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Prospects and Challenges of Green Buildings and Green Affordable Homes-Concept: A Study with Reference to Ernakulam, Kerala

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ABSTRACT

The concept of 'Green Affordable Homes' has assumed tremendous significance in the contemporary centrality because of the utmost importance of environment-friendly development initiatives, not only in the construction and housing development arena alone but in the entire gamut of all types of human endeavors as well. The need for preserving energy and ensuring high energy efficiency has added another dimension to the significance of green and affordable homes. As the governments the world over are keen on promoting various environment-friendly and energy-saving development initiatives, 'Green Buildings' in general and 'Green Homes' in particular are growingly becoming the preferred development models of governments, and also financing agencies, regulatory authorities, developers etc. In this context, this paper makes an overall review of the vital significance of green, affordable and energy-efficient construction activities, makes an empirical study of the awareness level, attitudinal issues, problems and prospects of such houses, and makes some suggestions based on the findings of the study.

KEYWORDS : Green Homes, Affordable Housing, Eco-friendliness, Energy Efficiency, Attitudinal Issues, Life Cycle Cost, Long-term Benefits.

Green buildings and GREEN AFFORDABLE Homes - Concept

The term 'Green Affordable Housing' generally refers to reasonably priced housing that incorporates sustainable features. In India, the term is often used interchangeably with the terms 'Sustainable Housing', and the latter term is more common too. For connoting the energy-efficiency aspect of green buildings, terms like 'high-performance buildings', 'environmentally responsible building' are used, though not very common in practice. There is no single definition for the concept of 'Green Building'. It is, however, recognized as a high-performance building designed, built, operated and disposed of in a resource-efficient manner with the aim to minimize the overall (negative) impact on the built environment, human health and the natural environment. Some examples of green building features are choice of site and orientation, efficient use of materials and resources, indoor environmental quality and innovation. 'Affordable Housing' in the US is defined as dwelling units whose total housing costs fit within the budget of households at the local median income level. Affordability is commonly defined as not spending more than 30 percent of household income on housing. Given the higher exposure of low-income households and the need for public assistance, the most salient features of green affordable housing are energy use, material use, durability and a healthy indoor environment. Thus, 'Green Buildings' in general or 'Green Homes' in particular, may be operationally defined as buildings and infrastructure that minimize the use of resources, reduce harmful effects on the environment and provide healthier environments for people. Terms interchangeably used in different contexts include 'Affordable housing', 'Budget housing', 'Low-income housing', 'Attainable housing', 'Subsidized housing' etc. Irrespective of the term used, they are used to describe single-family or multi-family dwellings having purchase prices or rental payments affordable to low-income to moderate-income individuals, usually with the help of subsidies.

The concept of 'Green Homes' has its origin in the United States (US). It has become increasingly common in the US with the adoption of state and local policies that favor or require green building practices for publicly owned or funded buildings. Potential benefits of green affordable housing include lower energy cost burden and improved health. In the context of building and home design, 'Green' commonly refers to practices that conserve natural resources in the short and long term, improve the quality and longevity of structures, and promote the health and well-being of occupants. Affordable housing developments are incorporating green features like energy-saving appliances and straw bale insulation that reduce utility bills; air quality improvements that reduce health care expenses; and community and personal gardens that provide local, organic produce at little cost.

In India too the concept is fast picking up. Of late the National Urban and Habitat Policy 2007 (NUHHP-2007) seeks to 'promote sustainable development of habitat in the country' and it has adopted 'Affordable Housing for All' as its ultimate goal. The policy has given due respect to the concept of 'Green buildings' and seeks to promote development of 'Green-field townships' at a reasonable distance from existing cities and towns. Development of 'Green Belts' around the cities for ensuring ecological balance, promotion of 'Green' or 'Intelligent' buildings for enhanced energy-efficiency etc. are part and parcel of NUHHP-2007.

Significance of the Study

It has been widely recognized that affordable homes can promote the housing development of any nation in an equitable manner as such homes alone can cater to the needs of the vast majority of the homeless, and at the same time ensure long term sustainability of development initiatives. Green affordable homes add another coherent feature that makes such initiatives even more appreciable, i.e. through the use of eco-friendly and energy-efficient materials and technologies. In this regard, it has been observed that, 'if the term 'affordable housing' is used to describe 'sustainable affordability' of single-family or multi-family dwellings for lower-income individuals, then green building becomes a perfect companion" (Kathy Moore Cowan). Likewise, Ed Glaeser and Mathew have argued that people should move from 'Brown cities' like Houston and Las Vegas (i.e. cities with high industrialization and environmental pollution) to 'Green cities' like San Francisco so that the overall carbon footprint would come down.

According to Larson, by balancing the purchase costs with the long-term operating costs and benefits, Green Affordable Homes enable families to continue to prosper while owning a home. This, in turn, helps stabilize neighborhoods. Also, such homes ensure a balance between up-front cost and long-term health benefits, and energy savings in case of improvements or renovations. In short, it is vital to consider the life cycle cost rather than the initial (upfront) cost while deciding on investments in Affordable or Green Housing. Because, empirical studies have proven that the long term returns of affordable homes would overweigh its initial (upfront) costs.

Statement of the Problem

The dwellers in a typical city might be very particular that they need a green environment to live in the city. But, ironically, the very same population who prefers such green living atmosphere to live, does not often take care in constructing eco-friendly, and energy-efficient houses or 'Green Houses'. Likewise, low and moderate income population who can afford to construct low cost, sustainable, and eco-friendly houses are not always very keen in constructing such houses. Reasons for these kind of attitudinal issues are to be tested using scientific and empirical studies. Thus, strategies for faster and equitable development of the housing sector could be formulated.

Objectives of the Study

- To make an overall study of the significance and relevance of Green Affordable Homes with special reference to the Indian scenario in this regard;
- To examine and analyze the affordability, attitudinal and other aspects of Green Affordable Homes from the perspective of the users of such homes;
- To make suggestions for sustainable development of Green Affordable Homes for the mutual benefit of all the stakeholders, based on the findings of the study.

Data Sources and Methodology

The study area is limited to Ernakulam city located at the central part of Kerala. The focus area of study is the affordability, sustainability and the attitudinal factors in respect of development of Green Affordable Homes. The study seeks to analyze awareness and attitude of the dwellers of such homes, including prospective ones i.e. home-less or those in dilapidated houses who are in need of dwelling units. The target population of the study is the moderate and low income groups residing in Ernakulam city of central Kerala. The study has employed a descriptive-analytical research approach. Study is based on both primary and secondary data. The primary data were collected for analyzing awareness and attitude of the respondents towards Green Homes. Sample survey was conducted and primary data were collected using well-defined interview schedules. Thus 210 households were taken as sample based on purposive sampling method among the lower and middle income households residing in Cochin Corporation area of Ernakulam city. It is noted that there is a general tendency among the dwellers to move from centre to periphery; in search of greener, cleaner and healthier atmosphere. So, purposively samples of 210 families who are residing in heart of the city for 20 years or more alone are selected. Common statistical tools were used to analyze the data collected.

A Green affordable Homes

Green features that are not necessarily cost-saving but contribute to community goals of being more environmentally friendly. These include cabinets built of lyptus—an easily replenished hardwood product made from eucalyptus trees—and a kitchen floor made of marmoleum, a natural material made from linseed that resembles linoleum. Often there is a focus on reducing allergens to improve air quality and lower health care costs for homeowners. Low-income families have long struggled to balance the costs of shelter, food, health care, and utilities. An emerging green movement in affordable housing aims to make the balance easier to achieve. Green features include fiberglass insulation blown into the wall cavities, drought-tolerant landscaping, low-odor paint, water-conserving toilets, energy-saving appliances, light-reflecting windows, foundational slabs made with recycled concrete, and waste minimization and recycling during the construction phase. In the context of building and home design, 'Green' commonly refers to practices that conserve natural resources in the short and long term, improve the quality and longevity of structures, and promote the health and well-being of occupants. Development of green affordable homes involves several green features such as waste minimization and recycling of materials during the construction phase, landscaping with native plants, high-efficiency drip irrigation, extra building insulation, and energy-efficient appliances and fixtures. Affordable housing developments are incorporating green features like energy-efficient appliances and straw-bale insulation that reduce utility bills; air quality improvements that reduce health care expenses; and community and personal gardens that provide local, organic produce at little cost.

long term Sustainability of Green Affordable Homes

In our current environment of rising utility costs and escalating gas prices, building houses that are affordable for low-income to moderate-income individuals to purchase or rent is not sufficient. To be truly affordable over the long term, residents must be able to afford the monthly mortgage or rent payment as well as the utilities and transportation costs associated with the home. Homes must be energy-efficient and located close to public transportation. Residents of green-built housing can realize long-term savings through efficiencies incorporated in the design of the home. Green, affordable housing presents an opportunity to reduce variable costs, such as utility and transportation expenses, which disproportionately affect low-income people. According to a 2005 report by the Federal Home Loan Bank of Atlanta, in addition to lower utility rates, green building practices improve occupant health and comfort through the use of better ventilation systems and better construction materials. The end result is cleaner indoor air and a reduction in the occurrence of asthma, respiratory diseases and other ailments. Some common green features used in affordable housing projects include:

- compact fluorescent lighting,
- energy-efficient appliances,
- low-flow fixtures and dual-flush toilets,
- environmentally preferable products,
- use of local sources for materials,
- recycling of construction materials, and
- home-owner awareness education.

Problems and Challenges of Green Affordable Homes

In spite of the vital significance of green houses and the various benefits that they provide, like, reduction in operating cost in long-run, there are a few challenges associated with such initiatives. The main challenge to green building cited by most affordable housing developers is the higher initial capital (upfront). However, a report by New Ecology Inc. shows that total development costs for green projects reviewed for the report ranged from 18 percent below to 9 percent above the costs for comparable conventional affordable housing. On average, the 16 case studies in the report show a small "green premium" of 2.42 percent in total development costs. These incremental costs are largely due to increased construction, as opposed to design, costs.

One criticism of green building is that innovative technologies such as solar water heaters often cost more to purchase and install than standard systems. The higher costs add up to a "green premium" that can make green construction more expensive up-front than conventional construction. As the New Ecology study notes, the green premium can be a barrier to affordable housing development, since affordable housing funders prefer to allocate dollars to the projects that have the lowest initial costs. The study reveals that, on average, the 16 projects cost 2.4 percent more to build than conventional affordable housing. However, on average, the developers and owners would see per-unit savings of USD 2725 in operation and replacement costs over the life of the property. For the majority of the 16 projects, the long-term savings would equal or outweigh the green premium. Thus, green building can be a cost-effective way for the developers of affordable housing units, who may target low or moderate income families.

Other challenges related to affordable green building include the following (Source: U. S. Green Building council):

- **Capacity challenges and the learning curve:** Many affordable housing providers lack the organizational capacity to undertake the additional planning. It requires additional training for affordable housing developers, and resources for training are limited.
- **Perceived risk:** Affordable housing developers are often risk-adverse because they have little margin for project failure. Any cost increases directly affect developer fees, which are used to sustain the organization and fund future development.
- **Multiple funding sources:** Affordable housing developers use many funding sources, each with its own criteria and regulations. It can often be difficult to fit new technologies and ideas into the existing funding criteria.
- **Lack of documented success:** To date, energy efficiency has been the only real measure used to show long-term affordability of green building. Lack of research makes it difficult for affordable housing developers to overcome the 'high upfront cost' prejudice of funders.
- **Lack of public transportation and land use planning:** Public transportation is not readily available in all areas. In some states (many within our district) only a handful of cities have public transportation systems in place. Therefore, residents must consider fuel costs when deciding where to purchase a home and how much they can afford.
- **Ability to sustain homebuyer educational programs:** Resources to sustain homebuyer awareness on how to keep their property green must be taken from existing sources

Scope of Adoption of Green Features

Some examples suggest that the construction costs of 'Going green' are nearly non-existent. But, common wisdom among developers is

that using green practices adds up about 2 to 5 percent to the total project cost. Additional costs are likely to decline over time as development teams gain experience. Rising demand for resource-sensitive materials, systems and practices may also drive down costs. Studies show that added construction costs can be offset by lower operating costs, as built-in efficiencies reap benefits through lower energy and water bills. For a homeowner, a slightly higher mortgage payment can be justified by a lower energy bill. Development of Green affordable homes presents a great opportunity for nonprofits, for-profits and energy-related entities to work together to create unique developments that improve communities by providing low and moderate-income families with affordable, sustainable housing. Besides, it may be noted that green developments do not necessarily have to be 'All Green' or No Green'. Rather, the transition from conventional to green building may occur in small steps. By adding just one green feature to each new development, a developer can build a repertoire of green expertise. Developers can use a range of strategies to improve the quality of life in neighborhoods and limit negative environmental impacts. Bringing the benefits of green building to families of all income levels is a challenge that several affordable housing developers are overcoming through unique partnerships and sophisticated financing. Thus, for developers of 'Green Affordable Housing' units, their strategy should be not only to provide permanent shelter and community stabilization at a lower cost, but also to provide low and moderate income families with long-term reduction in overall living expenses including loan repayment costs. Then only they can ensure the long term sustainability of their business, because the repayment capacity of their customers depends, inter alia, on low operating expenses throughout the loan repayment period.

Development of Green Homes and Green Buildings: the Indian Scenario

A green home is one that is ideally constructed with a smart design, and requires minimal maintenance. The overall harm to the environment is at a minimum and the residents remain healthy. In a country like India where the population is ever increasing, so are the demands. The demand for houses, shopping malls, hotels, commercial complexes etc. are on the rise. An emerging alternative is to go green in housing too. Indian Green Building Council (IGBC) promotes and regulates all activities connected with green buildings and green houses in India.

According to the Planning Commission, India will need to generate at least 700000 MW of additional power by 2030 to meet growing electricity requirements, so it is the need of the hour to build energy efficient houses. According to IGBC, "A green building is one which uses less water, optimizes energy efficiency, conserves natural resources, generates less waste and provides healthier spaces for occupants, as compared to a conventional building". Green Homes is the first rating programme developed in India, exclusively for the residential sector. Based on accepted energy and environmental principles, it strikes a balance between known established practices and emerging concepts. The vision of IGBC is to enable sustainable built environment for all and enable India to be one of the global leaders in sustainable built environment by 2025.

Benefits of Green Homes

A Green Home can have tremendous benefits, both tangible and intangible. The immediate and most tangible benefit is in the reduction in water and operating energy costs right from day one, during the entire life cycle of the building.

Tangible Benefits

- Energy savings : 20 - 30 percent
- Water savings : 30 – 50 percent

Intangible Benefits

- Enhanced air quality,
- Excellent day lighting,
- Health & wellbeing of the occupants,
- Conservation of scarce national resources
- Enhance marketability for the project

Acceptance of Green Housing in Ernakulam: Findings and Discussion

- Profile of the Population
- All the households were belonged to Ernakulam city, ie. Corporation area only
- 210 low and moderate income households were taken for study
- 192 households have male member as the head of the family.
- Only 18 households have female member as the head of the family
- 168 households (i.e. 82 percent) represent nuclear families
- 131 households (62.38 percent) had only 4 members

Major Observations of the Study

- Most of the families (viz. 182, i.e. 86.67 percent) had their houses in very small plots of areas of 3 cent or less, while 21 (10 percent) have their plots of 3 to 4 cents and the rest 7 households (03.33 percent) have 4 to 5 cents. None had more than 5 cents.
- 203 households (96.67 percent) of households prefer to move from centre to suburban areas while the rest do not want a shift from the present locality.
- Of the 96.67 percent of households who wish to move to suburban areas want the new location to have adequate transportation facility and water availability.
- As high as 206 households (98.09 percent) percent admitted that the prevailing surroundings are unhealthy.
- Totally 204 households (97.14 percent) opined that pollution of air and water is their main problem.
- As high as 206 households (98.09 percent) admitted that they are not happy with the neighborhood of labourers from other states, though labour becomes cheaper.
- 196 households (93.33 percent) were unaware of the concept of Green houses and Energy-efficient houses.
- 195 households (92.86 percent) were not bothered about general hike in house prices, as they wanted to move from city to suburbs by disposing their existing houses.
- Only 03 households (1.43 percent) were aware of the concept of Green finance.
- 194 households (92.38 percent) are not ready to bear higher initial cost of energy efficient houses.
- 189 households (90 percent) preferred natural ventilation and clean air from outside.
- 163 households (77.62 percent) are aware of rain water harvesting and are interested in rain water harvesting and other water preservation technologies.
- Findings Relating to the Attitudinal and Affordability Aspects of the Users
- Not even one percent of the respondents (0.95 percent) have got the ability to own conventional houses and accordingly almost all of them (99.05 percent) have to use houses under affordable segment only. Moreover, as high as 84.28 percent of the respondents have replied that affordability as the reason for opting such houses, while 11.43 percent have opted for the same because of the availability of housing finance under specialized schemes and another 3.33 percent have inherited from their parents or relatives. (Table II).
- It is noted that out of the total 210 respondents, just 13 alone (i.e. 3,667 percent) have some inclination at least, to own affordable houses. The rest 197 respondents have either disagreement with this preposition or have a neutral attitude. Table IV shows that there is a relatively low weighted score of 28.267 for this parameter.
- Majority of respondents believe that affordable homes can improve their physical security. (Table V). Thus, there is a high weighted score of 44.400 for this parameter.
- Majority of respondents believe that affordable homes can improve their living standards. Accordingly, Table VI shows that there is a quite high weighted score of 55.600 for this parameter.
- Respondents associate poor quality and lower utility with affordable homes and this fact is reflected in the quite high weighted score of 50.33 for this parameter. This attitudinal issue is a major deterrent to the growth of affordable homes. (Table VII). Similarly, respondents associate only lower resale value because of poor public awareness to affordable homes. This is another deterrent to the acceptance of affordable homes. (Table IX).

Suggestions for Promotion of Green Homes based on the study Findings

A vast majority of more than 90 percent of the households are unaware of the concept of Green homes or Energy-efficient homes, and are more

ignorant about Green finance. Thus, majority of them are unaware of the savings in operational costs because of the use of Green initiatives. Naturally, most of them are not prepared to make higher investments in Green Homes in order to derive the long-term savings by way of lower operating costs.In fact, Green finance is still in its infancy in Kerala, though some innovative financial institutions have developed an arsenal of green products and practices that are being supported by government incentives for resource efficiency in development. The following suggestions are made, for promotion of Green Buildings, particularly Affordable Green Homes:

- Government should take incentives to foster sustainable development through the promotion of green buildings, both residential and otherwise (like, commercial).
- Either through grants and rebates, tax credits, fast track permitting or through other strategies, the public sector must encourage green buildings, residential or otherwise.
- Housing finance institutions (including banks, housing co-operative societies etc.) and other lending agencies should insist on compliance with green standards while extending their credit facilities or grants. Green finance should be encouraged always by all concerned.
- Policymakers should incorporate green compliance as one of the essential pre-conditions for regulatory clearance of all types of construction projects, both residential and commercial.
- As the general level of understanding of the common man on the need and relevance of green construction activities and green finance is virtually nil, initiatives are required at the governmental level for creating the requisite 'green awareness' through mass awareness programmes through different government departments.

Concluding Remarks

As policymakers come to grips with hard questions about the sustainability of our current approaches to development, new strategies appear inevitable. The interests of businesses, governments, builders, consumers and financial institutions are converging to make green development part of the mainstream agenda. Thus, going green appears to be a natural corollary and also the sole remedy, for the multifarious issues facing the society and the governments, relating to long term sustainability, environmental degradation, depleting energy sources etc. However, it is high time that policy makers, governments and regulatory authorities insist on more stringent and more elaborate compliance norms, and also mass awareness programmes to educate the stakeholders regarding the urgency of 'Going Green' in all developmental initiatives, particularly construction of buildings. The earlier they initiate such measures the better. For instance, in the wake of the frequent oil-price rises, green homes will surely be an answer to India's ever increasing demand for energy.

Table I: Ability to Own a Conventional Dwelling Unit (i.e. Not under Affordable Segment)

Options	Number of respondents	Percentage of respondents
Yes	2	00.95
No	208	99.05
Total	210	100.00

(Source: Field Survey)

Table II: Major Reasons for Opting Affordable Housing Unit

Reasons	Number of respondents	Percentage
Affordability	177	84.28
Availability of subsidized housing finance	26	11.43
Inherited from parents or relatives, not opted	07	03.33
No specific reason / Other reasons	02	00.95

(Source: Field Survey)

Table III: Relative Weights for Different Alternatives (5-point Scale)

Indicators / Parameters	SA	A	ND	D	SD
Relative weight for the option chosen (Option or alternative chosen)	0.333 (5)	0.267 (4)	0.20 (3)	0.133 (2)	0.067 (1)
No. of respondents = 210	Maximum possible score = 70		Minimum possible score = 20		

[SA- Strongly Agree; A- Agree; ND- Neither agree nor disagree; D- Disagree; SD- Strongly Disagree]

Table IV: Whether Affordable Housing is Preferred to Conventional Housing?

Options	Number of respondents (Percentage)		Weighted Scores
Strongly agree	03	(03.33)	01.000
Agree	10	(06.19)	02.667
Neither agree nor disagree	31	(14.76)	06.200
Disagree	110	(52.38)	14.667
Strongly disagree	56	(26.67)	03.733
Total	210	(100.00)	28.267

(Source: Field Survey) Figures in Brackets show percentage of total respondents

Table V: Impact of Green Affordable Homes on Physical Security

Options	Physical security will improve (Percentage)		Weighted Scores
Strongly Agree	70	(33.33)	23.333
Agree	34	(16.19)	09.067
Neither agree nor disagree	18	(08.57)	03.600
Disagree	38	(18.09)	05.067
Strongly disagree	50	(23.81)	03.333
Total	210	(100.00)	44.400

(Source: Field Survey). Figures in Brackets show percentage of total respondents

Table VI: Impact of Green Affordable Homes on Living Standards

Options	Living standards will improve (Percentage)		Weighted Scores
Strongly Agree	66	(31.43)	22.000
Agree	100	(47.62)	26.667
Neither agree nor disagree	26	(12.38)	05.200
Disagree	08	(03.81)	01.067
Strongly disagree	10	(04.76)	00.667
Total	210	(100.00)	55.600

(Source: Field Survey). Figures in Brackets show percentage of total respondents

Table VII: Lower Preference of Affordable Homes – Quality and Utility Perception

Options	Poor Quality and Lower Utility Value		Weighted Scores
Strongly Agree	43	(20.48)	14.333
Agree	98	(46.67)	26.133
Neither agree nor disagree	31	(14.76)	06.200
Disagree	17	(08.10)	02.267
Strongly disagree	21	(10.00)	01.400
Total	210	(100.00)	50.333

(Source: Field Survey). Figures in Brackets show percentage of total respondents.

Table VIII: Lower Preference of Affordable Homes – Resale Value

Options	Low Resale Value due to poor public awareness		Weighted Scores
Strongly Agree	28	(13.33)	09.333
Agree	107	(50.95)	28.533
Neither agree nor disagree	33	(15.71)	06.600
Disagree	23	(10.95)	03.067
Strongly disagree	19	(09.05)	01.267
Total	210	(100.00)	48.800

(Source: Field Survey). Figures in Brackets show percentage of total respondents.

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