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GREEN CONSTRUCTION TECHNOLOGY IN CONSTRUCTION PROJECTS

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ABSTRACT

Green Buildings to society as this would enhance the awareness as well as scale up the requirement for Green Spaces in the market. This thesis follows the history of green building and its rating system. GRIHA rating system and the analysis made on the different criteria's under it. The study involves understanding the actual costs in Green Building Project. The Study is done to analyses the tangible benefits one is entitled to get after implementation of Green Building Techniques based on case study of SJVLN Building, Shimla. The work involved is to quantify the cost incurred and benefits accrued by doing the Cost Benefit Analysis for the SJVLN Building, Shimla based on the assessment of the criteria of GRIHA Rating System. The Case being analyzed is a Multi Dwelling Unit which is a GRIHA 3 star rated project. It consists a total built up area ***of 14033 sqm.*** *The analysis assumes a total lifespan of 30 years for the building. The operating and maintenance costs as well as annual benefits are assumed to be inflated at the rate of 5% every year. Year wise net benefit is taken and is discounted @ 12% to calculate the present value and by deducting the initial cost of we come to the Net Present Value of the building.*

Keyword : - *Green Building,GRIHA , dwelling.*

1. INTRODUCTION

In India, there is an increase in the number and capacity of the thermal power plants because of the increase in The development sector presents a major threat to the environment. Buildings pose for a minimum of 40% of the used energy around the world. Buildings consume approximately 42% water and 50% of the raw material in their manufacture, construction, and period of operation are taken into consideration. In augmentation to this, building development exercises contribute around half of the world's air contamination, 42% of its nursery gasses generation, half of all water contamination, 48% of the strong squanders and half of the CFCs (chlorofluorocarbons) to nature.

The improvement zone postures natural difficulties in India as well. The entire developed region when added to business and home territories, it was just about forty. Eight million square meters in 2004-05 which roughly 1% of the normal floor region constructed every year around the globe. This swing suggests a regular boom of 10% over the approaching years. Constructing electricity consumption has extended from 14% to almost 33% from Nineteen Seventies to 2004-05 along with a sustained 8% growth in the every year power intake inside the residential and

industrial regions. This intake of strength would continue growing unless appropriate movements are adopted to upgrade electricity performance without delay.

According to TERI estimates, there is a heightened requirement of about 5.4 billion kWh of power consistent with year to meet end-use need of electricity for residential and industrial homes. Buildings are dominant customers of water all through construction and operation. Water intake consistent with per capita in 1990 changed into 2464 m3 per capita per annum. However, by 2025, with a intended population of 1.four billion, it is likely to be less than 1700 m3 per capita per annum. Data retrieved from the State Governments of India, as of March 2004 approximately ninety three% of city populace can get admission to ingesting water as suggested in terms of water availability. For instance, the poverty-stricken, especially the ones dwelling in run-down settlements, are normally denied from those simple privileges. Similarly, the problems concerning supply of water are crucial not just for the daily needs of drinking water but additionally for agricultural and associated activities. Even as we conflict with water shortage, the resource gap will be met via treating the waste water and reusing the identical for diverse purposes. As indicated by an assessment performed by the Central Pollution Control Board (CPCB) at the status of wastewater period and treatment in Class I urban areas and Class-II towns in the course 2003-04, around 26 254 million liters for every day (MLD) (9.51 billion cubic meter (BCM) was produced in 921 Class I urban communities and Class II urban areas in India (lodging over 70% of urban populace).

1.1 Benefit of Green Building

A green building has brought down guide utilization in contrast with customary homes. The accompanying is the extent lessening of various resources in a building and their particular thought processes.

- Green structures devour 40%-60% less power when contrasted with ordinary structures. This is mostly on the grounds that they rely on upon latent compositional intercessions in the developing format, and over the top effectiveness materials and innovations in the designing format of the building.
- Green structures moreover endeavor to work toward on-site power era through sustainable power use to take into account its energy wishes. For instance, sun warm vitality can help create boiling point water and supplant the conventional electrical fountain in homes. Sun PV boards can help produce vitality which could lessen the structures reliance on lattice control.
- Green structures expend 40% to 80% lesser water when contrasted with regular structures. With the guide of utilizing to a great degree low-accept the way things are furniture, double pipes structures, squander water reusing structures and rain-water gathering, green structures no longer best decrease their interest for water utilize however also investigate site supply other options to take into account its inward and outside (scene) water requests.

1.2 Green Building Scenarios in India

India, the seventh biggest nation inside the world, might be a main economy and private to more than one billion people living in differed ecological condition zones. The nation's economy has been developing at a fast pace as far back as the technique for financial changes began in 1991. Development assumes a truly fundamental part in its economy tributary on a middle 6.5 %1 of the esteem. Modern and private areas still are a genuine commercial centre for the advancement exchange.

1.2 The Green Building Concept

The originations of green building are regularly replicated to the vitality (particularly fossil oil) emergency and in this manner the surroundings contamination worry inside the Severities. The unpracticed building development inside the U.S. begun from the need and need for a considerable measure of vitality temperate and earth benevolent development rehearses. There are unit assortments of thought processes in building unpracticed, and in addition ecological, monetary, and social points of interest. In any case, stylish property activities require AN incorporated and synergistic style to each new development and inside.

2. GRIHA INDIA (GREEN RATING FOR INTEGRATED HABITAT ASSESSMENT)

GRIHA stands for 'Green Rating for Integrated Habitat Assessment'. It is derived from Sanskrit language which means home. The building interacts with the nature in a number of ways in their whole life cycle. The resources are consumed in the form of materials and product, water and energy etc. The wastes from these resources are generated in the form of municipal solid or particulate emissions.

2.1 The Basic Features of GRIHA

GRIHA comprises of approximately 34 criteria under different segments for instance selection and planning of site, efficient utilization and conservation of material, performance and maintenance of building and other factors.

Points achieved	GRIHA Rating
50-60	★
61-70	★★
71-80	★★★
81-90	★★★★
91-100	★★★★★

Figure 1: Points achieved Griha rating

2.2 Understanding Green Building Costs

In order to successfully carry out the green building project, one need to understand the different types of expenses in relation to the building projects in general, and the ways in which the green buildings decreases the expenditure in the long term.

There are two separate and distinct ways to understand the "costs" of the project —

- Environmental Costs
- Financial Costs

2.3 Costs Associated With Environment

The setting value of a project refers to the imprint that the building project can leave on the environment, natural resources and therefore the individuals related to it and, eventually, addressing the building materials. The environmental value of the project is unsure in many ways that and could be a imprecise science, and it's positively not employment for under the building owner. It's the duty of the designer, the builder and therefore the builder's sub-contractors and vendor more over even so, it's the duty of the house owners to raise necessary queries and to lift the alertness for investment from project partners.

3. RESULTS AND DISCUSSION

The SATLUJ JAL VIDUYT NIGAM Ltd constructed its corporate headquarters and allied building at SANHAN-11 MALAYANA, SHIMLA. one of the unique GREEN BUILDING having a GRIHA of 3 stars. Thus, SJVNL headquarters is one of the best offices in NORTH INDIA. The following features help SJVLN in making it a 3-star GRIHA rating. The design of the building and its environs reflects a lot about it and its space. Natural resources, habitat and landscape are proposed to be preserved and integrated in to overall design. The layout of building has been so designed to create an inviting green approach to the complex.

3.1 Silent Features of the Building

The project consists of following blocks.

1. Total Plot Area for the Building : 29835 m2
2. Total Built-up Area - 14033 m2
3. Office block: 6 levels
4. Guest house blocks -7storeyed
5. Parking /Auditorium-5 storied
6. Service Block-Single Storey
7. Green Coverage Area - 14829.94 m2

Table 1: Floor Wise Area

BUILT UP AREA-FLOOR WISE	AREA
Level 1	2494sqm
Level 2	2454sqm
Level 3	2279sqm
Level 4	2209sqm
Level S	2073sqm
Level 6	2524sqm
Total built up area	**14033sqm**

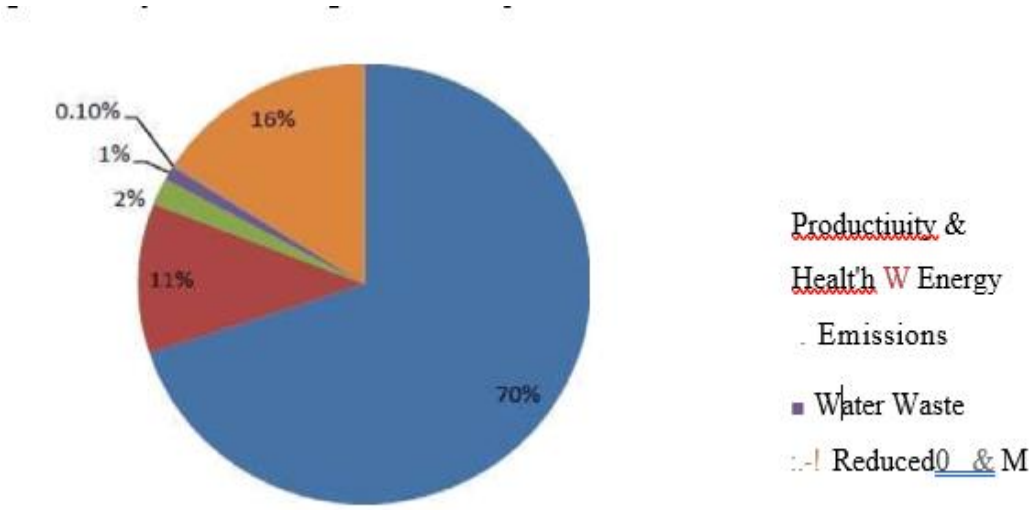

Chart -1 Percentage breakdown of Green Building financial benefits

3.2 Energy Savings

The utilization of renewable sources of energy and low energy lighting fixtures result into energy savings. SJVLN uses 40 No of Solar water heating system of 5000 LPD, Solar panel system 400 No of 250 w (Vikrant made) installed for energy savings in the building along with energy efficient and CFC free appliances used in all the building. Energy efficient HVAC system, access control system etc.

Table 1: Efficiency Table

	CERTIFIED	SILVER	GOLD	AVERAGE
Energy Efficiency (Above Standard Code)	18%	30%	37%	28%
On Site Renewable Energy	0%	0%	4%	2%
Green Power	10%	0%	7%	6%
TOTAL	28%	30%	48%	36%

Present Value (PV):

PV is calculated by discounting the future cash flows. Following equation is used for calculation of PV.

$PV = Z \{C / (1+ R) \}$

Where, n= year number (i.e. 1, 2, 3. .....20)

Cn= net cash flow at the end of year n (in our case it is annual benefit), R = Discount rate (in our case R= 12%)
Using this, PV for considered project is Rs. 900.62 lacs Net Present Value (NPV): NPV is measured as follows,

- NPV = PV — Initial cost = 900.62 — 272.74 = 627.88 lacs
- Hence NPV of entire project is Rs. 627.88 lacs.
- Total built up area of a project = 14033 sqm.
- Hence NPV per sqm = (827.88 x 10^s) - 14033 = Rs. 4,474.31

3.3 Payback Analysis

It is gives the number of years in which the initial extra expenditures for different alternatives are paid back. The simple Payback period can be calculated by the following.

Simple Payback Period = Initial Cost / Annual Savings

= 272.74/79.64

= 3.42 Years

4. CONCLUSIONS

Notwithstanding the specialized perspective, there is a point of view from monetary execution. As attention to natural maintainability furthermore, vitality productivity is turning far reaching, there's additionally a matter of rate of profitability. As power rates run higher alongside costs for flammable gas, the expenses to warmth and cool structures are relied upon to increment bit by bit. Structures that utilize creative, vitality productive materials help inhabitants battle with heightening service bills to advance the utilization of vitality proficient and supportable materials that prompt less power and water utilization.

By and large, the development business devours 40% of the aggregate vitality and around one-portion of the world's real assets. Consequently, it is basic to direct the utilization of green materials and less vitality utilization in development industry. Economical use of assets assumes a critical part in the advancement of economic development. Be that as it may, unless the methods for making these green structures reasonable for the average folks are created, we can't achieve full maintainability. A genuinely green building ought to be vitality productive, fuse solid that contains minimal measure of Portland bond, also, utilize substantial volumes of supplementary cementitious materials and reused concrete. To actualize the manageability and imaginative framework innovation, green building in the end requires the change of green solid innovation into development destinations

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