# Construction Materials For Sustainable Environment In Residential Building

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***Abstract-*** *Consequently, Sustainable materials vary from building structures. They need specialized materials and construction methods, in addition to a managerial commitment to sustainability. The cement manufacturing sector has made considerable strides in lowering its Emissions of carbon dioxide from cement production. Concrete has good sustainability attributes. Utilizing a carbon-negative manufacturing technique and renewable power, they are made. Society, the environmental, industry, and the commerce are the four interconnected components of sustainable agriculture; they are not distinct. Sustainable development is a way of discussing the future in which biological, social, and economic indicators are combined in the goal of a higher quality of life. For instance, a flourishing civilization depends on a healthy ecosystem to supply its residents with food and clean water, basic sanitation, and clean air. To apply the concepts of Responsible Bricks (Fly ash bricks), Self-sustaining Cement/ Sustainability Mortar (Made with Fly ash), and Responsible Paints (recycled paints), as well as practices that benefit the public, such as Rain water collecting and solar electric architecture. To 1.1 Generalinvestigate the constraints of polymeric plastics in relation to development and Sustainable innovations above traditional techniques. To investigate the economic viability (Cost analysis) of environmental sustainability components.*

***Keywords***- Sustainable materials, cost analysis, Construction Techniques

## I. INTRODUCTION

The earth's condition is deteriorating rapidly and it will turn sever unless people adopt eco-friendly policies. Eco-structure building has long been a concept and widely practiced for better living. India, having 159.1 million people due to sharp urbanization, population explosion facing severe problem. Up to 40% of the entire energy level is utilized by the buildings and constructions. There is a need of concentrating on a Sustainable environmental building, which is one of the most important and one of the most discussed topics throughout the globe, in the age of global warming and climate change worldwide. However, the assessment of new buildings covers only performance aspects from the initial planning stage through to building completion.

Actual performance during building use depends on what has been achieved in terms of improved design and construction quality, as confirmed by final testing and commissioning, the quality of m anagement, operation and maintenance practices, as well as the activities of building users. Sustainable environment in residential building are characterised as those providing the required building performance over the building life-cycle whilst minimizing consumption of non-renewable resources and the environmental loadings to land, air and waters. However, the assessment of new buildings covers only performance aspects from the initial planning stage through to building completion.

### 1.2 Definition of environmental sustainable building

"An environmental sustainable 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."

To explain in the simplest terms, Sustainable Building is environmentally-conscious construction and operation of a building structure. And for many good reasons, Sustainable Building is becoming increasingly common. With the shift in mind-sets today the idea of promoting sustainability and Sustainable Building concepts have taken a front foot in the Real Estate industry. And as different stakeholders look for the opportunity to become more involved with promoting these concepts, several Sustainable Building technologies have been developed to pave the way and ease the process for long-term practices in green and sustainable construction. But what is Sustainable Building technology? Let's understand it.Sustainable Buildings are designed, constructed, and operated to enhance the well-being of their occupants and support a healthy community and natural environment.

In practical terms, Sustainable Building is a whole-systems-approach to building that includes:

- Designing for livable communities
- Using sun and site to the building's advantage for natural heating, cooling, and daylighting

- Landscaping with native, drought-resistant plants and water-efficient practices
- Building quality, durable structures
- Reducing and recycling construction and demolition waste
- Insulating well and ventilating appropriately
- Incorporating durable, salvaged, recycled, and sustainably harvested materials
- Using healthy products and building practices
- Using energy-efficient and water-saving appliances, fixtures and technologies

The practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life-cycle from siting to design, construction, operation, maintenance, renovation and deconstruction. This practice expands and complements the classical building design concerns of economy, utility, durability, and comfort. Sustainable Building is also known as a sustainable or 'high performance' building.

When implemented holistically, these strategies serve to preserve our environment for future generations by conserving natural resources and protecting air and water quality. They provide benefits for us today by increasing comfort and well-being and helping to maintain healthy air quality. Finally, Sustainable Building strategies are good for everyone's pocketbook by reducing maintenance and replacement requirements, reducing utility bills and lowering the cost of home ownership, and increasing property and resale values.

A sustainable building, is an outcome of a design philosophy which focuses on increasing the efficiency of resource use energy, water, and materials while reducing building impacts on human health and the environment during the building's lifecycle, through better siting, design, construction, operation, maintenance, and removal. Though building sustainable is interpreted in many different ways, a common view is that they should be designed and operated 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, and Reducing waste, pollution and environmental degradation

**1.3 Benefits of Sustainable Building:**

- **The Rising Popularity of Sustainable Architecture**

With our society's increasing concern for the environment, it's no surprise that Sustainable Building continues to grow in popularity and you may be wondering what is green design? From residential structures to corporate facilities, architects are discovering new sustainable design processes to preserve our ecosystem while reducing our carbon footprint. Here are ten benefits of Sustainable Building and green construction practices and how this architectural trend can protect the generations of tomorrow:

- **Improved Indoor Environment: Quality of Life**

When it comes to our quality of life, it's no secret that our surroundings have a major impact on our health. Over the past several decades, designers around the globe have made massive progress, developing sustainable architecture that can dramatically affect the inhabitants of such buildings and drastically reduce the negative environmental impact that buildings may have. From interior design elements like improved lighting sources, thermal conditions, ergonomic features and even upgraded air quality, occupants residing or working in green structures have experienced a marked improvement in their health, stress levels and overall quality of life.

- **Saving Water: Reduce, Reuse, Replenish**

Another tangible benefit of sustainable building: water efficiency. Research shows that green architecture can not only reduce water waste through water-efficient plumbing fixtures but also reduce the strain on shared water resources. By installing specially-engineered systems to purify water, it enables water recycling and also allows for alternative sources of water (such as rainwater). These developments not only save this vital natural resource but protect clean water sources for the future.

- **Enhanced Health: Eco-Friendly for Life**

Living in a sustainable building can save your life – literally. According to studies, people who reside in green structures experience a myriad of health benefits due to the eco-friendly materials utilized in construction. For example, Sustainable Buildings avoid using building materials that may contain harmful volatile organic compounds (VOCs) or plastic by-products which have been known to release toxic fumes and carcinogens into the atmosphere. These dangerous materials are linked to respiratory disease, allergies, and other health disorders, and in extreme cases, an increased risk of cancer.

- **Reducing The Strain: Shared Resources, Increased Efficiency**

With our planet's ever-increasing population (particularly in large cities across the globe), our local shared resources are being threatened as demands continue to grow. Based on the advancements and sustainable practices and technologies developed by ingenious architects worldwide, vital resources such as water and energy are being protected. By increasing efficiency, green structures are capable of reducing the environmental impact on such resources, which can potentially be protected and preserved for future generations.

- **Reduced Operational Cost and Maintenance: Traditional vs. Green**

One of the greatest benefits of Sustainable Buildings are their lower maintenance costs – featuring specially-engineered design elements to lower energy consumption and help reduce energy cost and water bills for each occupant. These efficient structures can save corporate and residential owners a bundle. Although the expense required for building owners to build such structures may be initially higher than traditional non-green forms of architecture, the cost over the long term is recovered exponentially.

- **Energy-Efficient: Non-Renewable vs. Natural Resources**

As a green architect, energy efficiency is a primary goal in Sustainable Building design. Developing structures that derive their energy from natural sources – such as the sun, wind, and water – is extremely beneficial to the environment, protecting the ecosystem from pollution associated with non-renewable sources (such as oil and coal). An added benefit: non-renewable energy sources are not only toxic but costly, while their energy-efficient counterparts (such as solar energy vs. traditional electricity) can save thousands over the lifetime costs of the infrastructure.

- **Carbon Footprint Reduction: Saving The Planet One Step at A Time**

There has been an increase in large corporations opting for green initiatives. According to the Environmental Protection Agency (EPA), buildings account for 30% of all greenhouse gas emissions in the United States. Landlords and large businesses have taken heed, as increasing sustainability is an opportunity to do something positive for both business and society as a whole.

- **Keep It Clean: Protecting Our Ecosystem**

Global warming has been a growing concern for a number of years, and it's no wonder – our planet has seen a drastic depletion of our natural resources, while pollution and the consequent climate-change is at an all-time high. Sustainable architecture is not only energy-efficient and healthier for its inhabitants, but it also benefits the planet. By reducing our reliance on non-renewable resources (fossil fuels such as coal and oil), green architecture can actually promote and maintain a cleaner environment.

- **Efficient & Sustainable Material: Minimal Use for Maximum Impact**

Upcycling has taken the architectural world by storm – by using recycled material and reusing resources (and even repurposing old structures), sustainable architects, engineers, and green designers are tapping into existing resources to reduce carbon footprints and save natural resources. By implementing sustainable strategies into the design process, like reducing waste, preserving natural resources (such as water and wood), protecting our air supply, and limiting energy use, Sustainable Building companies can create extremely efficient structures that can withstand the test of time.

- **Durability for The Green Homeowner: Built to Last**

For educated homeowners, going green is a no-brainer: from energy and water savings and improved air quality to overall durability, sustainable materials have been proven time and time again to last longer. Green materials (such as recycled decking and roofing) not only endure for years exposed to the elements but require much less maintenance. In addition, because many of them are free from harmful chemical treatments, they are healthier for the environment

### 1.3 AIM

The aim of the research is to find out the contribution of construction materials in Sustainable development in construction industry.

### 1.4 OBJECTIVES

- To study various Sustainable building materials. (theory)
- To study the contributing parameters of construction materials for Sustainable development with the help of questionnaire and data analysis using SPSS. (survey)

- To implement the concept of Sustainable Bricks (Fly ash bricks), Sustainable cement/ Sustainable cement (Made with Fly ash) and Sustainable paints (recycled paints) as well as the techniques of profit of people such as Rain water harvesting and passive solar architecture. (cost, duration, maintenance)
- To study the limitations of conventional materials with reference to sustainability and Sustainable materials over it.
- To study the economic feasibility (Cost analysis) of materials in Sustainable development.

## II. LITERATURE REVIEW

**Thong Jia Wena.et.al,2020**

The purpose is to apply IBS in residential building construction towards greener building and sustainable development. The functional unit of the comparison analyses was one square meter of produced building area for the respective construction period. A comparable inventory analysis will be carried out between two case studies. An input-output flowchart is created for each process to determine the components included in the analysis. Flows of assembly phase will be modelled in Gabi 6.0 software to further interpret the life cycle impact assessment (LCIA) between the two construction methods, and to determine the hotspot between the processes. Finally, a sensitivity analysis will be conducted to determine the influence of variations in assumptions, methods and data on the results.
Rapid urbanization has greatly impacted housing demand and housing development in Iskandar Malaysia, Johor. Iskandar Malaysia vision towards development of a low carbon society and in line with Malaysian government policy promoting Industrialized Building System (IBS) to meet the increasing housing demand.

**Tarja Ha« kkinen.et .al, 2011**

The most important actions to promote sustainable building are the development of the awareness of clients about the benefits of sustainable building, the development and adoption of methods for sustainable building requirement management, the mobilization of sustainable building tools, the development of designers' competence and team working, and the development of new concepts and services. The interviews and case studies were carried out in Finland, but the results may be applicable or interesting to other countries as well.

What are the actual barriers and drivers for sustainable building? A literature review, interviews and case studies are presented to address this question. Sustainable building is not hindered by a lack of technologies and assessment methods.

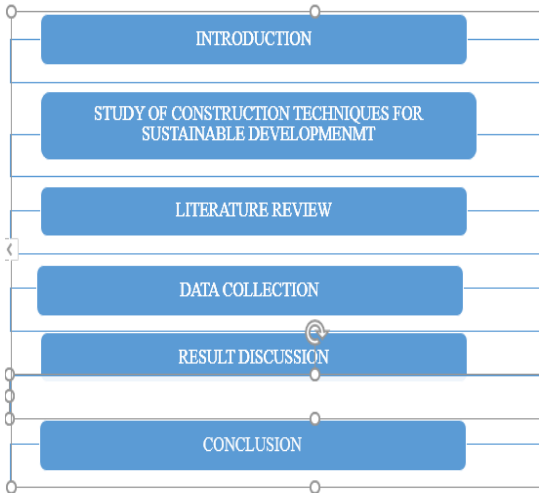
**Peter O. Akadiri.et.al, 2012**

This paper presents a conceptual framework aimed at implementing sustainability principles in the building industry. The proposed framework based on the sustainable triple bottom line principle, includes resource conservation, cost efficiency and design for human adaptation. Following a thorough literature review, each principle involving strategies and methods to be applied during the life cycle of building projects is explained and a few case studies are presented for clarity on the methods. The framework will allow design teams to have an appropriate balance between economic, social and environmental issues, changing the way construction practitioners think about the information they use when assessing building projects, thereby facilitating the sustainability of building industry.

**David R. Riley.et.al,2010**

Following a thorough literature review and comprehensive comparisons between prefabrication and on-site construction method, a total of 33 sustainable performance criteria (SPC) based on the triple bottom line and the requirements of different project stakeholders were identified. A survey of U.S. experienced practitioners including clients/developers, engineers, contractors, and precast concrete manufacturers was conducted to capture their perceptions on the importance of the criteria. The ranking analysis of survey results shows that social awareness and environmental concerns were considered as increasingly important in construction method selections.

## III. METHODOLOGY



- Introduction
- Literature survey
- Study of the research topic in detail
- To study the research papers, articles and magazines related to the topic of study.
- Data collection from the proposed areas of study which includes large, medium and small scale construction projects.
- Collection of information with the help of web surveys.
- Finding out new ways and techniques for development of green construction.
- As the energy required for manufacturing of cement and other construction material is more so it is major contributor to the consumption of our total energy source. Using such materials described below with their benefits towards environment. Following are the materials which we have selected looking in to their local availability, benefits, cost and durability.

### 3.1 Challenges that Sustainable Buildings Face in India

Sustainable living is taking center stage buzz in the real estate market thanks to the advent of green architecture. More and more people are turning towards green homes since such home promote sustainable living and promise a better future. Although the latest technology and trends have played an important role in gearing up energy efficient homes, here are a few challenges or myths which Sustainable Buildings face in India:

**1. Myth About High Costs Involved:**

There is a huge myth that costs to build green homes are higher than conventional homes. In fact, the truth is that green homes are cost-effective in the long run. But, there is still a gap left between green architecture and potential real estate developers across the country. Lack of knowledge about benefits and pricing myth associated often leaves real estate developers in India ignorant towards green homes.

**2. Lack Of Awareness About Administrative Support:**

National Housing Bank (NHB) and HFCs such as IIFL Home Loan are working towards bringing together industry experts on a common platform to address developers on the benefits of green home in India. NHB is playing a significant role to promote affordable green housing in India.

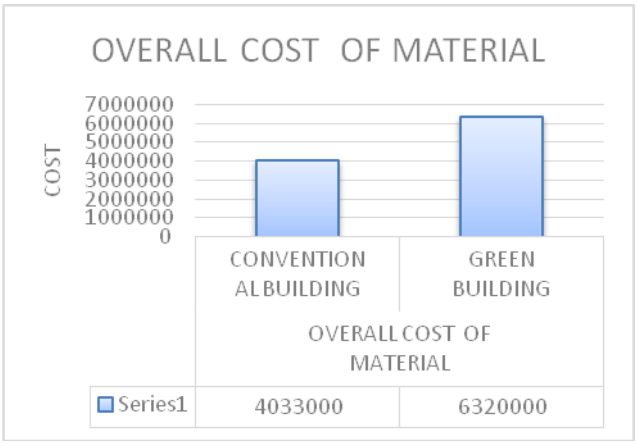
**3. Awareness In The People:**

Most of the people are still not aware of the benefits of green architecture and sustainable living, making them disinterested in the idea. Under Promoting Green Housing Refinance Scheme (PGHRS), NHB will also provide refinancing support to eligible PLIs for their individual housing loans on green homes located in residential areas. This will reduce the cost of such homes while first time home buyers can also avail CLSS subsidy under Pradhan Mantri Awas Yojana.

To draw their attention towards making green homes, there has to be a collective effort of experts in green and sustainable infrastructure arena along with developers to succeed in achieving sustainable real estate in the country. Creating awareness among people about environmental consequences is important. Training camps, workshops, news broadcasts etc. can educate developers and end users on addressing the sustainable living in India.

## IV. RESULT

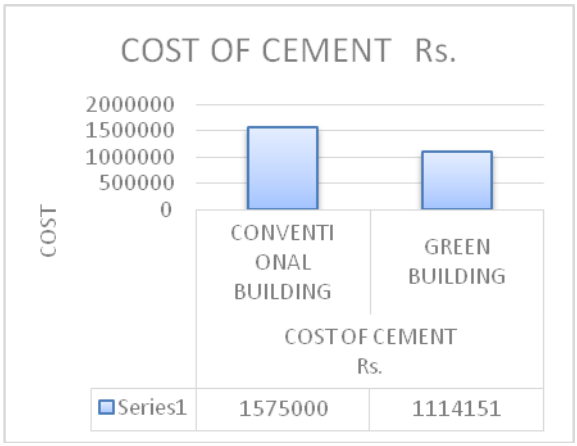
| OVERALL COST OF MATERIAL | |
|---|---|
| **CONVENTIONAL BUILDING** | **GREEN BUILDING** |
| 4033000 | 6320000 |




**Cost-effectiveness**: The higher overall cost of materials for the green building indicates that incorporating sustainable and eco-friendly features can result in increased expenses during the construction phase. This may be due to the use of specialized materials, energy-efficient technologies, or environmentally friendly construction practices. However, it's important to consider the long-term benefits of green buildings, such as lower energy and maintenance costs, improved occupant health, and reduced environmental impact.
Investment in sustainability: The higher cost of materials for the green building suggests a deliberate investment in sustainable practices and technologies. Green buildings typically prioritize energy efficiency, renewable energy

sources, water conservation, and waste reduction. By opting for these features, the project stakeholders demonstrate their commitment to reducing the building's environmental footprint and promoting sustainable development. While the initial costs may be higher, the long-term benefits and positive impacts on the environment make it a worthwhile investment.

| COST OF CEMENT Rs. | |
|---|---|
| **CONVENTIONAL BUILDING** | **GREEN BUILDING** |
| 1559950 | 1114151 |



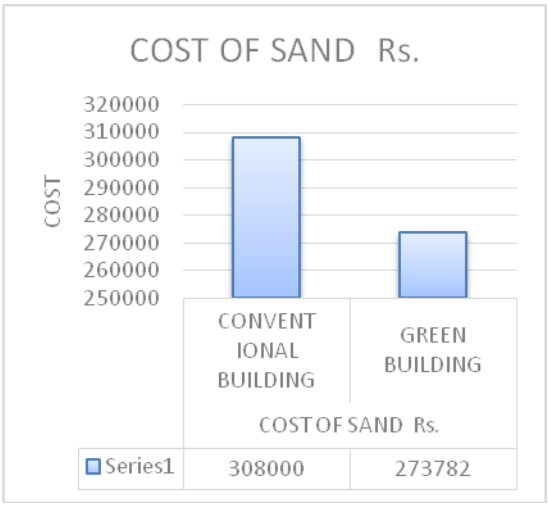

Cost of Cement:
Conventional Building: Rs. 1,559,950
Green Building: Rs. 1,114,151

This interpretation suggests that the cost of cement for a conventional building is Rs. 1,559,950, while for a green building, it is Rs. 1,114,151. It implies that the cost of cement is lower for the green building compared to the conventional one.

Cost Comparison:
Conventional Building: Rs. 1,559,950
Green Building: Rs. 1,114,151

In this interpretation, the given information is used to compare the costs of the two types of buildings. The cost of cement for the conventional building is Rs. 1,559,950, whereas for the green building, it is Rs. 1,114,151. This implies that the green building is more cost-effective than the conventional building, as it requires less money for cement.

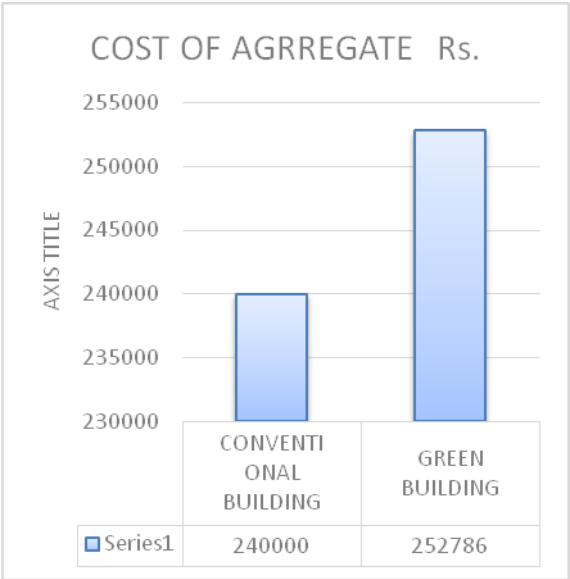
| COST OF SAND Rs. | |
|---|---|
| **CONVENTIONAL BUILDING** | **GREEN BUILDING** |
| 273782 | 273782 |




The cost of sand for both conventional and green buildings is specified as Rs. 273,782. This suggests that the expense associated with sand procurement and usage in constructing both types of buildings is identical. It implies that the choice of building type, whether conventional or green, does not impact the expenditure related to sand materials.

The mentioned figures of Rs. 273,782 for both conventional and green buildings could represent an estimated or typical cost for the required amount of sand during the construction process. It indicates that the construction of both types of buildings, whether conventional or green, entails a comparable expense for sand materials.

| COST OF AGRREGATE Rs. | |
|---|---|
| **CONVENTIONAL BUILDING** | **GREEN BUILDING** |
| **240000** | **252786** |



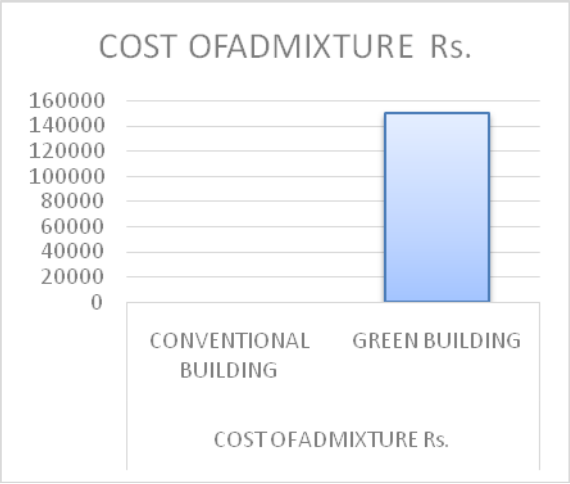

Conventional Building Cost: Rs. 240,000 Green Building Cost: Rs. 252,786

This interpretation suggests that the cost of aggregate for a conventional building is Rs. 240,000, whereas for a green building, it is Rs. 252,786. The cost of aggregate refers to the total cost of all materials used in construction, such as sand, gravel, crushed stone, and cement. Therefore, it implies that adopting green building practices has led to a higher cost for the materials used compared to conventional building methods.

Cost Difference: Rs. 12,786

Another interpretation is that the cost difference between a conventional building and a green building, specifically related to the cost of aggregate, is Rs. 12,786. This implies that opting for a green building approach has resulted in a slightly higher cost for the materials used, as the green building's aggregate cost is Rs. 12,786 more than that of the conventional building.

| **COST OFADMIXTURE Rs.** | |
|---|---|
| **CONVENTIONAL BUILDING** | **GREEN BUILDING** |
| 1559950 | 1114151 |




The cost of admixture for a conventional building is Rs. 1,559,950, while for a green building, it is Rs. 1,114,151. This interpretation suggests that the cost of using admixture, a material added to concrete to enhance its properties, is significantly lower in green buildings compared to conventional buildings. It indicates that green building practices may involve more sustainable and cost-effective alternatives to traditional construction methods.

The cost of admixture for a conventional building is Rs. 1,559,950, whereas the cost for a green building is Rs. 1,114,151. In this interpretation, it can be inferred that implementing green building practices results in a reduced cost of admixture. This could imply that green buildings prioritize the use of environmentally friendly admixtures or techniques that require less admixture, leading to cost savings.

## V. CONCLUSION

Green buildings are naturally different from conventional buildings. They require special materials and building practices as well as management commitment to sustainability.

In this study two case studies green building and conventional building are estimated ,energy analysis is done for an average of 10 years

Initial cost of construction is observed 10-15% high because of additional features such as UV reflectors, solar panels,rain water harvesting.

After analyzing the overall electricity consumption the cost benefits per flat will be 250000 over 10 years in green building per each unit so overall benefit of project will be 3600000 for entire project.

After visiting sales department for each site it was observed that green building site is having 3 lacs profit for each unit as they are using green building component as a marketing tool which is very effective

Green buildings have improve the chances of delivering the project within acceptable costs and schedule. Realistic financial and time constraints, superior planning, design and construction processes are needed to deliver a green and sustainable building project.

It is important to explore the strategies for containing cost during the planning phase of a project to reduce developers first cost in delivering the green and sustainable building project Sustainable and green building requires a client who is sympathetic to this ideal, user who understands and values the concepts and designers and contractors

From this , I have studied & observed all the above research papers. From from there literatures I found to know about the thesis regarding green building. The papers have explained much better concepts. Paper also elaborated about the rating systems of green building. What I did, is all the analysis comparison. I have studied both the buildings i.e. green building and conventional building , with the help of overall cost , I compared both building with the help of green building rating system. GRIHA contributed the most in my thesis work. After the research, I will prefer the green building

construction concept as the future benefits. Green building would be best for the further era of construction.

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