ANALYSIS OF THE AWARENESS, POTENTIAL AND CHALLENGES OF "GREEN BUILDING CONCEPT" IN CONSTRUCTION SECTOR WITH REFERENCE TO PUNE CITY

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ABSTRACT

This study is aimed at investigating the green building practices in construction sector .Green building (also known as green construction or sustainable building) refers to a structure and using process that is environmentally responsible and resource-efficient throughout a building's life-cycle: from site to design, construction, operation, maintenance, renovation, and demolition. The Green Building practice expands and complements the classical building design concerns of economy, utility, durability, and comfort. Although new technologies are constantly being developed to complement current practices in creating greener structures, the common objective is that green buildings are designed to reduce the overall impact of the built environment on human health and the natural environment by: Efficiently using energy, water, and other resources, protecting occupant health and improving employee productivity, Reducing waste, pollution and environmental degradation. The most criticized issue about constructing environmentally friendly buildings is the price. Photo-voltaic, new appliances and modern technologies tend to cost more money. Most green buildings cost a premium of <2%, but yield 10 times as much over the entire life of the building. In regards to the financial benefits of green building, "Over 20 years, the financial payback typically exceeds the additional cost of greening by a factor of 4-6 times. As a result of the increased interest in green building concepts and practices, a number of organizations have developed standards, codes and rating systems that let government regulators, building professionals and consumers embrace green building with confidence. In some cases, codes are written so local governments can adopt them as bylaws to reduce the local environmental impact of buildings. Green building rating systems such as BREEAM (United Kingdom), LEED (United States and Canada), DGNB (Germany) and CASBEE (Japan) help consumers determine a structure's level of environmental performance.

Keywords: *Green Building, Cost Efficiency, Sustainability, Solid Wastes, Greenhouse Gases.*

INTRODUCTION

What is Green Building Concept? : IGBC defined 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.

The housing sector in India is growing at a rapid pace and contributing immensely to the growth of the economy. This augurs well for the country and now there is an imminent need to introduce green concepts and techniques in this sector, which can aid growth in a sustainable manner.

Green concepts and techniques in the residential sector can help address national issues like water efficiency, energy efficiency, and reduction in fossil fuel use in commuting. Further, it helps in handling of consumer waste and conserving natural resources. Most importantly, these concepts can enhance occupant's health, happiness and well-being.

Green homes can have tremendous benefits, both tangible and intangible; Intangible benefits of green homes include enhanced air quality, excellent day lighting, health & wellbeing of the occupants, safety benefits and conservation of scarce national resources

Overall, buildings and their associated construction activity account for at least 30 percent of world greenhouse gas emission. Thus the design and operation of real estate can play an important role in energy conservation in advanced societies.

OBJECTIVES

1. To study the awareness of Green Building Concept in Pune among builders.

2. To analyse the present building scenario and potential of Green building in Pune.

REVIEW OF LITERATURE

The article of green housing- review, rating systems and implementation by **Narendra D. Patel and Nikesh P. Shah** highlighted various aspects and stages of ratings and also the provisions that can be made mandatory or optional selectivity. The paper also suggests various incentives, which can be given, on achieving various levels of rating. The article defines what Green Building is and what Green is. According to the authors, Green building is one which has incorporated nature friendly features and Green means nature.

The article highlighted what is the importance of Green building by arguing how with the rapid urbanisation natural resources are being utilised rapidly and erratically without any
Planning and equivalent replenishment. How the Eco friendly practices can be included like Adequate land use and better site planning so as to not disturb the natural resources like trees, lakes, rivers etc., Conservation of electricity and efficient practices, Renewable and non-conventional energy generation, alternative fuels, Water management including drainage, waste water disposal, rain water harvesting, recycling grey water, etc., Maintaining good air quality, Human safety and comfort.

Further, the article shows the incentives for Green Building in Indian context. Other than the Indian Green Business Council, there are many other government, private and non-government organisations working in the field of green buildings. One such distinguished agency in India is the International Institute for Energy Conservation (IIEC), a NGO involved in developing the green building assessment criteria and rating systems.

A. Jignesh C Sailor, B Himanshu A. Naik and C. ViralKumar I. Makwanain the article **"Green Building", Leader in Energy and Environment Design for building Sector"** published in the year September 2010 has defined Green Building as "design and construction practice that promotes the economic health and well-being of our family, the community and the environment". Under Needs and Opportunity, the article has highlighted that the expected growth rate of Indian population is pegged at 1.3% thus correspondingly there is a energy consumption rate of growth will be 4.3%.

According to the article published the LEED (Leadership in Energy and Environment Design) rating system of USGBC includes rating for, New Construction and Major Renovation, Commercial Interior, Core & Shell, Homes, Neighbourhood development, Schools, Retail, Health care

The Green Building uses 26% less energy, 54% less Water consumption, 13% reductions in aggregate maintenance, 27% of higher occupant satisfaction and 33% of less CO2 emissions. The various features of Green Building are, Energy efficiency in terms of Air conditioning, lightening Systems, Reduction of impact on the Environment, Use of Recycled, Nontoxic and Environmental friendly building materials, Efficient use of Water recycling, Improved Indoor Air quality for Human Safety and concern

Due to rapid growth in India during the last decade, it emitted 1,539.1 Mt of Carbon emission in 2009 or 4.94% of the global of that year. The Indian construction industry growth rate was 9.2 % against world average of 5.5%. The Indian construction sector consumed 7% of the total final energy compare to the Industrial sector which consumed 28% of the total. The Air conditioning and lighting are the top two energy end users within the building sectors.

The Indian government enacted the Energy Conservation Act (ECA 2001), which promotes energy efficiency and conservation domestically; ECA also authorized BEE to establish an Energy Conservation Building Code (ECBC). In 2009, the Indian Green Building Council (IGBC) is actively promoting green buildings in India. IGBC is comprised of construction companies, architects, product manufacturers and research institutions.

Rating System in INDIA: - The LEED-India provides building owners, architects, consultants, developers, facility managers and project managers the tools they need to design, construct and operated green buildings.

LEED-INDIA promotes whole-building approach to sustainability by recognizing performance in the following five key areas, Sustainable site development, Water Savings, Energy efficiency, Materials selection, Indoor Environmental quality.

The article highlighted the importance of source of renewable source of energy in the following way, Passive Solar heating and Cooling, High performance building envelope, Cool day light and advance lighting, Geo thermal heating cooling, Recycled and sustainable materials.

Overall the conclusion of article is that the green building movement and technology is for the benefit of individuals, society, country and global environment concerns.

METHODOLOGY

Sample and Procedure

A random sample of 10 prominent builders chosen from the Pune and contacted them with questionnaire and all of the participants interviewed had considerable experience in construction sector.

Hypothesis

Hypothesis 1

H_0 There is no potential for green buildings in Pune

H1There is potential of green buildings in Pune

Hypothesis 2

H_0 There is lack of awareness among builders in Pune regarding Green Building Concepts

H_1 There is awareness among Builders in Pune regarding Green Building Concepts

Results

Table 1. Awareness of Green Building Concept

S. No	Awareness	n=10	%
(a)	Yes	**9**	**90**
(b)	No	**1**	**10**

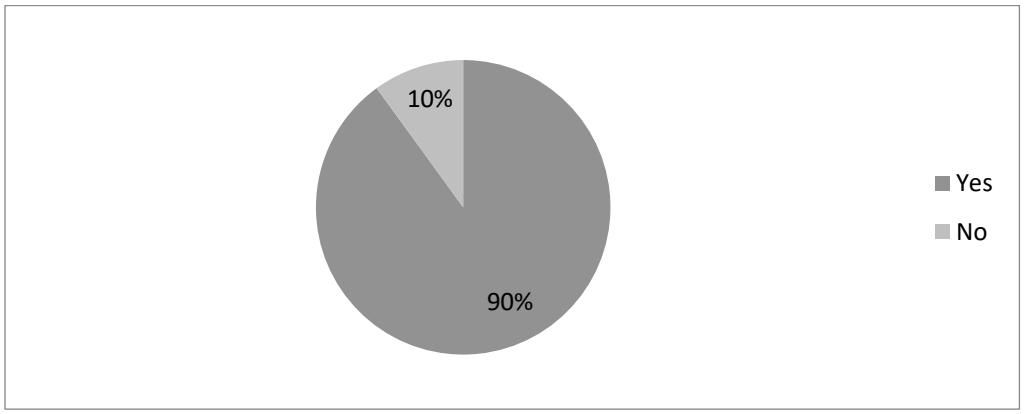

Figure 1: Awareness of Green Building Concept

Discussion:

It can be inferred from the above Table 1 and Figure1 that 90% of respondents were aware of Green building concept. Hence for Hypothesis 2, null hypothesis which states "There is lack of awareness among builders in Pune regarding Green Building Concepts" is rejected and

alternate hypothesis which states "There is awareness among Builders in Pune regarding Green Building Concepts" is accepted.

The above results are also similar to the results of Jignesh Sailor, Himanshu Naik and Viral Kumar Makwana who in 2010 also found that more people are interested in green buildings due to social and environmental benefits due to the Green Building uses 26% less energy, 54% less Water consumption, 13% reductions in aggregate maintenance, 27% of higher occupant satisfaction and 33% of less CO2 emissions.

The above Table and Figure also support the 1st objective of the study which was "To study the awareness of Green Building Concept in Pune among builders."

Table 2. Customers Satisfaction with regard to Green Building

S. No	Customers Satisfaction	n=10	%
(a)	Very unsatisfactory	**0**	**0**
(b)	Unsatisfied	**0**	**0**
(c)	Neutral	**3**	**30**
(d)	Satisfied	**4**	**40**
(e)	Very satisfied	**3**	**30**

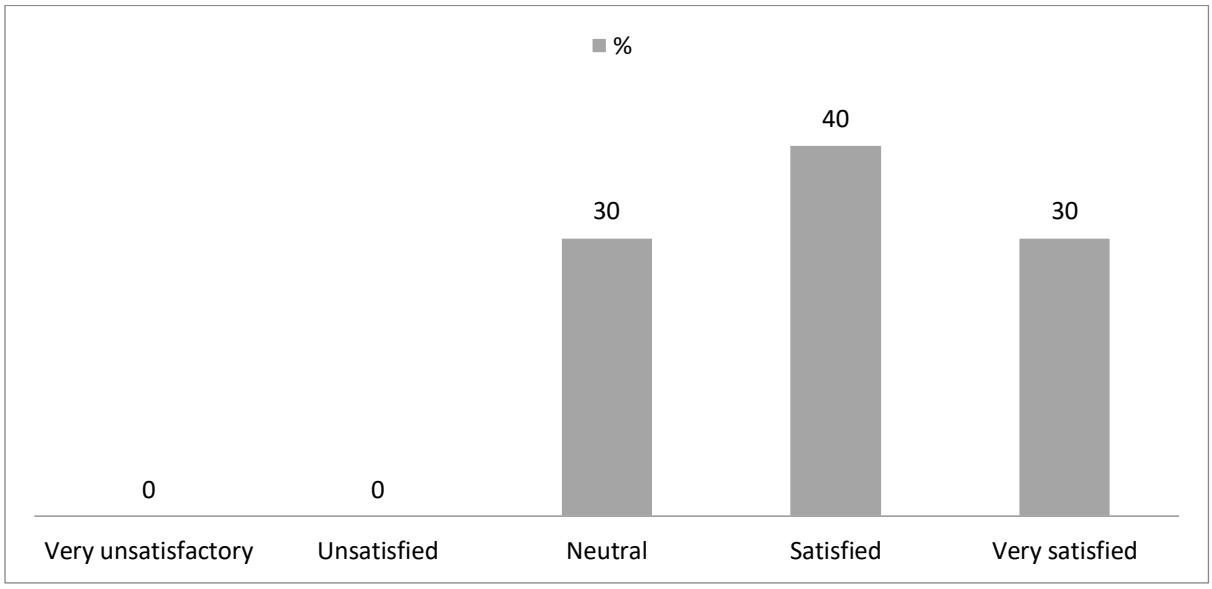

Figure 2: Customers Satisfaction with regard to Green Building

Discussion:

It can be inferred from the above Table 2 and Figure 2 that 40% of respondent's customers were satisfied with regard to Green building concept. 30% respondent's customers were very satisfied with green building concept. Hence for Hypothesis 1, null hypothesis which states "There is no

potential for green buildings in Pune" is rejected and alternate hypothesis which states "There is potential of green buildings in Pune" is accepted.

Table3. Implementation of Green Building Concept

S. No	Implementation	n=10	%
(a)	Yes	**9**	**90**
(b)	No	**1**	**10**

Discussion:
It can be inferred from the above Table that 90% of respondents adopted Green building concept in their projects. Only 10% respondent did not adopted Green building concept.

CONCLUSION

The study indicates that the majority of builders are aware of Green building Concept. Assessing the findings of them it is agreed that there is future for Green buildings, which concludes that there is an awareness of Green Building Concepts in Pune among builders as well as there is potential of Green buildings in Pune.

Assessing the findings of the study indicates that majority of builders are applying Green Building concepts in their projects though not fully but partially, which concludes that there are Green building projects in Pune and builders were aware of Green building concept. Builders are promoting and education customers to promote Green buildings for future to save environment, energy and wastages.

RECOMMENDATION

The findings of the study indicates that there is huge potential for Green buildings in Pune which can't be met without the participation of Government, Customers & Builders. Below are the recommendations:

Government: Study indicates that Government must take initial steps to enforce Green building concepts to existing and future projects and helps builders by providing those subsidies and encourage builders to adopt Green Building Concept. Government need to promote Green building to everyone builders and customers for the awareness including its benefits, long term gain and future for coming generations.

Builders: Study indicates that builders were not fully aware of Green building concept, Green building certification bodies that are responsible for Green building ratings in India (GRIHA & IGBC). Builders must focus more to learn fully and be aware of Green building concepts, its rating system and the bodies responsible for ratings.

Customers: Study indicates that customer's satisfactions level is good but still there are few customers who were not fully aware of these concepts and don't want to pay more for the property as it's expensive. Customers have to think for the future of their children and make sure that they

will invest only in Green building properties, which will help and encourage more and more builders to adopt this technology.

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