

# Cost Analysis of Greening an Existing Building

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**Abstract:** We can use rooftop solar system and solar wind hybrid systems in existing building both can easily balance the requirement of fossil fuel-based energy thus reducing carbon footprint. The sector is becoming one of the highest contributors to the country's carbon emission. Its alone accounts for 22% of India's total carbon emissions so we can use green building concept in India to reduce carbon emissions. An estimated by the "Indian green building council at present there are only 2204 certified green building in India but it is projected to rise to about one lakh by 2025. So, if we similarly make existing buildings into green building it helps us to improve in the number of certified green buildings.

**Keywords:** Carbon emissions, carbon footprint, green buildings.

## 1. Introduction

We know that for the normal building the cost of electricity is very high. If we converted this existing building into green building, we can save up to 40% or plus energy. So, by using green building concept we can save our energy as well as the cost of the electricity bill will be also very low comparatively.

Greening Existing Buildings can have tremendous benefits, both tangible and intangible. Tangible benefits are like Energy savings upto 15-30% and Water savings up to 15 - 50% while Intangible benefits are Enhanced air quality, Health & higher satisfaction levels of occupants etc.

### A. Scope and Objective

- The main objective of our project is to plan how to make a normal building into a green building. For this we have selected one of our group member buildings.
- The objective of green building concept is to develop building which use the natural resources to the material at the time of construction as well as operation.
- To make residential building into green building we need to find all the aspects of the building like area of building, height of building, number of flats in the building, rate of electricity consumption in one flat.
- Cost analysis of electricity of green building as compare to normal building
- Cost analysis of rain water harvesting
- Green building will provide financial benefits that conventional building does not.

- It will lower tenant turnover after the building is converted into green building.
- It will have higher future capital value.
- We are using energy saving appliances for our building to reduce electricity cost
- We are using our building waste for producing cooking fuel it also helps us to reduce waste pollution and helpful for environment

## 2. Building Details

- Name of Building: Maa Vaishnavi apartment.
- Address: Vaishnavi Park, Saibaba Nagar, Shankar Pawshe Road, Katemanivli, Kalyan (east)
- Total No. of Floors: A (wing) 5 Floors, B (wing) 5 floors
- Total No. of Houses: 40 Houses (Both wing)
- Total Height: 40 ft
- Electricity Bill: 1.2 to 1.5 lakh (per month)
- Maintenance bill: 70 to 80 thousand (per month)
- Area occupied by: 7500 sq. Feet

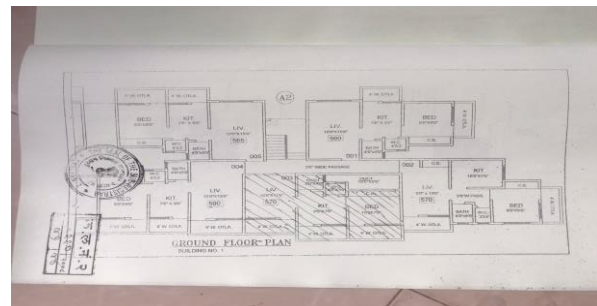


Fig. 1. Building plan

## 3. Methodology

We are study the aspects and properties of the building to convert it into green building.

Data analysis of energy consumptions of green building and conventional building. We until collect the data from the conventional building about its electricity consumption water consumption etc. And then we will assume data after making the conventional building into green building and compare them. After comparing the data, we will future proceed to make a building into green building with the help of techniques and

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materials which are suitable for it.

#### A. Rain Water Harvesting

- Rainwater harvesting methods are site specific and hence it is difficult to give a generalised cost. But first of all, the major components of a rainwater harvesting system - rain and catchment area- are available free of cost. A good proportion of the expenses would be for the pipe connections. By judiciously fixing up the slopes of roofs and location of rainwater outlets, this could be brought down considerably. However, the cost varies widely depending on the availability of existing structures like wells and tanks which can be modified and use for water harvesting. [1]
- Typically installing a water harvesting system in a building would cost between Rs 2,000 to 30,000 for building about 300 sq.m. [1]

##### 1) Cost calculations of Rain water harvesting for green building

- Total area of building: 697 sq. m
- Cost of 300 sq. m for rain water harvesting: Around 30000 Rs.
- Cost for our building: Around 60300 Rs

##### 2) Water consumption details

- For one residential (1 BHK) = 4 X 135 Lit/per day  
= 540 litres
- For one floor = 540 x 40  
= 21600 litres
- For one tower = 21600 x 5  
= 108000 litres
- Total rain water harvested = 49,208 litres

##### 3) Cost of water bill

According to Kalyan Dombivli municipal corporation the cost for per 1000 litre is around Rs 7

Therefore, the cost of water bill:

$$= (49,208 \text{ lit} \times \text{Rs. } 7) / 1000 \\ = 343 \text{ Rs. per day}$$

$$\text{Cost per annum} = 10,290 \times 12 \text{ Months} \\ = 1,23,480 \text{ Rs.}$$

Installation cost for rain water harvesting = 60,300 Rs

Maintenance cost for rain water harvesting per annum = Around 5000 Rs.

Total cost = 65,300 Rs.

Total payback period = Around 6.5 months

##### 4) Color/Grayscale figures

#### B. Biogas Plant

Organic waste such as a kitchen waste is regarded as waste and thrown, which then becomes the source of the pollution. This pollution results in many environmental problems as well as health problems leading to many diseases. For the management of the food waste, people prefer to compost the waste for using as manure in the field and ignore the energy that could be obtained from the waste. In this context, anaerobic digestion of organic waste could be better solution, as it minimizes the volume and mass of organic waste and also recovers energy at source at the same time anaerobic digestion

is the process of decomposition of biodegradable substance by microorganisms in the absence of oxygen. The end product of anaerobic digestion is gas containing mainly methane and carbon dioxide, referred to as biogas and a slurry or solid residue. Biogas is the most important alternative and useful energy source which is technically feasible and economically viable than other approaches [2]

This was carried out with the aim of producing biogas from kitchen waste Using innovative urban biogas plant [2].

##### 1) Overall Cost Analysis of Electricity for Green Building Components:

###### Solar water heater:

- Flat plate collector system
- Evaluated tube collector-based system

###### Main components of solar water heater:

- Solar collector [ to collect solar energy]
- Insulated tank [ to store hot water]
- Supporting stand
- Connecting pipes and instrument

###### Difference:

- Total energy required for water heating in green building = 64800 units
- Total energy required for water heating in conventional building = 81000 units

###### T-5 Tube light:

- There is total 40 flats in building. In which 34 flats are 1BHK and 6 flats are 2BHK so, for 1BHK flats there are 102 T-5 tube lights and for 2 BHK flats there are 36 T-5 tube lights required.
- Cost Calculation For T-5 Tube light: 138 no's X 28-watt X 6Hrs X 365 days = 8462.16 KW  
8462.16 12 Rs/units = 101545.92 Rs.  
8462.17 Implementation charge: - 16560 Rs.  
8462.18

###### Power Saver Fans:

There are 92 power saver fans are used for buildings

Cost Calculation for Power Saving Fans:

$$92 \text{ No's} \times 50\text{-Watt} \times 6 \text{ Hrs} \times 365 = 10074 \text{ kw} \\ 10074 \text{kw} \times 12 \text{Rs/units} = 120888 \text{ Rs} \\ \text{Implementation charges} = 119508$$

###### Led Bulb:

There are 92 LED bulbs are used for buildings

Cost Calculation for Led Bulb: -

$$92 \text{ No's} \times 8.5\text{-watt} \times 2 \text{ Hrs} \times 365 = 570.86 \text{ kw} \\ 570.86 \times 12 \text{Rs/units} = 6850.32 \text{ Rs} \\ \text{Implementation Charges} = 15640$$

###### Green lift:

Cost Calculation for Green Lift:

$$5 \text{ Kw} \times 60 \% \times 5 \text{ Hrs} \times 365 = 5475 \text{ units}$$

$$5475 \text{ units} \times 12 \text{Rs/units} = 65700 \text{ Rs.}$$

Final Cost for Green Building: 294984.24 Rs.

Total Implementation\_Charges: 451708 Rs.

Table 1  
Cost benefit estimation of kerosene substitution in term of biogas

Total energy available/Annum (MJ)	Annual cost savings in kerosene (Rs.)	Cost of Bio-slurry/Annum (Rs.)	Total cost savings in kerosene (Rs.)	Investment cost (Rs.)	Simple payback period (Months)
604.20	1,277.24	62,606.25	63,883.49	51,100	9.5

Table 2  
Cost benefit estimation of LPG substitution in term of biogas

Total energy available/Annum (MJ)	Annual cost savings in LPG (Rs.)	Cost of Bio-slurry/Annum (Rs.)	Total cost savings in LPG (Rs.)	Investment cost (Rs.)	Simple payback period (Months)
604.20	1,150.51	62,606.25	63,756.76	51,100	9.5

*Overall Cost Analysis of Conventional Building:*

*Fluorescent Tube light:*

Cost Calculation for Fluorescent Tube light:

138 No's X 48-Watt X 6Hrs X 365 = 14506.56 units

14506.56 X 12Rs/unit = 174078.72Rs.

*Led bulbs:*

Cost Calculation for Led Bulbs:

92 No's X 40-Watt X 2 Hrs X 365 = 2686.4 units

2686.4 units X 12 Rs/Unit = 32236.8 Rs.

*Normal Fans:*

Cost Calculation for Normal Fans:

92No's X 80-Watt X 6Hrs X 365 = 16118.4 units

16118.4 units X 12 Rs/ unit = 193420.8 Rs

*Normal Lift:*

Cost Calculation for Normal Lift:

5Kw X 5Hrs X 365 Days = 9125 units

9125 X 12 Rs/unit = 109500 Rs

Final cost for conventional building:

509236.32 Rs.

*Cost comparisons between green building and conventional building:*

Total Cost of Green Building = Implementation charges +

Total cost.

= 451708+ 294984

= 746692 Rs.

*Total Cost of Conventional Building:*

Total savings:

Total cost of green building – Total cost of conventional building

= 746692 – 509236

= 237455.68

- Total Cost of Green Building is 7,46,692 Rs. and Total cost of Conventional Building is 2,37,455.68 Rs.
- So, at the start of project the cost is high as compared to conventional building but after its give us high returns.
- From above calculation we observe that the Total recovery time is 9 months and 20 days.

#### 4. Conclusion

This paper presented a cost analysis of greening an existing building.

#### References

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