

Toward a Green Housing Development in the Case of Miaoli Hakka Countryside of Taiwan

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Abstract: The construction style and features of Hakka countryside in Miaoli country in Taiwan have been evaluated by the field investigation in this study. This research also proposes the basic green housing strategy framework for improving Hakka countryside housing pattern and for as reference by the residents in the actual operation of green housing space improvement. Investigated results show 68% of concreted roof top material and 53% of concreted surface material were used in this area, that caused an adverse environment quality in Hakka countryside. The research is aimed to implement countryside reconstruction strategy including (1)improving countryside living environment by providing leisure space for farmers; (2) setting up local community construction style and model rather than emphasizing economical development; and (3)establishing sustainable countryside development concept and ultimately promoting and implementing countryside reconstruction and control by continuous countryside reconstruction, that will fully be coordinated between local residents and its government.

Keywords: Green housing, Sustainable development, Hakka, Surface material, Energy conservation index

I. Introduction

Recently the countryside community environment and building landscape have been changed dramatically in Taiwan. Traditional characteristics is quickly disappearing [1] as a result of that the living space originally coordinated with natural environment has become unsuitable for human dignity and features of countryside. In Miaoli county of Taiwan, the overall natural environment of countryside has gradually deteriorated after farmhouses have been rebuilt in a same type of reinforced concreted building, and asphalt and roads cemented and courtyards replace many plants and trees. In facing this difficulty, it is important to improve the city living environment, and to emphasize the reservation of natural resources of countryside, in order to make beneficial to the overall environmental protection and the sustainable development of future living environment. With economic growth and technology advancement the living standards of people are enhanced correspondingly, nevertheless it has also imposed serious impacts to global environment.

Due to the significantly increasing of carbon dioxide emission on global environment, target on carbon dioxide emission reduction was officially formulated on many countries, therefore the environment problems caused by construction and manufacturing industries are an important and urgent topic. Taking an example of Taiwan case, the carbon dioxide emitted from the energy consumption of construction and manufacturing industries accounts for 24.3% of total emission content of the country [2]. Moreover, the deviation of construction structural ways [3], the illegal acquisition of construction materials [4], water impermeable design used in artificial environment, poor ventilation of construction, waste of energy and poor energy saving design, all contribute further damages on global environment.

The green housing is a sustainable way that can be described as: in the life cycle of construction (production, planning, construction, usage management and demolition process), using the manner and methods that are most energy saving, most effective use of resources, lowest environmental load to construct the safest,

healthiest, most effective and comfortable living space, thereby attaining the goal of co-prosperity and of sustainable development among man, construction and environment [6]. The concept of green housing is not only on the planting of trees and plants on the construction environment; it embarks on the viewpoint of environment protection, with human health as foundation, and pursues the sustainable development design concept of living environment.

In case of countryside residence space conforming to green house index [7], it will be beneficial to the countryside living condition. Thus, this is also an important topic related concerning ecological environment and economic technology in the study of Hakka countryside housing to pursue a sustainable development concept. The goals of this research are: (1) to expand the development of green house and to appraise index of the existing green house; (2) to analyze countryside housing by reviewing the feasibility of design, and by promoting green housing in countryside in near future. Also this research also discusses the green housing index in the environmental essence and its actual application condition, and constructs fundamental investigation information, to be used in countryside residence.

2. Hakka Countryside Investigation

Hakka countryside located in the north side, particularly at Miaoli, Hsinchu and Taoyuan area. The characteristic of Hakka countryside is living on the mountainous area and its culture and customs are much different from other areas in Taiwan. Consequently, it can be easily verified that the Hakka housing characteristics with ancestral temple and old folks living style. In order to maintain the traditional features and raising the quality of modern housing in this countryside, it is an effective ways to develop Hakka countryside housing by rebuilding and improving countryside living habits and space use, and by utilizing human resources of local villagers to develop their ability in built housing by themselves. According to a study on Hakka countryside residence [8], there is a analysis related to green housing subject, showing current stage of Hakka countryside housing conditions.

For example, countryside housing pattern, residence external wall, roof condition, construction material and structure model, and resident cognition in countryside housing design will influence the pattern of countryside housing in the future. The investigative information was collected from the northern Hakka countryside, and the sampling data were compared by farming characteristic, comparative to each index of green housing and basic afforestation, water conservation, daily energy conservation, carbon dioxide reduction etc. Table 1 shows that Hakka countryside mainly is a farming area, and nearly one half of countryside housing style has been changed to modern one. Traditional Hakka countryside characteristic constructed will gradually be replaced by modern construction that simultaneously damages overall beauty of countryside landscape. Our analysis shows that countryside construction style can be divided into construction style in traditional or modern one, and these Hakka countryside constructions mostly be built in lower stories, and the ratio of modern construction housing is rather high, the building used period is from 1 to 10 years, and its roof style of buildings are mostly built at reinforced concrete construction.

Fig. 1 shows the ratio of roof materials adopted, it can be noted that the more the quantity of modern construction, the more the quantity of reinforced concrete on flat top roof. Concerning that carbon dioxide reduction index on Hakka countryside construction it is not adequate. Because flat top roof style is not beneficial to energy conservation, nevertheless it is ideal if we consider to install solar collectors to use its sustainable resource. From the viewpoint of green housing, housing can be designed or redesigned in order to achieve the effect of energy conservation. Shown in Fig. 2 is the ratio of concreted walls accounts for 60%, this type of external wall constructed is not a good design for energy conservation consideration. It is also noted that the overall color of external walls are in agreement with energy conservation index of green housing standard because that material used in gray and white color series are less absorbed radiant heat. Regarding to Hakka of countryside construction style we can find local residents very concerning

the direction of housing location due to the cognition of them on customs of Feng-Shui, and nearly 30% of residents prefer housing built in east-west direction. The majority of Hakka countryside housing is built by owners themselves, they little considered inviting architects/contractor to do due to limited budget for housing construction. It points out that Hakka countryside residents have no idea on housing built by professional design. Therefore it needs to be encouraged by local government measures and educational guidance.

3. Construction Characteristics and Implement

3.1 construction and community style

Of traditional Hakka countryside community its construction style was highly appraised with environmental improvements and building styles which conform to ecology. In order to understand the existing problem of countryside environment, and substantive construction conditions we surveyed countryside field, building construction and environment resources maintenance, green housing community development condition etc. The Shi Qiang village located at Miaoli Hsien Cuan Cuan Hsiang of Miaoli county was investigated in this study. The building style of Shi Qiang village is a typical of Hakka style constructed thus it deserved to be preserved the original village style. However, in latest decade their building style has been substantially changed to the modern style (Fig. 4). On an on-going Shi Qiang Village housing and landscape project, that abandoned open space had been planted with beautiful garden, where not only was increased the artistic view of countryside community, but also provided leisure place for residents. The village is near Hou Long Brook, its neighboring landslide site had been planted and designated as a recreation area for children use, but it is still needed to concern the potential environmental disaster. A brook flowing through the village allows residents to use it to as resting pavilion, washing clothes etc. Related investigative studies were carried on building materials (Fig. 3a), and the use in courtyard surface material (Fig. 3b). Although residents participate in initiative but the main subject content still has

been not focused on countryside ecology, afforestation and water conservation effect etc. Overall green housing construction was very few, due to limited fund for country development plan. Current improvements plan and strategy can be stressed on the following:

- I. Surface materials constructed must be changed to water permeable surface in order to increase green covering rate and water permeability, and hedgerow or trees can be planted along the roads to provide shades for passers-by, and make the streets green in coordination with each scenic spot.
- II. Instead of ecological porch path only being done on local road plan it can be extended to all insides of the community by designing a series of porch path to make overall countryside more beautiful and ecological landscape.
- III. Vines and plants can be planted on the walls of residences to create three-dimensional afforestation, thereby indoor temperature reducing, thus unpleasant scenic spots can be covered up in the countryside.
- IV. Too many unused spaces will waste the overall landscape and its natural resources thus these spaces must be reused and managed in the future. Concerning to effectively use water resources, rain water collection system and ecological pond must be set up in order to watering flowers and plants in the garden.
- V. Used or unused buildings could be installed with solar energy collector to achieve the goal of energy conservation. Because the sewage treatment system in the community has not yet been installed, rain and sewage must be separated to prevent more pollutant water emission. In addition local government must pay more attention to residents, needs and gives more guidance and financial assistance as possible as they can.

3.2 Green housing implementation

The traditional interior facilities not only has not been adjusted to the need of present living but local residents were lack of skill in building construction, and of concepts in material

adopted, space deployed, natural lighting used, building style designed, landscape conservation etc. Accordingly, mostly traditional Hakka building have been reconstructed in a typical modern reinforced concrete flat top building that made a non-harmonized countryside landscape where can be found easily. Table 2 shows the problems encountered in countryside construction in Taiwan, and that could be expected to attain the standard of European countries or Japan in near future if solutions can be effectively solved. The following points aim to implement countryside reconstruction: (1) improving countryside living environment by providing leisure space for farmer and for reasonable green housing design for; (2) setting up own community construction style on the construction art and continuance of tradition should be taken into consideration rather than only emphasizing economical development; and (3) establishing sustainable countryside development concept that emphasizes the reasonable use of construction material, conservation of energy, recycle of resources, ecological environment performance, effective waste and garbage management; and (4) ultimately promoting and implementing countryside reconstruction by fully coordinating between local residents and government unit. It is worth to note in this study that design pattern of countryside green housing must follow: (1) stressing ecology of overall region environment; (2) conforming to the affinity of countryside construction and environment; and (3) continuing to study countryside construction, residents living condition and quality, and urging residents and users to participate together.

4. Conclusion

This research focuses on the survey of Hakka countryside community and the surrounding environment. Although there are still many problems existing in Taiwan Hakka countryside, with proper promotion and guidance, it will have substantial benefits to the improvement of hakka countryside construction and community. In addition, this research investigates the hakka countryside current condition and related analyses in order to truly reflect the green housing development in domestic Hakka

countryside community. The construction style and features of Hakka countryside in Miaoli country have been evaluated by the field investigation in Taiwan. This research also proposes the basic green housing strategy framework for improve Hakka countryside housing pattern and for as reference by the residents in the actual operation of green housing space improvement. Results show 68% of concreted roof top material and 53% of concreted surface material were used in this investigated area, that resulted in adverse environment quality in Hakka countryside.

It was hoped this study will help the government and civic organizations to promote the work of green housing [5], and to encourage countryside people to join in the activity of energy conservation by saving resources and pollution control of the environment. Subsequently enhancing the quality of life of countryside and increasing the competitiveness of upgraded industries are main purposes. In the future, Hakka countryside community will be further discussed, and as reference for Hakka countryside green housing implementation. It is also hereby suggested that Hakka countryside green housing improvement and implementation be incorporated into region development evaluation, in order to encourage civic organization and industry circles to actively participate in the countryside reconstruction and countryside green housing construction.

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Table 1 Basic characteristics of Agriculture Improvement Research on Tao Yuan Area [8]

Subject	Type	Persons	%
Farm model	Traditional type	145	48.3
	Modern type	143	47.7
	Combination	12	4.0
Occupation	Agriculture	176	58.7
	Concurrently agriculture (farmer)	78	26.0
	Concurrently agriculture (not a farmer)	45	15.0
	Others	1	0.3

Table 2 Problems encountered by agriculture construction in Taiwan

Problems	Affected scope
. The new model uses sky buildings and adjacent edifices in the agriculture area, conflicting with the traditional agriculture construction	Agriculture area construction
. Agriculture area of public facilities space plans are inadequate and defective	Natural landscape and leisure space
. Urbanized countryside containing disorganized land usage, factory site chosen is not adequate; zero development on the primary land usage and building	Countryside development, production space and landscape compatibility
. People are migrating. Part of the traditional countryside area is unused	Countryside public facilities, living qualities, and traditional culture space
. Difficulty in conserving traditional culture and construction	Countryside characteristics, and tradition culture space
. Lacking professional architect personnel	Living conditions, and beautification of environment
. Countryside land do not have clear property right divisions, causing land developments disorganized	Economic efficiency, landscape space, development foreground
. Outdated people system, traditional social meanings slowly disintegrating	Human resources, and social consciousness
. Countryside area development is not yet mature	Design method, space beautification, living environment, and transformation progress
. Professional plans cannot match with the residents requests and needs	Countryside independence, countryside nature, production cooperation, living habits

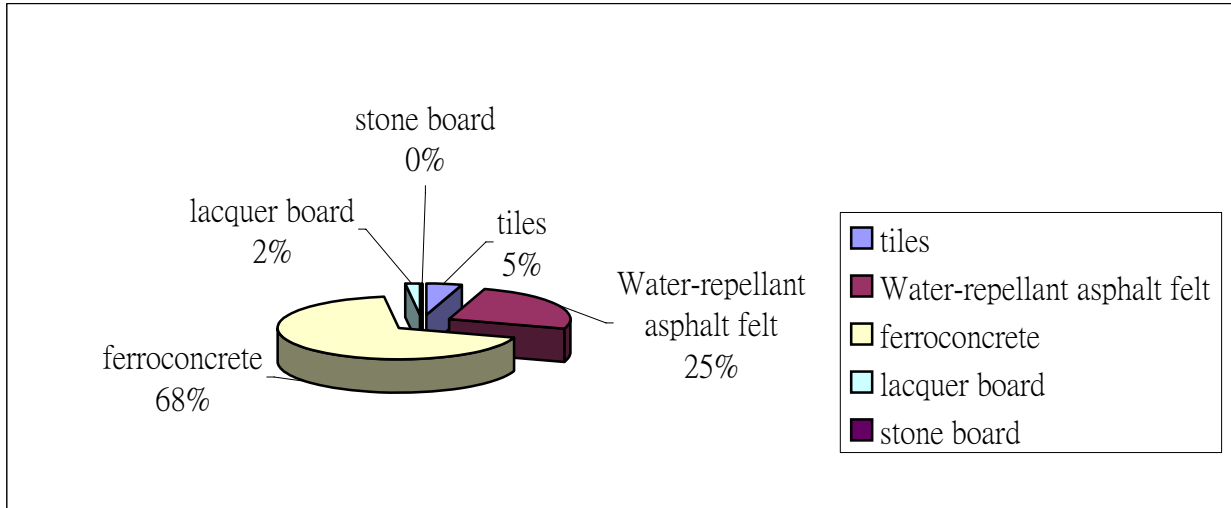


Fig. 1 Analyses of modern Hakka roof top construction materials.

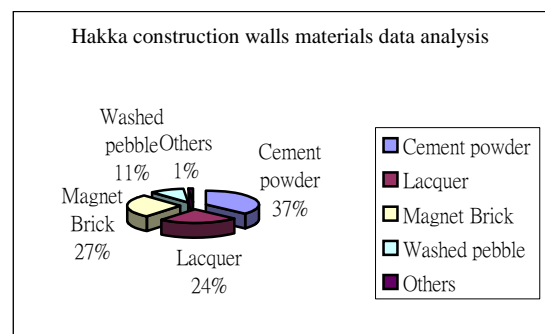
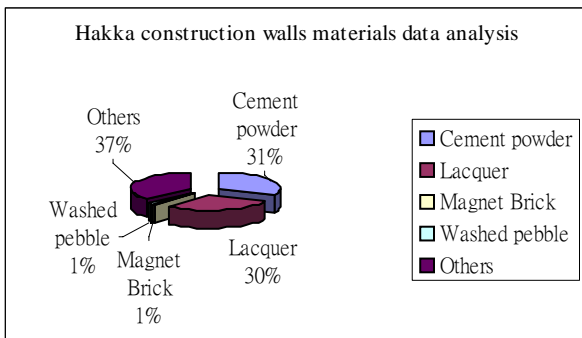
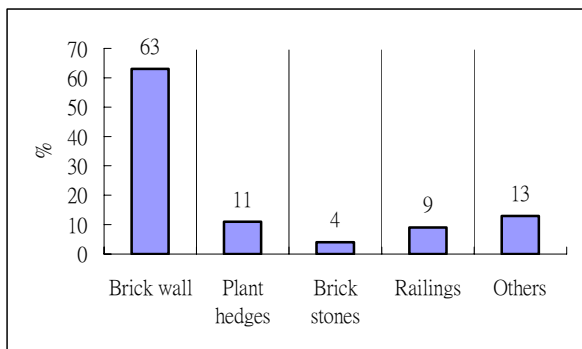


Fig. 2 Analyses of external walls materials constructed in Hakka community.

(a) Statistic in wall materials



(b) Statistic in surface materials

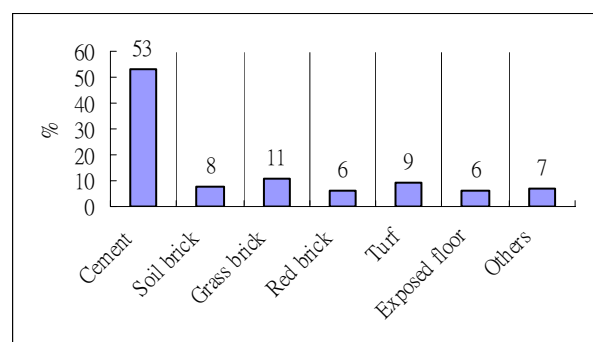


Fig. 3 Statistics in (a) community housing walls, and (b) courtyard surface materials in this study.