



The Investigation of Practice on Green Residential Buildings in Shenzhen, China

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Abstract: Construction industry throughout the world has been one of the biggest contributors to the energy consumption and CO₂ emission, while the world is facing serious energy resources shortage. Sustainable development of construction has been seen in the past years to reduce the negative impacts on the environment but at the same time to assure the function of buildings was properly delivered. Current literature showed that majority of studies focused on the commercial and public green buildings, while for the residential buildings, research was mainly focused in developed countries such as Great Britain, America and Australia. There were generally few studies on the specific high-rise residential buildings which are common in the big cities with high-density population in the developing countries. This paper will investigate the practice of green buildings for residents in Shenzhen, China, which is one of the six Tier 1 cities with urban population of more than 10 million and GDP of more than USD 24,000 per head. The study will investigate the attitude of potential customers and the satisfaction of existing customers towards them, and will identify the opportunities and challenges of green residential construction in Shenzhen from the point of view of developers and managers. The results will show some inside views of green residential buildings from driving forces (consumers), and provide additional suggestion for the developers and local governmental agency in the future development.

1. INTRODUCTION

As the world population booms, more buildings were built to provide accommodations and for other purposes. The energy demand for constructing and operating those buildings is inevitably posing threats to our environment in terms of natural resource consumption and CO₂ emission associated with those activities (Yudelson & Meryer, 2012, P.3; Allen & Thallon, 2011, P. 10). The construction activities could also have great impact on people's health (Nahmens, 2009) since they resulted in a large amount of pollution and waste from the time when houses are being built to the time when they are used (Horvath, 2004; UNEP, 2007; Wu & Low, 2010). Out of the concern for environment and for the well-being of humans, it is quite necessary to make the whole process of residential construction environmentally friendly.

Previous studies on green residential construction mainly discussed its development and practice in developed countries such as Great Britain, America and Australia. However, there were not many studies which have set out to explore the practice of green residential construction in developing countries, such as China. Many of them adopted a theoretical perspective instead of a practical one. Therefore, there is a gap to fill in. As we all know, China is a developing country with largest population. The economic booming in the past twenty years saw more houses needed than those in any other countries and thus created a higher pressure on our Earth by building a much larger number of houses. It is therefore especially important to understand how green residential construction has been practiced in China.

Yet, we know that China is a large country geographically and it is almost impossible to collect data in every city to show the general condition of green residential construction in the whole country. The scope of the study was therefore narrowed down to focus on a specific city of China, the city of Shenzhen, which is one of the six Tier 1 cities with urban population of more than 10 million and GDP of more than USD 24,000 per head. Shenzhen is a newly developed city since 1980 as a Special Economic Zone and its population has increased dramatically in the short period of a few decades. Starting with 30,000 in 1980, the population living in the city increased to 4 million in 1994. Ten years later, the number doubled and exceeded 8 million. By 2012, the population was more than 10 million (SZTJ, 2013). The sharp increase and the large population lead to a high demand for houses and a huge increase in the construction activities. According to the statistics of the city, the floor space of buildings under construction by the end of 2008 was about 54 million square meters while the figure had increased to be more than 97 million square meters by the end of 2012(SZTJ, 2013). Such large-scale construction activities in the city of Shenzhen showed that it urgently needs green residential construction to ease the heavy dependence on natural resources and energy.

This paper, therefore, aims to investigate how green residential construction has been practiced in the city of Shenzhen, China. Questionnaires and face-to-face interviews were taken place to investigate (1) to what extent the green residential construction has been practiced and their specific aspects in practice; (2) the attitude of potential & existing consumers toward green residential construction; (3) the opportunities & challenges for green residential construction in the city.

2. METHODOLOGY

As for the research methods, the study combined questionnaires and interviews. Questionnaires were

developed and sent by email to 30 housing developers that have housing projects in the city of Shenzhen. The questionnaires mainly asked the housing companies about the situation that they practiced green residential construction. If they gave positive answers, they were also invited to share why and through what specific actions they did so. As a result, 10 housing developers filled in the questionnaire and sent them back with their opinions.

Interview was conducted in person to obtain information about what the potential customers considered to buy houses with green construction practices. The questions were all open-ended ones. Another set of interview was conducted within the existing residents of green houses, who came from three different green communities in different districts of the city. 30 interviewees were contacted as potential and existing customers respectively.

Telephone interviews were finally conducted with 3 managers in the industry to investigate the opportunities and obstacles for green house construction. Two of them were project managers who have been responsible for green projects; while one was the executive manager of a construction company. All three managers had at least 5 years of working experience in the housing industry.

3. RESULTS AND DISCUSSION

3.1 Case 1: Questionnaires from developers

The development of green residential project in the city of Shenzhen was questioned among the 10 bosses (owners) of selected construction companies. Results showed that 5 companies(50%) have developed green residential projects, and 3 companies(30%) are not currently developing but planning to develop green residential projects in the future, while the remaining 2 companies(20%) are not developing and do not plan to develop green residential projects. Within the 8 companies planning to develop or having developed green residential projects, 5 companies (62.5%) stated that they did so because of the requirement from government; while 3 companies (37.5%) said that they did so mainly because of positive market prospects. In other words, they believed developing green residential projects would help them to make profits. Meanwhile, no companies are driven to develop green residential projects because of “green” belief or environmental protection awareness.

Identifying the “Green” characteristics was included in the questionnaires. 5 companies have included the characteristics of conserving land resources and providing good exterior facilities but they failed to incorporate other green characteristics such as saving water and conducting operation management to reduce the negative effects on the environment and people living near the construction site. For example, noise, dust and construction waste were commonly brought by construction

House decoration is one of the important factors which will directly affect the customers’ choice, and this was questioned as well. The responses of the 5 companies that have developed green projects indicated that 4 out of 5 companies (80%) would like to give customers their own choice to decorate their houses at their wills, while the remaining 1 company (20%) has tried to decorate the houses using environment-friendly material, as they believed that decorating houses collectively and using environment-friendly materials can be beneficial to the environment. Even though, the percentage of decorated houses was 30%, while the remaining 70% houses were undecorated.

Incentives play very important roles in promoting green housing projects, and developers were asked their availability in the city. Feedback showed that majority of the contacted companies (4 out of 5) did not receive any incentives from either local or central government. The only lucky one received subsidy from local government because of the application of using renewable energy in buildings, i.e. solar thermal energy.

The concept of green residential projects was tested within the dynamic housing market. Only 40% of the companies admitted that the green projects were more appealing to customs than the traditional ones, while another 60% were not sure about its marketing. The confidence level directly affected their further investment in green residential projects and their corresponding response for that was in line with the marketing results. Interestingly, no companies gave definite answers that they will not develop green house in the future. The results also showed that there were some general reasons for the companies to go forward with green residential projects, i.e., they believe that being green and environment-friendly will be a trend and will be more and more popular in the future. The confidence on the market demands requires them to continue developing. There were also obvious reasons for the companies not to be involved further. First, they believed that the current acceptance of customers toward green residential projects is low and a majority of consumers have no idea about them or would not purchase them because of higher prices. Also with low attraction to customers, it is hard for developers to turn the high cost into profits in the short period of time.

3.2 Case 2: Interviews with potential customers

The interview took place with potential customers as they would be driving force for the future green residential houses. The result showed that about 87% of the respondents replied that they did not know exactly about the idea and felt that the housing project with green construction would have higher rate of green coverage in the community or is good for the environment. In other words, they only got a general idea, but failed to know what kind of specific actions it should incorporate. The understanding of customers toward green residential construction is still superficial and needs to be improved in order to further promote green construction in the housing industry, for example, via dissemination and/or education.

The interview result also indicated the attraction of potential customers to green houses is not obvious. Only 40% of the respondents said that they would be willing to choose green houses in their purchasing decision. By contrast, the remaining 60 % of the respondents are not willing to do so, because they believed that green houses would generally cost more than traditional house per square meters. The lack of understanding can also account for the low attraction of green houses.

3.3 Case 3: Interviews with existing residents in green houses

The feedback from existing residents in the so called “green residential housed” is vital and they were considered as piloting customers for the new style of living. The interviews with the existing residents show that 73% of the existing residents replied that they were satisfied with the living conditions of the green houses. The specific aspects they are satisfied with included: (1) good indoor environment provided by good ventilation and designs to ensure appropriate lighting levels; (2) good air quality enhanced by the

high rate of green coverage in the neighborhood; (3) providing convenient much-needed facilities around, i.e., schools, hospitals/clinics, shopping malls, supermarkets, and public transportation.

Additionally, there was still room for improvement. The respondents surveyed pointed out the following aspects to be improved: (1) the noise level can be further controlled. This, to some extent, complied with the result of the questionnaire that only 60% of housing developers surveyed used specialized building materials to reduce the level of noise; (2) the waste created by the residents in the neighborhood was also advised to be classified more carefully and collected separately so that some can be recycled. Overall, the existing residents surveyed gave positive comments on the green houses.

3.4 Case 4: Telephone interviews with managers in the green housing industry

The interviews with three managers showed the following opportunities: (1) More and more customers will choose green houses in the future, which means the market prospect for green residential construction will become better sooner or later. The interview with the potential customers showed that only 40% of the consumers are willing to buy green houses. Yet, the managers interviewed believed that this percentage will increase in the future. The underlying reason they gave was that along with the increase of their income, they would naturally want to live a life with higher-quality, part of which can be met by living in green houses. In addition, when the society continues to develop, people's awareness to protect the environment will also increase, which accordingly fuel the development of green residential construction. (2) Considering that China has a big duty to reduce CO₂ emission under international agreements, Chinese central and local governments will put more efforts in the development of green construction in housing industry. They have also realized the environmental problems caused by the boom of housing construction and have issued some regulations to relieve the environmental stress. They will continue to enhance the implementation of related rules and regulations in the future.

The interviews with three managers also found the following obstacles: (1) the cost of certain types of environmentally friendly material serves as the financial barriers to green residential construction. The green residential houses usually have to be built in different ways with different materials at some aspects. For instance, in order to conserve energy and use renewable energy like solar energy, certain equipment has to be installed and extra cost is inevitable. Such higher cost will turn into the higher price of the built house, which hinders some consumers from buying it although there will be some financial benefits in the later operation stage. (2) Currently consumers failed to have adequate understanding of the concept of green residential houses. They don't know clearly what construction practices or characteristics green residential houses must incorporate, neither their advantages over traditional houses. (3) The current financial incentives from the central and local government are not enough. Currently, there is some subsidy for green efforts to conserve energy. Yet, there is no subsidy for other green attempts such as conserve water and improve good indoor environment.

4. CONCLUSIONS

To sum up, it can be seen that green residential construction has actually been practiced in the city of Shenzhen, China, but on a relatively small scale. Its market is not mature yet due to the following reasons

- Its perception among potential customers is still low and not many people understand green residential houses and their advantages clearly.
- The incentives from governments are still limited and currently incentives will only be awarded towards the application of renewable energy technologies.
- The development of green construction is still hindered by higher financial cost.

However, it can also be concluded that people who have been living in green houses mostly enjoyed the living experiences and believed that living in green houses have clear advantages. Under such situation, the joint efforts of housing developers and government will make the future of green residential construction even more prospective, with the promotion on the public awareness and more incentives and rigorous enforcement of its regulations for green residential construction.

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