



95: EcoCab (Taxi), Toronto, 2008









110: gardening near Yuan Yuan



111: oil extractor used for 1,000 years



112: tree label in 2 languages

H) **potential Educational Programs** that could be considered:

- 01) **medical**: alternative healing techniques, traditional medicine & acupuncture, reflexology
- 02) **food**: traditional Chinese/Hakka herbs (Figs. 59-60) & cuisine (Fig. 61)
- 03) **meditation/philosophies**: yoga, Tai Chi, QiGong, Taoism (Figs. 62-63)
- 04) **arts**: Chinese/Hakka paintings/art/drawings/sculpture (Figs. 64-67), ancient instruments & music (Figs. 68-70), mountain songs and opera (Figs. 71-73)
- 05) Chinese **Language** course: intensive mandarin for North Americans, Expatriates & Europeans
- 06) EcoCamp for **children**: 2 weeks of environmental education for children
- 07) **environmental stewardship**: integrated approach to healthy living for body, mind & soul
- 08) **plants**: edible & medicinal wild plants & their relationship to community living (Figs. 74-77)
- 09) **renewables**: solar (Figs. 35, 41-42) mini-hydro (Figs. 13-16, 43), biodiesel (Fig. 93), cogen
- 10) **construction**: "hands on" **workshops**: i.e. rammed earth construction (Figs. 78-81)
- 11) **star gazing**: study of the solar system and integration into Chinese history & culture
- 12) **Hakka planning & architecture**: defensive/aristocratic form, old/modern, both tulou & mansion style, Feng Shui (Figs. 82-84), siting, planning, architecture, details, best examples
- 13) Chinese **Genealogy**: computer based tracing of historical records & ancestry (Figs. 3, 85-86)

**Note:** It is recommended that Zhenfu become a satellite campus of the Hakka Research Institute at Jiaying University (under the direction of Professors Fang and Liang) as lead partner in the development of all educational programs on the property, with graduate students (Figs. 62, 92).

I) **possible Cottage Industries** (economic diversification, local job creation/income, green incubator):

- 01) **ecotourism**: tour guides for hiking trails (Figs. 9-12, 87-89), translation, B&B/Inns, concessions
- 02) **EcoResort**: hotel room/pension/inn accommodations with shared canteen
- 03) **school** tours: local schools (Figs. 7, 90) & university practicums (foreign architecture schools)
- 04) **culture**: special events, festivals & dances, musical performances (Figs. 6, 68-73)
- 05) **education**: courses, workshops & seminars (Figs. 62, 91-92)
- 06) **renewable energy**: solar (Figs. 35, 41-42), mini-hydro (Figs. 13-16, 43), biodiesel (Fig. 93)
- 07) **emissions trading**: sell sequestered CO<sub>2</sub> (environmental) credits <sup>20</sup>
- 08) **green transit**: buses, bicycles (rental & repair), Segways, electric vehicles (Figs. 90-96)
- 09) **building renovation**: repair & upgrade (Figs. 4 & 5, above)
- 10) **furniture**: new furniture (Figs. 100-102) & repair of broken furniture using natural materials
- 11) **solar installations**: solar hot water collectors in the region (Figs. 35, 41-42)
- 12) **fabrication**: solar ovens/dryers (Figs. 103-104)
- 13) Hakka **food**: fruits & vegetables, restaurant (Fig. 61)
- 14) **export**: solar dried fruits for export (Fig. 105)





113: Zhenfu Lou with Nanxi River, stone wall, row house, south Gate, SE entrance, walkway and hill behind

J) **Permaculture & aquaculture: (sustainable Farm & Fish Ponds):**

Organic & biodynamic agriculture using natural pest control, companion planting, integrated land management, with of high value, low energy, agricultural produce

01) aquaculture: expansion of existing ponds (Fig. 2)

02) terraces: south facing terraces, building on culture/experience (Figs. 107-108, 113)

03) fruits & nuts: most nutritious fruits (Fig. 109) & trees for local consumption & export

04) gardens: functional, educational, nutritional & biodynamic vegetable gardens (Fig. 110)

• camphor, tea, hemp, banana, bamboo are locally grown <sup>15</sup>

05) compost production: to produce healthy & safe soil for gardens & farm

06) reforestation: new trees for CO<sub>2</sub> mitigation, oil/fruits/nut/oxygen production, erosion control (for oil Hakka extraction, see Fig. 111)

07) plant identification: labels in Chinese, English and Latin of all species (Fig. 112)

K) **Stakeholders & Partners and potential roles (without brides):**

01) Su family: decide the future path, and if interested in this proposal, to select a liaison person

02) local people: get an inventory of labour skills & interest to put “natural capital” to useful work

**Note**: this program must benefit the family, local people & their micro-economy

03) philanthropists/investors: seed money for: research, program development, proposal, PPT, as built drawings, design, project management, inspections and local assistants/labour

04) government (UN, provincial, county): to facilitate concept, program, design, approval process, construction, success & replication

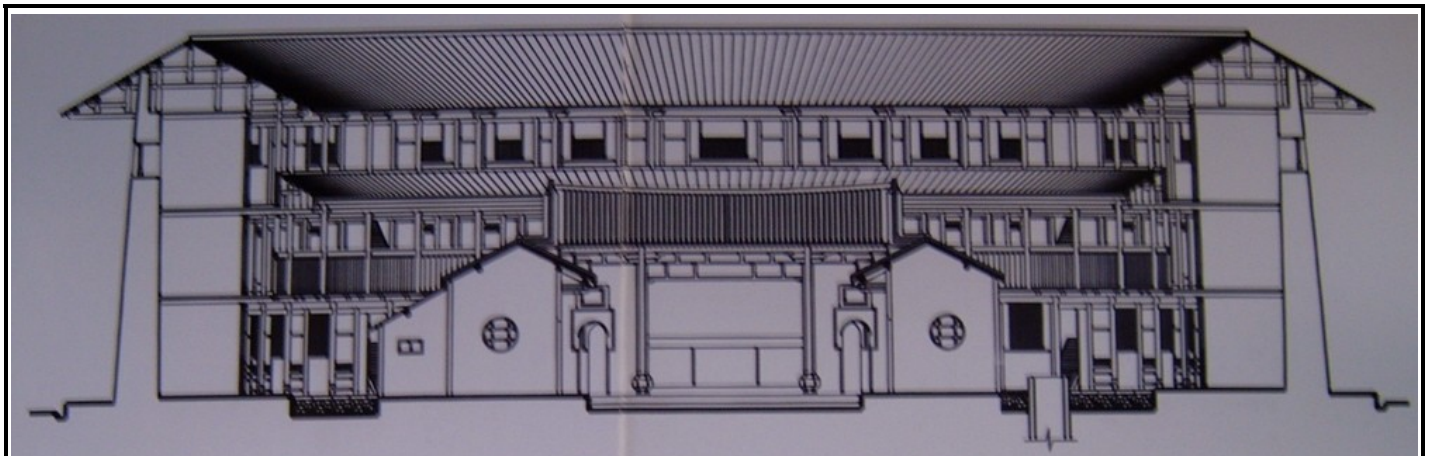
05) educational institutes: local universities, international architecture schools for programs

06) industry: partnerships for supply/install of appropriate technology

07) NGOs: influential international & Chinese organizations for partnerships, support promotion

08) visitors: to make it a success with package tours for ecoTourists, schools and other visitors





114: Zhenfu building section showing central Ancestral Hall, on display in the Zhenfu Museum

**L) aspects of an implementation Strategy (both tulou & adjacent building):**

A strategy for Zhengfu could include, but not limited to, the following implementation plan:

- 01) pre-construction: commissioning of the following, if approved by the leaders & community:
  - a) PPT presentation on the “Zhengfu Lou Revitalization Concept” to family (& stakeholders)
  - b) weather station, EcoInventory, water flow analysis, initial sketches/discussions/precedents
  - c) Building Analysis Report to identify integrity of structure, fire, safety, water & sewage
  - d) Cost Estimate of work to be undertaken: repair, including all aspects covered in #c above
  - e) EcoTourism Feasibility Study: how many tourists visit now and what potential is there
  - f) Mini Business Plan (including fund raising): to demonstrate a possible cash flow scenario
  - g) site plan: integrated community approach to harness real potential of entire site (Fig. 1)
  - h) architectural & engineering design:
    - i) "As Built" drawings of existing structure for the record: plans, elevations, sections, specs
    - ii) RecoFit Plans: plans for new uses to bring back daily life to the empty halls & rooms
  - i) partners: universities, government, NGOs, industry suppliers, philanthropists, investors, etc.
- 02) transit: only buses (Fig. 93) to parking area: then bicycle, Segway (Fig. 99) rental, or human powered rickshaws (Fig. 95), electric vehicles (charged by renewable energy) Fig. 94, 98)
- 03) advertising & promotion: alliances with government & package tour companies
- 04) special events: to celebrate major Chinese & western holidays
- 05) educational programs: international speakers, seminars, workshops, think tanks, etc.

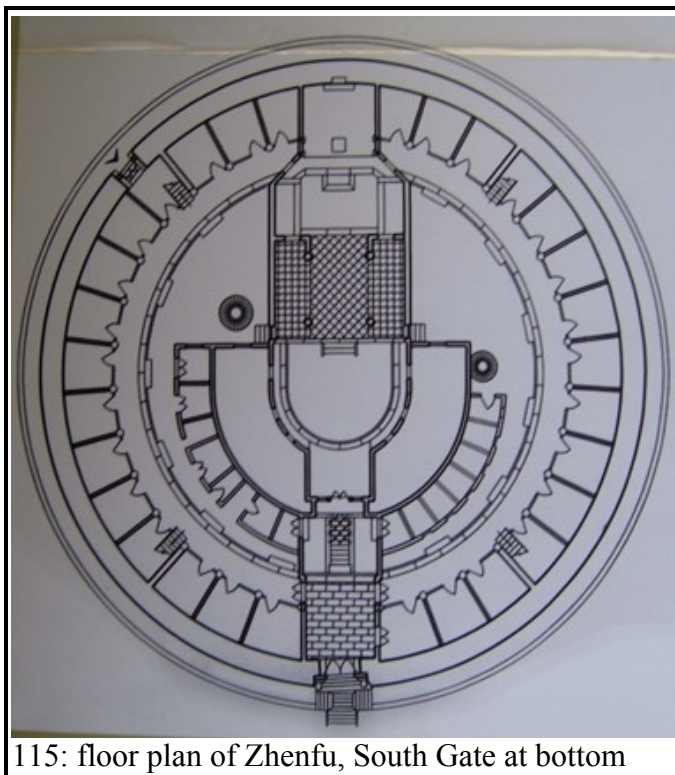
**M) Feasibility (5=high probability, 0=no possibility):**

01) a museum recycled into community)?	4	09) funding from various sources?	3
02) redesign of optimal buildings/site ?	5	10) conservation program?	3
03) a learning/living centre?	4	11) government support?	3
04) a Centre for Appropriate Technology?	5	12) industry support?	3
05) an educational program to generate income?	4	13) permaculture?	4
06) a model project?	3	14) economic diversification?	4
07) renewable energy (mini-hydro installation)?	4	15) ecotourism?	4
08) new income for local people?	4	16) can it be a live-in community?	5

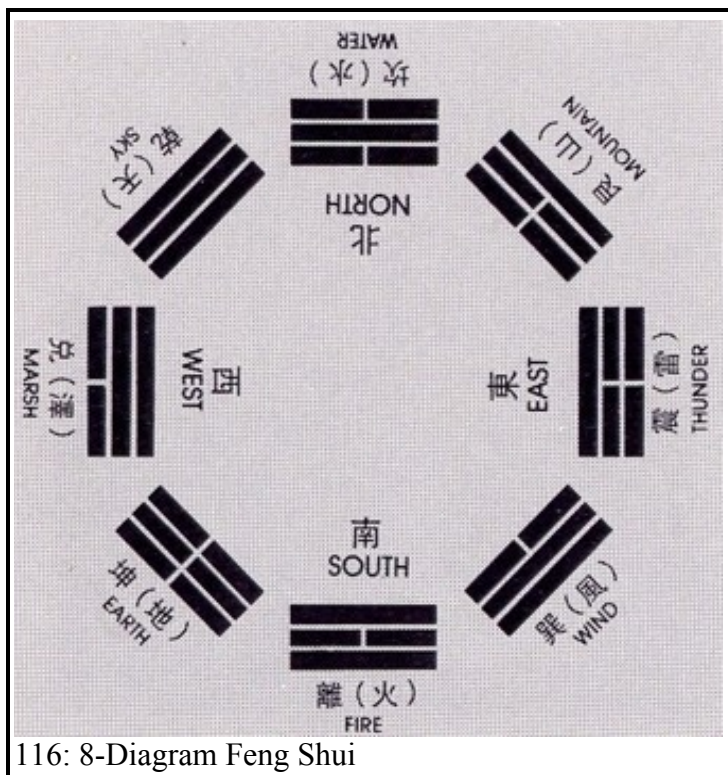
**N) Assumptions:**

- 01) numbers of tourists will increase in the future
- 02) government & UN will support this initiative, although this will take considerable time & effort
- 03) clan has final say in all decisions
- 04) the only way to proceed is environmentally in all aspects
- 05) the plan for the future must be an integrated approach
- 06) community to select local project co-ordinator as liaison person
- 07) all work to be done by skilled experts or professionals





115: floor plan of Zhenfu, South Gate at bottom



116: 8-Diagram Feng Shui

**O) Conclusions:**

01) the sustainable nature of tulous has been recognized by various parties, but only in passing:

- a) “harmonious relationship with their environment” <sup>11, 13</sup>
- b) “They are excellent examples of ecologically sustainable building design” <sup>15</sup>
- c) “improved plan for the sustainability of the farming landscape which respect local farming traditions should be developed” <sup>11</sup>
- d) “The biggest message that comes from Fujian round architecture is that a genuine practitioner of environmental and social sustainability relies on a simplicity of approach - a respect for nature.” <sup>26</sup>

This fact provides a solid foundation on which to build a new plan for sustainable revitalization.

02) Such a vision and plan, although by far the most superior for the family, local people, land, environment, culture, history and business, as a new paradigm, will take a long time to realize, especially with government involvement on the county, provincial, national and United Nations levels. It will not be fast or easy. However it is definitely worthwhile. It may also be the first, and the process could be accelerated by professional project management. Ultimately, the negotiation process is key. This undertaking may well establish a precedent for all other tulous on the World Heritage Site list.

03) UNESCO documents can be utilized as a powerful foundation or support for the above plans, since they share such common aspects of our work of the last 32 years, including:

- a) need to maintain historical authenticity: buildings for settlement, community and offices.  
Several tulous were built by businessmen, including Zhenfu. It should be noted that many tulous also had their schools within their clan building.
- b) surrounding area: need to improve the surrounding forest and farming practices
- c) other key aspects include: sustainability, environmental harm, “best practices, Feng Shui

04) no restrictions: on improvements, renovations or retrofit of the structures have been found

05) strategic location: first building to Chuxi village, as a natural gate house

06) the greatest opportunity here is to seize the opportunity, lead the way and set the benchmark and precedent by doing it properly (sustainably), with existing technologies and proven methods, before others get on the bandwagon with little or no experience.





117: Zhenfu Lou, upper rooms



118: entry, courtyard Ancestral Hall



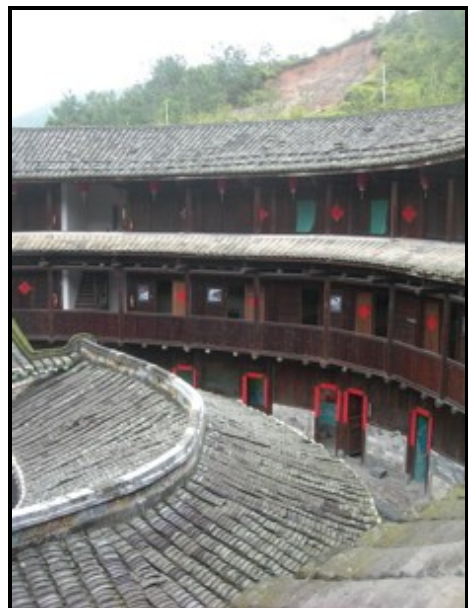
119: Zhenfu Lou, central ring



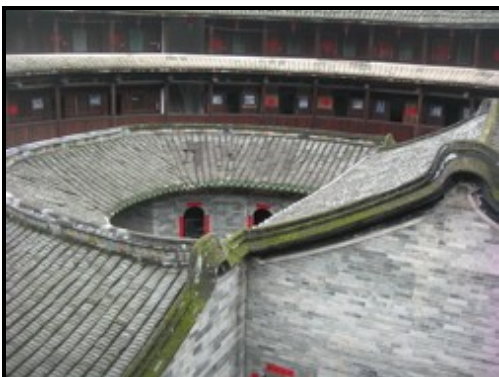
120: Zhenfu, outer Gate to yard



121: Main south-facing Entrance



122: 3 story outer ring



123: high outer ring, low inner ring



124: Nanxi River, Zhenfu Lou



125: outer E wall+out buildings



**P) Acknowledgements:**

- 01) my dear wife Helen for roughing it on 2 trips through rural China
- 02) EcoTourist Guide/Translator Xiaoyan Li for faithfully taking us to all places shown above
- 03) colleague/architect Minoru Ueda for photographs, discussions, measuring & cataloguing
- 04) Dr. Keith Lowe for his continuous support, encouragement and opportunities
- 05) Mei-Juan Lin, for supplying Fig. 6, photograph of LuoRuiHe Village

**Q) Bibliography:**

- 01) Hawkin, P., Lovins, A & H., *Natural Capitalism: Creating the Next Industrial Revolution*, Rocky Mountain Institute, Snowmass, CO, US, 2000-2008
  - a) <http://www.natcap.org/>
  - b) <http://www.natcap.org/images/other/HBR-RMINatCap.pdf>
  - c) \*<http://www.globalissues.org/video/732/amory-lovins-natural-capitalism> (Note: Mandarin)
  - d) <http://www.bigpicture.tv/videos/watch/072b030ba>
  - e) [http://www.treehugger.com/files/2005/08/natural\\_capital.php](http://www.treehugger.com/files/2005/08/natural_capital.php)
  - f) <http://www.abc.net.au/science/slab/natcap/default.htm> (good detail)
- 02) Centre for Alternative Technology, Machynlleth, Powys, Wales, UK, <http://www.cat.org.uk/index.tpl?refer=index&init=1>
- 03) Kortright Centre for Conservation, Kortright Ontario, Canada, <http://www.kortright.org/>
- 04) Jorg Ostrowski, Hakka Trail Proposal, Toronto Hakka Conference 2008, PPT presentation <http://www3.telus.net/mudesign/Hakka/Hakka01.html>
- 05) Zhong Yeen editor, *Understand Fujian by Visiting Local Buildings*, Photographic Art Publishing House, Fuzhou, 2003, ISBN :7-80562-918-8, Chinese
- 06) Kentarou Okada, *Lou Hakka yen*, Ryokojin Ultra Travel Guide, Japan, 2008
- 07) *Nomination Files*: <http://whc.unesco.org/en/list/1113/documents/> (Summary Page)
- 08) *Fujian Tulou*, multiple locations (list showing name, location, coordinates, area) [http://whc.unesco.org/en/list/1113/multiple=1&unique\\_number=1505](http://whc.unesco.org/en/list/1113/multiple=1&unique_number=1505)
- 09) *1.e-6 (5), Map Showing the Area of Nominated Property and Proposed Buffer Zone around Fujian Tulou – 5: Zhenfu Lou*, (China, Fujian Tulou.pdf, p. 19) <http://whc.unesco.org/en/list/1113/documents/>
- 10) *Advisory Body Evaluation, Fujian Tulou (China), No. 1113*, p. 22 <http://whc.unesco.org/en/list/1113/documents/>

“This large circular tulou, standing on its own in a narrow valley, covers 4,000 square metres, and was built by a businessman in 1913 to house workers for the tobacco industry. Like Zhencheng Lou, it is a mixture of Hakka and western architectural styles – the elaborate ancestral hall has granite columns, and the porch is tiled and enclosed by an iron grille gate. Part of the internal space was used for storing tobacco products and for offices.”
- 11) *DECISIONS ADOPTED AT THE 32nd SESSION OF THE WORLD HERITAGE COMMITTEE (QUEBEC CITY, 2008)*, (*Decisions report of the 32nd session (Quebec City, 2008) WHC-08/32.COM/24*), p. 163 <http://whc.unesco.org/en/sessions/32COM/documents/> [http://whc.unesco.org/pg\\_friendly\\_print.cfm?cid=305&id\\_decision=1481&](http://whc.unesco.org/pg_friendly_print.cfm?cid=305&id_decision=1481&)  
**Decision: 32 COM 8B.20**

3. Adopts the following Statement of Outstanding Universal Value:

The Fujian *Tulou* are the most representative and best preserved examples of the tulou of the mountainous regions of south-eastern China. The large, technically sophisticated and dramatic earthen defensive buildings, built between the 13th and 20th centuries, in their highly sensitive setting in fertile mountain valleys, are an extraordinary reflection of a communal response to settlement which has persisted over time. The tulou, and their extensive associated documentary archives, reflect the emergence, innovation, and development of an outstanding art of earthen building over seven centuries The elaborate compartmentalised interiors, some with highly decorated surfaces, met both their communities' physical and



spiritual needs and reflect in an extraordinary way the development of a sophisticated society in a remote and potentially hostile environment. The relationship of the massive buildings to their landscape embodies both Feng Shui principles and ideas of landscape beauty and harmony.

**Criterion (iii):** The tulou bear an exceptional testimony to a long-standing cultural tradition of defensive buildings for communal living that reflect sophisticated building traditions and ideas of harmony and collaboration, well documented over time.

**Criterion (iv):** The tulou are exceptional in terms of size, building traditions and function, and reflect society's response to various stages in economic and social history within the wider region.

**Criterion (v):** The tulou as a whole and the nominated Fujian tulou in particular, in terms of their form are a unique reflection of communal living and defensive needs, and in terms of their harmonious relationship with their environment, an outstanding example of human settlement.

The authenticity of the tulou is related to sustaining the tulou themselves and their building traditions as well as the structures and processes associated with their farmed and forested landscape setting. The integrity of the tulou is related to their intactness as buildings but also to the intactness of the surrounding farmed and forested landscape – into which they were so carefully sited in accordance with Feng Shui principles.

The legal protection of the nominated areas and their buffer zones are adequate. The overall management system for the property is adequate, involving both government administrative bodies and local communities, although plans for the sustainability of the landscape that respect local farming and forestry traditions need to be better developed.

4. Recommends that the State Party give consideration to the following:

- a) as one of the main potential risks to the property is increased visitor numbers, there is a need to ensure that tourism protection plans are adhered to;
  - b) care needs to be exercised to avoid maintenance and conservation activities that may have an adverse impact on the authenticity and integrity of tulou by means of policy and “best practice” guidelines;
  - c) improved plan for the sustainability of the farming landscape which respect local farming traditions should be developed;
  - d) given the importance of the landscape setting of the tulou, consideration should be given to the protection of the wider setting of the property as well as the property and buffer zones;
  - e) there should be a one-year re-evaluation of the monitoring system in detail;
  - f) a coordinated overall interpretation and presentation plan at the provincial level is needed to ensure consistency in site interpretation and presentation. This should ensure consistency in quality and style from county to county, so as to create a recognizable visual identity in the eyes of visitors and local inhabitants.
- 12) *32COM 8B.20 - Examination of nomination of Natural, mixed and cultural properties to the World Heritage List - Fujian Tulou (CHINA)*,  
[http://whc.unesco.org/pg\\_friendly\\_print.cfm?cid=305&id\\_decision=1481&](http://whc.unesco.org/pg_friendly_print.cfm?cid=305&id_decision=1481&)
- 13) *Fujian Tulou*, <http://whc.unesco.org/en/list/1113/> (general description)

**Brief Description:** Fujian Tulou is a property of 46 houses built between the 12th and 20th centuries over 120 km in south-west of Fujian province, .... Several storeys high, they are built along an inward-looking, circular or square floor plan as housing for up to 800 people each. They were built for defence purposes around a central open courtyard with few windows to the outside and only one entrance. Housing a whole clan, the houses functioned as village units and were known as “a little kingdom for the family” or “bustling small city.” They feature tall fortified mud walls capped by tiled roofs with wide over-hanging eaves. The most elaborate structures date back to the 17th and 18th centuries. The buildings were divided vertically between families with each disposing of two or three rooms on each floor. In contrast with their plain exterior, the inside of the tulou were built for comfort and were often highly decorated. They are inscribed as exceptional examples of a building tradition and function exemplifying a particular type of communal living and defensive organization, and, in terms of their harmonious relationship with their environment, an outstanding example of human settlement.

**Outstanding Universal Value:** The Fujian Tulou are the most representative and best preserved examples of the tulou of the mountainous regions of south-eastern China. The large, technically sophisticated and dramatic earthen defensive buildings, built between the 13th and 20th centuries, in



their highly sensitive setting in fertile mountain valleys, are an extraordinary reflection of a communal response to settlement which has persisted over time. The tulou, and their extensive associated documentary archives, reflect the emergence, innovation, and development of an outstanding art of earthen building over seven centuries. The elaborate compartmentalised interiors, some with highly decorated surfaces, met both their communities' physical and spiritual needs and reflect in an extraordinary way the development of a sophisticated society in a remote and potentially hostile environment. The relationship of the massive buildings to their landscape embodies both Feng Shui principles and ideas of landscape beauty and harmony.

Criterion (iii): The tulou bear an exceptional testimony to a long-standing cultural tradition of defensive buildings for communal living that reflect sophisticated building traditions and ideas of harmony and collaboration, well documented over time.

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Criterion (v): The tulou as a whole and the nominated Fujian tulou in particular, in terms of their form are a unique reflection of communal living and defensive needs, and in terms of their harmonious relationship with their environment, an outstanding example of human settlement.

The authenticity of the tulou is related to sustaining the tulou themselves and their building traditions as well as the structures and processes associated with their farmed and forested landscape setting. The integrity of the tulou is related to their intactness as buildings but also to the intactness of the surrounding farmed and forested landscape – into which they were so carefully sited in accordance with Feng Shui principles.

The legal protection of the nominated areas and their buffer zones are adequate. The overall management system for the property is adequate, involving both government administrative bodies and local communities, although plans for the sustainability of the landscape that respect local farming and forestry traditions need to be better developed.

14) museum displays, Zhenfu, 2007

15) *Fujian Tulou*, [http://english.longyan.gov.cn/tourism/spots/200810/t20081030\\_66573.htm](http://english.longyan.gov.cn/tourism/spots/200810/t20081030_66573.htm)

In the southeastern Chinese provinces of Fujian, Jiangxi and Guangdong, there exist a lot of buildings with a long history called "Tulou". Raw earth, the main construction material, has been combined with wood structures, and stones have been used to certain extent. Most of these grand buildings with unique shapes and exquisite structures are round multi-storey buildings in mountainous regions serving the needs of families or villagers living together. These Tulou buildings, in isolation or in clusters, together with other traditional low residences in the localities, form villages large and small. They not only embody a profound cultural and historical tradition, but also integrate with the natural environment perfectly, presenting harmonious and wonderful scenes.

Unique, widely distributed and numerous Fujian Tulou buildings are an outstanding and representative architectural form created from long life experiences under unique historical and cultural backgrounds and particular natural and geographical conditions. With a large amount of objects and written records left from different times after the 11th century, the buildings reflect the emergence, innovation and development of this extraordinary art of raw earth buildings from the 11th century till now, provide abundant material evidence for the development and evolution of specific historical processes, cultural traditions, ethnic groups and folk customs, and have globally outstanding and universal historical and aesthetical value.

Among the world's various residential buildings, Fujian Tulou is known for its unique architectural shape, large size and exquisite structure. It is distinctive in the layout, and the choice of location which is integrated into nature. The abundant ethnic and cultural connotations and particular way of inhabitation make them unique and charming.

Fujian Tulou in the mountainous areas is a unique residential building complex made from rammed earth. It is a creative masterpiece in raw earth architecture. Fujian Tulou is mostly built by mountain side in rational layout. It absorbs the Fengshui principles in China's traditional architectural planning, meeting living and defense requirements of a family who live together. It cleverly makes use of narrow flat land in the mountains and local building materials such as raw earth, timber, cobblestone, etc. The many-storied building is itself a well-equipped, cost-effective and extremely solid system. It is both of high aesthetic value and marvellous defensive capabilities. Despite its seemingly plain appearance, its



concept, design, shape (circular in most cases) and exquisite interior structure is in an elegant harmony with surrounding mountains and rivers, presenting a uniquely charming picture.

Fujian Tulou is an architectural achievement and historical witness under specific natural, geographical conditions and significant social changes and turmoil, based on oriental kinship-based ethics and the tradition that a clan lived together. The modernized lifestyle and process of urbanization is influencing the continuity of traditional lifestyle. A practical way needs to be explored to protect and preserve the Tulou Building Cluster now and in the future.

The nominated Fujian Tulou is a unique and beautiful example of raw earth residential buildings or systems widely distributed in Fujian, Jiangxi and Guangdong provinces in China. Fujian Tulou is most widely distributed with the largest quantity and the richest variety. Approx. 3,000 Tulou buildings have been strictly confirmed. The properties presently proposed for inscription include ten buildings in Chuxi Tulou Cluster in Yongding County, seven buildings in Hukeng Tulou Cluster, four buildings in Gaobei Tulou Cluster and Yanxiang Lou, **Zhenfu Lou**, five buildings in Tianluokeng Tulou Cluster in Nanjing County, 13 buildings in Hekeng Tulou Cluster and Huaiyuan Lou and Hegui Lou, three buildings in Dadi Tulou Cluster in Hua'an County. They represent all known Tulou types and are of the best construction quality, highest aesthetic values, best preservation and management status with their authenticity and integrity least compromised.

Fujian Tulou has conformed to the oriental philosophy that regards the heaven and man as a whole and the so-called Fengshui theory of architectural planning. The indigenous construction material has been used, the site selection is either besides the mountain or along the river. Looking simple and rough in architectural style, the buildings are wonderfully elegant in form, appropriate in size and have complete functions. They present an idyllic picture in a charming country setting of mountains and rivers, and embody the harmonious and sustainable coexistence of human habitat and nature. Fujian Tulou is a perfect demonstration of a widely influential cultural tradition of a nation in a specific natural and geographical setting. It praiseworthy achieves a harmonious unity between residential buildings and natural environment, and is an architectural expression with singular features and aesthetic values. Though confronted with the modernized process, such kind of achievements in architecture and planning still have a charm and value we may not afford to overlook today.

16) *The tour centre of Hakka houses or Tulou – Hukeng,*

[http://www.whatsonxiamen.com/travel\\_msg.php?titleid=333](http://www.whatsonxiamen.com/travel_msg.php?titleid=333)

Yongding is a city in Yongding County; whereas Hukeng is a little town in the County. Many people know Yongding because it has been made famous due to its rammed earth buildings or round houses called Tulou.

Even though Yongding has got the name for being the place to see Tulou in the west of Fujian, the actual Tulou groups are not centred around Yongding, it is rather concentrated around Hukeng. (湖坑)

If you are rough and tumbled or for go comfort in the name of 'life experiences', It is also possible to stay in an earth building. Fuyu Lou (福裕楼) is one of them. It is reasonably clean and has good food. However, the bath room and toilet is on the ground floor whilst the bedroom is on 2<sup>nd</sup> floor (British). There is no air-con or heater. In winter, it is freezing. However, the cost is only around 60-100 rmb per night per person. Tourists can contact Mr Su who can also act as a guide, but please note he speaks no English.

In Hukeng town itself, you can walk to many of the tulou which are usually occupied and resided by families.

Hongkeng village (洪坑村) is the main centre for tourist activity with many of its showpieces, one of them being the Zhencheng Lou (振成楼). Though some of the Tulou are restored for tourists in which these Tulou are brought back to former glory, many are still resided by villagers and in their day to day living states. You can spend some time wandering around the village. Most of the buildings are still lived in. They aren't just historical relics. They are excellent examples of ecologically sustainable building design.

Hongkeng is a long village lying along both banks of a river that winds between fertile, sunny mountain slopes with terraced rice fields. In places where it is impractical to create terraces are found camphor and pine trees, tea, hemp, banana, bamboo and tobacco.



All of the 2500 inhabitants of Hongkeng bear the surname Su and almost all are Hakka.

In many villages, including Hongkeng, communal activities take place in the shade of an especially large tree. Here is also found the local altar of the soil, a small stone typically about one metre high.

For many years it was believed that the Hakka were the first to build tulou, as a direct consequence of their traditions and way of life. But there is now evidence of the existence of the tulou from before the arrival of the Hakka, most are today inhabited by other, South Chinese, ethnic groups.

The She people (a subgroup of the Yao people) lived here in the hills before the Hakka and inspired them in such matters as gender roles, division of labour, and even their architecture.

On the other hand, the counties of Yongding and Nanjing are predominantly inhabited by the Hakka and there is little doubt that they have to this day exerted a great influence on the buildings appearance.

Some Tulou have been restored and are showpieces rather than dwellings, Zhenfu Lou (振福楼) in Hongkeng Village is one of them

About five kilometres from Hongkeng village is Chengqi Lou (承启) which is the largest of the earth buildings. It is almost three hundred years old and is made up of three concentric circular buildings.

- 17) *Three-star Tourist Hotel of Yongding Hakka Tulou Scenic Spot*,

<http://www.fjfdi.com/fr/cn/project.asp?job=showen&id=7711&yuyan=en>

Fujian Provincial Hakka Tulou Tourism Development Co., Ltd.

Contact person: Huang Minyuan

- 18) *Sir Crispin Tickell: Clean, Green Growth in China*, (video)

<http://www.globalissues.org/video/766/crispin-tickell-clean-green-growth-in-china>

- 19) C.S. Kiang: China's Future.

<http://www.globalissues.org/video/767/cs-kiang-chinas-future>

- 20) environmental credits (emissions trading):

a) *Emissions Trading*: [http://en.wikipedia.org/wiki/Emissions\\_trading](http://en.wikipedia.org/wiki/Emissions_trading)

**Emissions trading** (or **emission trading**) is an administrative approach used to control pollution by providing economic incentives for achieving reductions in the emissions of pollutants.

b) Emissions trading: Like foreign aid, but better,

<http://www.theglobeandmail.com/servlet/story/RTGAM.20070320.wcomment0321/BNStory/Front/>

c) ONTARIO EMISSIONS TRADING REGISTRY INTRODUCTION,

<http://www.ene.gov.on.ca/envision/air/etr/index.htm>

d) *The Emissions Trading System - putting a price on carbon*,

[www.youtube.com/watch?v=y7veRksc\\_Yk](http://www.youtube.com/watch?v=y7veRksc_Yk)

- 21) *DIY Green Energy projects*: <http://www.hydro-electricity.net.cn/energy/>

- 22) *Sustainable Tourism in Hakka Luodai old town*, (E-RENLAI Magazine)

<http://www.erenlai.com/index.php?aid=1332>

The old town of Luodai is located 17 kilometers away from Chengdu. It was founded during the Three Kingdoms era (Note: the Archaeological Site of the Palace of the Nanyue Kingdom, built 2,000 years ago, in Guangzhou) in what was then the Kingdom of Shu. It is said that Luodai took its name after the Emperor Liu Shan of the Shu Kingdom dropped his jade belt into the town's eight-sided well. Luodai is a simple folk town with a long history and a profound cultural legacy. The town counts 23,000 inhabitants of whom more than 90% are Hakka. The Hakka dialect, folklore and way of life have been well preserved up to now.

Lessons can be drawn from the example of how Luodai preserved its historical Hakka culture while developing sustainable tourism. The natural appeal of the site makes it attractive to tourists. The core attraction of LuoDai is the preservation of its traditional Hakka architectural heritages such as guild-halls. The people of Luodai have kept with utmost care what remains of their tangible and intangible ancestral heritage. The imposing and exquisite Guangdong Guildhall, Hunan and Guangxi Guildhall, Jiangxi Guildhall and Sichuan Guildhall have been kept intact. This ancient street of LuoDai is composed of 7 alleys. The two sides of the old street are of the same gray brick tiles and inlaid wooden doors. The embellishments engraved on windows together with the engraved roofs and eaves are perfect examples of the architectural style of the Ming and the Qing.

The yearly “Water Dragon Festival » and “Fire Dragon Festival” are folk activities that were brought by the Hakkas 900 years ago.

The people who have lived in the town for a long time are an integral part of the cultural landscape. Their hospitality plays an important role in the tourists’ experience. The tourism industry here has developed by focusing on the ordinary lives of the population in the ancient town. This allows the local population to preserve their own and unique customs of life, while participating in the development and promotion of the local tourist industry.

The activities of the international Peach Blossom Festival in Longquan, the celebration of the “Water Dragon Festival” and the “Fire Dragon Festival” link the countryside and agricultural tourism to Hakka culture.

This developmental model through sustainable tourism unites history and the present, while preserving and magnifying the ancient Hakka town of Luodai so as to open the way to future generations. By using sustainable tourism as a method of development, Luodai is becoming «The main Hakka Town of the West ».

E-RENLAI Magazine: interested in "pilot projects for humane and sustainable development... to build together a world order that would be more humane and sustainable"

23) *The Hakka toulou (round houses)*,

<http://ouryearinxiamen.blogspot.com/2007/12/hakka-toulou-round-houses.html>

24) *Hakka industry Research Center*, National Pingtung University of Science & Technology,

<http://tve.npust.edu.tw:8080/npust/hakka/oall.htm>

25) Taipei Hakka Affairs Commission, <http://english.taipei.gov.tw/hakka/index.jsp>

26) Stephen Siu-Yiu Lau, Renato Garcia, Ying-Qing Ou, Man-Mo Kwok, Ying Zhang, Shao Jie Shen, Hitomi Namba, *Sustainable design in its simplest form: Lessons from the living villages of Fujian rammed earth houses*, *Structural Survey*, 2005 Vol. 23 Issue: 5, ISSN: 0263-080X, Emerald Group Publishing Limited

“**Purpose** - The aims of the study are to analyze the features of a socially self-contained society; to analyze the features of an environmentally sustainable society; and to generate a discussion on an indigenous approach towards the sustainable design of communities, particularly through the study of the round village for its unique form and performance in terms of sustainable construction.

**Design/methodology/approach** – Researchers from an international group undertook a field study of a number of specimen round and square shape Hakka villages in December 2004. They discussed their preliminary findings with local academics regarding significant attributes for sustainable design principles, and summarized lessons by means of spatial and construction studies that inform contemporary urban designers' knowledge and practice of sustainability through indigenous architecture.

**Findings** –Through reinterpretation of “Feng-shui” theory, various observations made were easily and naturally correlated to basic laws of sustainability. The biggest message that comes from Fujian round architecture is that a genuine practitioner of environmental and social sustainability relies on a simplicity of approach –“ a respect for nature.

**Research limitations/implications** – The study is confined primarily to observations by a team of architects and engineers.

**Practical implications** –Field study of vernacular architecture provides useful information and first-hand data for researchers on rammed earth structures.

**Originality/value** – The study of rammed earth structures in remote areas of China, in both coastal and earthquake active zones, offers fresh insight into the integrity and ingenuity of early settlers in sustainable construction. The research provides preliminary findings regarding environmental and construction practice in age-old Hakka round houses.”

27) *Feng shui*, <http://en.wikipedia.org/wiki/Fengshui> and [http://www.newworldencyclopedia.org/entry/Feng\\_shui](http://www.newworldencyclopedia.org/entry/Feng_shui)



- 28) Ronald Knapp, *Chinese Houses, The Architectural Heritage of a Nation*, Tuttle Publishing, 2005
  - a) "The Five Phoenix Mansion", 176-183
  - b) "Round Fortress Ramparts in Fujian, p. 184-191
  - c) "Hakka Encircling Dragon", 192-201
- 29) John King Fairbank, Merle Goldman, *China, A New History*, 2<sup>nd</sup> ed., Belknap Press, Cambridge, Mass., 2006
- 30) Stephen Turnbull, *The Great Wall of China, 221 BC-AD 1644*, Osprey Publishing, Oxford UK
- 31) Norbert Schoenauer, *6,000 Years of Housing*, Norton Publishing, 2000, New York, NY US
- 32) *World Heritage Sites*, China Intercontinental Press, Beijing, China, 2003
- 33) Robert Murowchick, *Cradles of Civilization, China*, University of Oklahoma Press, Norman OK US, 1994
- 34) Caroline Blunden, Mark Elvin, *Cultural Atlas of China*, Checkmark Books, New York, NY, 1998
- 35) Catherine Bourzat, *Undiscovered China*, Octopus Publishing, London, England, 2004
- 36) *Hakka Enclosed Houses in Guangdong and Hong Kong*, subtitles in English
- 37) Kwai-Yun Li, *The Palm Leaf Fan*, 2006, TSAR Publications, Toronto
- 38) *Traditional Chinese Vernacular Dwellings* (Rammed Earth Collective Dwellings in Fujian), CD
- 39) *The Forever Homestead*, english subtitles for photographs
- 40) Jiao Hong-Hui, *The Home of the Hakka*, an on-the-spot Photo Album, many people pictures
- 41) *Hakka Enclosed Houses*, English Preface, Titles & Introductions (thin book)
- 42) David, P.Y. Lung, *Chinese Traditional Vernacular Architecture*, Regional Council and the University of Hong Kong, Exhibition Hall, Sam Tung Uk Museum, Kwu Uk Lane, Tsuen Wan, N.T. (Eric K. C. Lye, 1991, Professor and Head, Department of Architecture, University of Hong Kong)
- 43) Huang Hanmin 黄汉民