

# Green residential building in India: Cost, affordability and financing strategies



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## **Preface**

For concerns of deteriorating climate, worldwide there have been movements towards constructing Green building. The residential sector is an important sector and likely to dominate the construction of new buildings in India. This project pertains to the construction of green residential buildings in India. The project seeks to outline few relevant policies for green residential buildings in India.

The project is sponsored by National Housing Bank vide letter No. HO/MRCPD and CCC/DAK/2023/00188. I am thankful to members of NHB project evaluation committee to award this project proposal through competitive bidding.

I am indebted to Dr Piyush Tiwari, Professor of Property at Melbourne University, Australia for conceptualization the project and also for formal analysis of the work. His deep insights in the real estate economics led to many crucial inputs throughout the execution of the project. He was also deeply involved in review and editing of the project report.

The report would not have been completed in such a short time without the untiring efforts of two Academic Associates of IIM Trichy, Hema Krishnaswamy and Rishabh Atray. They worked hard to get the responses for the two surveys conducted for this report and also helped in getting the data required for many calculations reported in the report.

Special thanks are also due to Mr. Ponraj A, Junior Engineer (Civil) of IIM Trichy. He was very kind to provide with many of the details of cost calculation for a typical residential building of 60 sq. meters.

Special thanks are also due to Mr. Murali, Accounts Officer of IIM Trichy who was kind enough to spend his valuable time to provide us the income difference between Tier 1 and Tier 2 cities for government employees.

**Saumen Majumdar**

## **Green residential building in India: Cost, affordability and financing strategies**

### **Project summary**

Residential construction accounts for a large share of building construction in India. Economic growth, demographic shift and rising affluence would increase the demand for residential construction in future. Building sector will play a major role in India's net zero agenda. However, this is one of the sectors that is falling behind in the adoption of green technologies. This project examines the cost, affordability and financing strategies for green residential buildings in India. The results indicate that the green features increase the cost of construction by 3.6%. This increase in the cost of construction would strain affordability of households in economically weaker sections, low income and middle-income households, who constitute a major proportion of households in India. Results from survey of lenders suggest that return on capital is paramount determinant of their investment decisions. This, in turn, implies that lenders do not, in general, offer discount on interest rates for buyers of green residential buildings. However, the due diligence requirements of green residential buildings are lower than for conventional buildings. Lenders also charge a lower loan fees to buyers of green buildings. There is, however, discount of 0.5-1% on green building construction loans to developers. Based on the study, an important policy advocacy will be to put in place regulatory prescriptions on commercial banks to provide as low as 0.5-1% discounts on interest rate on housing loans for homebuyers. Based on the affordability calculations provided in the study, it may be suggested that only regulatory prescriptions may not be enough. Some enhanced form of government subsidies is required if housing is sought to be made affordable for the BPL, EWS and LIG household categories.

## **1. Project brief**

Sustained economic growth, rising household income, and urbanization have led to a surge in demand of residential properties in Indian cities. The energy footprint of residential properties is large. Residential housing in India consumes around 24 percent of electricity generated and projected to grow in the future. Green residential building, which consume less energy will play an increasing role in fulfilling India's net zero commitments and target to reduce 1 billion tons of projected emissions till 2030. To bridge the gap between demand and supply of affordable housing, the Government of India (GoI) initiated Pradhan Mantri Awas Yojana (PMAY) in 2015. PMAY was also tasked to identify and publish new environmentally sustainable materials and construction technologies in updated compendium annually.

Past studies conclude that there is a general desire for households towards green buildings. Lack of awareness of what constitute 'green' seems to be common grievance among households. However, it is noticed that households are willing to pay to add green materials and features in their homes (IFC 2022). This makes for a good case for builders/ developers and investors/ lenders to offer green financial products as markets for the same are bound to increase in the near future.

## **2. Objectives**

The main objective of the present study is to outline avenues to make green certified building more affordable to the low- and middle-income households. The research is sub-divided as follows:

- (i) Firstly, it will try to examine the life-cycle cost of green residential buildings in India.
- (ii) Secondly, it will try to estimate the impact of cost of green buildings on affordability for a homebuyer and
- (iii) Thirdly, based on (i) and (ii), study proposes key considerations for lenders in designing financing products for green buildings.

## **3. Methodology and scope of the work**

Data on construction cost, rentals, sale price, lease covenants in the residential sector are difficult to obtain in the Indian context. To offset this limitation, perception-based surveys of stakeholders involving builders/ developers and lenders/ investors are undertaken. Earlier work as reported in Tiwari et al 2018, identified a rental premium of 3-10 percent for office properties, 1-4 percent for retail and industrial properties. The present surveys expand those studies and investigates whether there exist similar premium values for residential projects in India.

Section 4 outlines a brief description of the spread sheet model used to calculate putative discounts needed to offset the increase in costs for a green residential building. Section 5 dwells on the affordability aspect of housing in India. Section 6 outlines a brief description on the

design of the surveys undertaken. Section 7 reports on the findings of the surveys conducted for this study. Section 8 gives a brief overview of incentives offered to stakeholders of green building at various stages of construction while Section 9 outlines various government incentives and the rating mechanism in India. Section 10 concludes the study.

#### **4. Calculations of putative discounts on interest rate of housing loans**

The main purpose of this exercise is to calculate the putative discounts on the interest rate charged by commercial banks/ housing finance companies on housing loans to offset the increase in the total present value cost of a green housing unit over a conventional unit. A spread sheet model is built which calculates separately the total present value of the life cycle cost of a 60 sq. meters house size both for a conventional and a green housing unit.

First, the model calculates the total present value of the life cycle cost of a conventional housing unit of 60 sq. meters. Next, appropriate set of green attributes are chosen so as to enable the housing unit to achieve green certification. The attributes chosen are as follows:

- a) Use of autoclaved aerated concrete (ACC) block instead of brick masonry
- b) Roof insulation and reflective paints on the roof
- c) Provision of solar hot water systems
- d) Low Volatile Organic Compounds (VOC) paints
- e) Water efficient fittings
- f) Rain water harvesting
- g) Compact fluorescent lamp (CFL)/ LED hybrid light fittings
- h) Solar panel/ photovoltaic (PV) panels
- i) Brush-less Direct Current (BLDC) fans
- j) Sensor based lights
- k) Automatic water pumping to Over Head Tank

The costs of these green attributes are obtained from the online market-based websites ([IndiaMART.com](http://IndiaMART.com)) and from published CPWD cost norms.

It is assumed that the households are able to obtain a loan amount equivalent to the cost of the house. The interest rate of the housing loan is assumed to be based on the prevailing market rate. Assuming the duration of 10 years, the EMI of the loan is calculated.

Second, the present value of the life cycle operating cost comprising of water, electricity and maintenance charges is calculated. The total present value cost comprising of the operating cost and the EMI is the total monthly outflow of payments. The difference in the total present value costs between a conventional unit and a green unit is the extra payments required for owning a green dwelling.

Third, the model iteratively calculates the discounts on interest rate that is required to equate the two present value costs.

Estimate of the discount in the interest rate is calculated as .85% based on the assumptions of the model. Some of the key assumptions of the model are listed in Table 1 in the Appendix.

## 5. Calculations for affordability across income groups

In this exercise the households are distinguished among income groups based on the classifications followed in the Prime Minister Awas Yojana (PMAY). The income level of the Below Poverty Line (BPL) has been scaled up for the year 2023 based on inflation data given in Economic Survey. The other income categories are Lower Income Group (LIG), Middle Income Group (MIG), Higher Middle-Income Group (HMIG) and Higher Income Group (HIG). The income level for BPL for 2023 is taken to be Rs.8000 per month. The house size for the income groups for respective income groups are adapted from the PMAY classifications.

The basis for all the assumptions regarding house size for each income groups and the associated norms of affordability are adapted from the Deepak Parikh committee report. The committee defined affordable housing for EWS/ LIG category of households as “a unit with a carpet area most likely between 300 and 600 sq. ft. with (a) the cost not exceeding four times the household gross annual income and (b) equated monthly instalment (EMI) rent not exceeding 30% of the household’s gross monthly income”. For the MIG category, the carpet area was considered as 1200 sq. ft. and the cost deemed to be five times of the household gross income and EMI/ rent not exceeding 40% of the household’s gross monthly income. Wadhwa (2009) further revised the norms and created a new category for BPL household with associated norm as: cost not to exceed two times of the household gross annual income and EMI/ rent not to exceed 5% of the household’s gross monthly income. Also, the norms for EWS category is revised for EMI/ rent to 20% and housing cost not to exceed three times of the annual income.

The housing cost for 30 sq. meters, 60 sq. meters, 120 sq. meters 150 sq. meters and > 150 sq. meters are sourced from publicly available advertised price of residential buildings from websites of [99acres.com](http://99acres.com), [HOUSING.com](http://HOUSING.com) and other web base reality companies. Based on the classification of Tier 1 and Tier 2 cities, house prices of cities are separately collected for all cities. The average house prices for Tier 1 and Tier 2 cities are considered in the calculation for affordability as shown in the Table 2 and Table 3 below. The sale prices of houses for the Tier 1 cities are markedly higher than that of the Tier 2 cities for obvious reasons. The higher land cost in the Tier 1 cities is one of the major factors for this difference. The house sale prices for the green residential buildings are scaled upwards by 6%. This scaling factor is derived from the survey for the builders which was discussed earlier in this report. The survey noted that the builders perceive on an average a cost escalation of around 6.23% for green residential building over conventional building.

The average income levels of households in Tier 1 cities are also scaled up. The scaling factor is derived based on the pay difference of government employees between Tier 1 and Tier 2 cities. Although the basic pay is same, the Housing Rent Allowance (HRA) and Travelling Allowance (TA) is higher for Tier 1 city in comparison with the Tier 2 city. The calculations for gross pay at different income category are given in Table 2 below, which also reports the scaling factors used for subsequent calculation of affordability across the income groups.

**Table 2. Gross Pay for Government Employees across income groups**

Particulars	LIG (Rs.)		MIG 2 (Rs.)		HMIG (Rs.)		HIG (Rs.)	
	Tier 1	Tier 2	Tier 1	Tier 2	Tier 1	Tier 2	Tier 1	Tier 2
Basic Pay	18,000	18,000	44,900	44,900	67,700	67,700	1,44,200	1,44,200
DA @ 46%	8,280	8,280	20,654	20,654	31,142	31,142	66,332	66,332
HRA	4,860	3,240	12,123	8,082	18,279	12,186	38,934	25,956
Transport Allowance	1,350	900	3,600	1,800	7,200	3,600	7,200	3,600
DA on TA	621	414	1,656	828	3,312	1,656	3,312	1,656
EPF	3,154	3,154	7,866	7,866	11,861	11,861	25,264	25,264
<b>Total</b>	<b>36,265</b>	<b>33,988</b>	<b>90,799</b>	<b>84,130</b>	<b>1,39,494</b>	<b>1,28,145</b>	<b>2,85,242</b>	<b>2,67,008</b>
Change in % between Tier 1 and Tier 2	<b>6.70%</b>		<b>7.93%</b>		<b>8.86%</b>		<b>6.83%</b>	

Source: Authors own calculation based on data from Government of India notifications

The results for affordability show that housing is way beyond affordable for the BPL, EWS and LIG income groups in the Tier 1 cities as shown in Table 3. It is somewhat affordable in the Tier 1 cities for the MIG income groups, only if we consider households living on rent and not affordable if households were to own their own houses. It is affordable to a certain extent for the HMIG and HIG income groups in the Tier 1 cities.

**Table 3. Housing Affordability for income groups for Tier 1 cities**

Tier 1 Cities	Defined Affordability (norms)				Affordability Status in 2023			
Income group	Monthly income of household (in INR, 2023)	House Size (sq m)	Affordability (1): House price (rent/EMI) as percentage of monthly income	Affordability (2): Ratio of House Price to Annual Income of Household	House price (rent) as percentage of monthly income		Ratio of House Price to Annual Income of Household (in 2023)	
					Conventional	Green	Conventional	Green
Below poverty line BPL	8000	30	5%	2	108.2%	114.7%	30.92	32.78
Economically Weaker Section (EWS)	<25000	30	20%	3	34.6%	36.7%	9.90	10.49
Lower income group LIG	25000-50000	60	30%	4	44.9%	47.6%	12.82	13.59
Middle income group MIG	50000-100000	120	30%-40%	5	37.6%	39.9%	10.75	11.39
Higher middle income group (HMIG)	100000-500000	150	30%-40%	5	30.9%	32.8%	8.84	9.37
Higher income group (HIG)	200000	>150	30%-40%	5	28.4%	30.1%	8.12	8.61

Source: Authors own calculation and adapted from Tiwari and Rao (2020)

Housing is somewhat affordable even for the LIG category in the Tier 2 cities as shown in Table 4. It is affordable for the MIG, HMIG and HIG income categories in Tier 2 cities. In general, housing is more affordable in Tier 2 cities in comparison with Tier 1 cities. However, for BPL and EWS income categories, housing is not affordable by a wide margin and there exit a wide disparity between these groups in comparison with the HMIG and HIG groups.

**Table 4. Housing Affordability for income groups for Tier 2 cities**

Tier 2 cities		Defined Affordability (norms)				Affordability Status in 2023			
Income group		Monthly income of household (in INR, 2023)	House Size (sq m)	Affordability (1): House price (rent/EMI) as percentage of monthly income	Affordability (2): Ratio of House Price to Annual Income of Household	House price (rent) as percentage of monthly income		Ratio of House Price to Annual Income of Household (in 2023)	
Below poverty line	BPL	8000	30	5%	2	Conventional 73.4%	Green 77.8%	Conventional 20.97	Green 22.23
Economically Weaker Section (EWS)		<25000	30	20%	3	23.5%	24.9%	6.71	7.11
Lower income group		25000-50000	60	30%	4	27.4%	29.0%	7.82	8.29
Middle income group		50000-100000	120	30%-40%	5	19.8%	21.0%	5.65	5.99
Higher middle income group (HMIG)		100000-150000	150	30%-40%	5	15.7%	16.7%	4.49	4.76
Higher income group (HIG)		200000	>150	30%-40%	5	13.8%	14.6%	3.94	4.18

Source: Authors own calculation and adapted from Tiwari and Rao (2020)

## 6. Survey design

Two survey instruments have been designed to survey builders/ developers and lenders/ investors.

The pertinent research questions for the lenders/ investor community are identified as follows:

- What hurdle rates do lenders and other investors use for evaluating their investment in residential projects? Does this differ between green and conventional buildings?
- Do lenders offer discounts on mortgages for green residential housing units?
- What are the investment objectives of lenders and investors in residential projects, do these differ by projects or are they determined at organizational level?
- What challenges do investors face in financing green residential projects?
- What regulatory and policy incentives do the investors require to facilitate investing in green projects

Keeping in mind the objectives, following are the research questions identified for the builders/ developers:

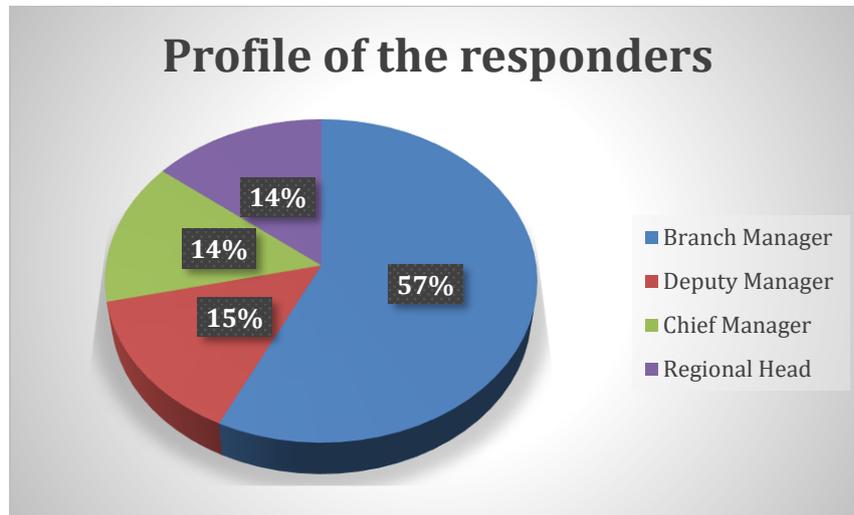
- What are the costs premium associated with developing green residential buildings?
- How developers perceive risk (revenue and cost) associated with green residential building?
- How developers see the potential demand for green residential building?
- What required rates of return developers use in evaluation of residential projects, and does this differ across residential building?
- Does the cost of the construction finance differ for green building from conventional building?

## 7. Survey Findings

### 7.1 Lenders' Survey

In order to gauge the lender’s behaviour towards facilitating ‘green’ house loans, a survey of the prominent lenders was undertaken. All the respondents are high level officials ranging from Branch Managers to Regional Heads of their respective lending institutions. Most of them have work experience of more than 10 years (Figure 1). This is to ensure credibility to the responses gathered from the survey.

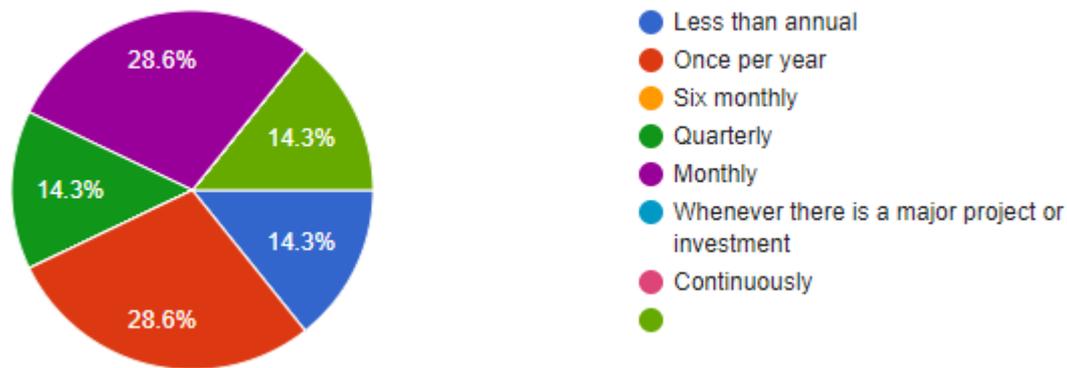
**Figure 1 Respondents profile for lenders’ survey**



Most of the lending institutions have an exposure of less than Rs.4000 crores towards residential lending comprising of residential mortgage and construction finances. Responses also reveal that most of these lending institutions maintain the goal of maximizing the value of funds as their principal investment objective. For funds under residential property development and overall mortgages, there is an emphasis on the twin principal objectives of increasing new business and attaining competitive return against benchmark/ market/ competitors. The lending institutions are very conscious about the performance of their peers and try to match their rivals with regards to pricing loans and at the same time they seem to focus on expanding their business. Expectedly, some of the responders also reveal that their objectives are influenced by the regulatory requirements (such as priority sector lending) for investments in infrastructure.

Next, the respondents are asked about the criteria they choose to evaluate prospective loan applications. The responses reveal that most lenders use hurdle rate, which is deemed to be the minimum rate of return required on a project or investment with riskier projects attracting a higher hurdle rate. From the responses, it is seen that there are in general two broad ways to evaluate projects: (a) Net Present value (NPV) and (b) Internal Rate of Return (IRR). In both cases hurdle rate is the key parameter based on which the projects are evaluated. Most of the responders suggest that the Accounting rate of return/ or the Adjusted Present Value methods are most frequently used to assess projects. It is interesting to note that the financial companies revise their respective hurdle rate at varied levels of frequencies ranging from monthly, quarterly to annual as shown in Figure 2.

**Figure 2. Frequency of the changes in the hurdle rate**



Source: Authors own calculation based on Lender's survey

Does the hurdle rate vary from project to project, i.e. specific to each residential development project? Or is there a country specific hurdle rate? Does the company use an organized weighted average cost of capital as the hurdle rate? In response to these queries, the majority of responders seems to suggest they use an organization level hurdle rate which does not vary across the region. A typical organization as an entity determines the hurdle rate based on its equity and debt obligations and use this rate for evaluating across their portfolio of loans at the organization level.

For evaluating the residential projects, how are the hurdle rate calculated at the organization level? The responders were given four standard choices regarding the basis for calculating the hurdle rate:

- a) Weighted average cost of capital or equivalent
- b) Fixed target rate of return
- c) Property yield plus a risk premium, and
- d) Bond yield/ risk free rate plus a risk premium

Analysis of the responses suggests that the weighted average cost of capital is the most popular method of calculating the hurdle rate. Probing further to understand how the lenders incorporate risk for evaluating prospective investments, the survey reveals that hurdle rate are rarely increased to reflect increase in the risk of the projects. If at all, the hurdle rate for residential projects is increased due to only these following reasons:

- a) If it is anticipated to be a long-term investment
- b) If the investment in question require significantly more funds than a typical investment size of the organization.

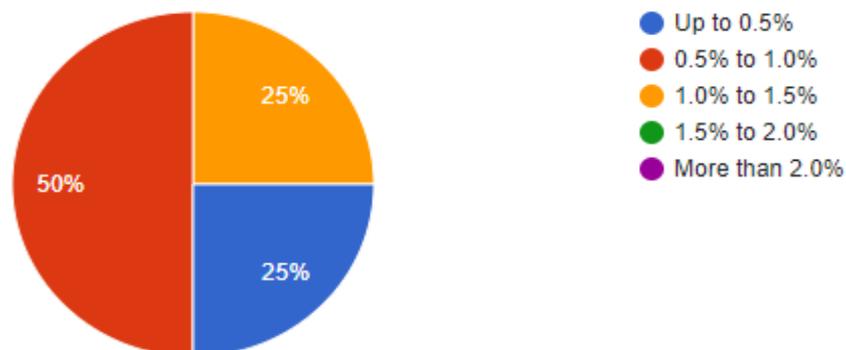
What are the factors that may lead to change in the hurdle rate? There are two broad reasons that may lead to change in the hurdle rate. Firstly, if there are any changes in the sources or pricing of the capital (for example, if there are any changes to the cost of capital of the organization or whether there are changes to the expected market risk premium). Secondly, if

the general economic conditions of the economy changes (for example, if the economy is in the midst of an economic cycle or real estate cycle).

Does the lending company provide any incentives for green residential projects in comparison with conventional projects? Most of the responders agree that usually they have a policy of lower due diligence requirements for evaluating green residential building projects. Some of them also report that they do consider a lower hurdle rate specific to green residential building projects and also charge lower fees for evaluating the same. This goes to show that lenders have an active policy in place for evaluating green residential projects. The lending institutions are conscious of the need to propagate construction of green buildings taking cognize of the benefits of lower maintenance costs over the life of the buildings and also the lower carbon emissions for the benefit of the future climate.

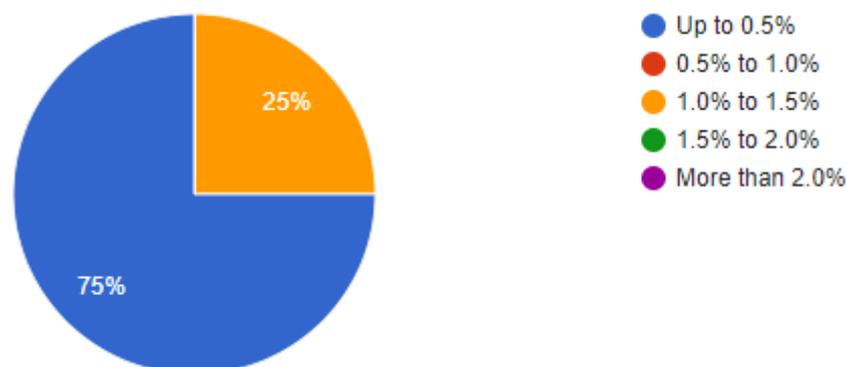
As for the commercial banks, an overwhelming majority of them provide interest rate discounts on construction loan for green residential properties. It is pertinent to note that the discounts range from 0-1.5%, with a majority of them reporting that they provide a discount ranging from .5% to 1% as shown in the Figure 3. Majority of the commercial banks also provide a discount of up to .5% on interest rate for Green residential construction loans pertaining to the builders as shown in Figure 4.

**Figure 3. Discounts offered by Commercial banks to green residential loans**



Source: Authors own calculation based on Lender's survey

**Figure 4. Discounts offered by banks on interest rate for Green construction finance**



Source: Authors own calculation based on Lender's survey

To gain a better perspective both on what motivates the commercial banks to offer discounts, the survey posed the questions to the commercial banks outlining few possible reasons. The responses of the lenders may be categorised into two broad themes: (a) need to fulfil social objectives (corporate social responsibilities/ corporate mission and shareholder's requirements) and (b) business proposition (price of green building is likely to appreciate faster than conventional building and borrowers have better cash flows over time due to lower energy and water costs, which reduces default risks). The government may be well advised to put in place requirements for commercial banks accessing funds through government programs (such as PMAY under credit-linked subsidy scheme) to provide higher interest rate discounts for both green residential loans for households and green building construction loans for the builders than for conventional buildings.

Those commercial banks which offer no discounts are similarly asked to choose from a list of possible reasons of not offering the same. The commercial banks cited the following reasons in decreasing order of importance: catering to business reasons such as (a) borrower's risks are same irrespective of the type of buildings (conventional or green), (b) cost of funds for the organization is not different for green and non-green investments and (c) value of premium for green buildings are not evident and operational reasons such as (d) due diligence of green buildings take longer. The commercial banks also suggest that the possible reason for lack of technical skill in evaluating green projects seems to be less of a factor for not offering discounts on green loans. There are already few green certifications granting organization in the country (prominent examples are GRIHA and IGBC) and enough human resources capability as well to verify the green attributes for granting those certifications. That possibly explain the bank's choice of reasoning.

## ***7.2 Builders' Survey***

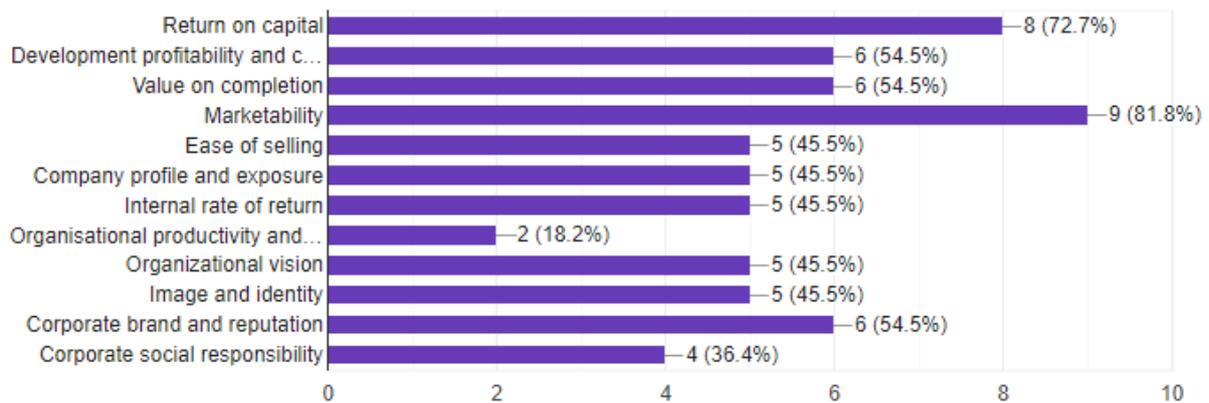
In order to understand the supply of green buildings, a survey of the builders (construction companies) was conducted. Majority of the builders were involved in green residential construction apart from the traditional conventional buildings. Most of these builders have a healthy pipeline of new green projects to complete in the future. The builders were asked about the problems they face in constructing conventional buildings. They identified costly maintenance schedule as one of the key problems. The builders fear that conventional buildings may suffer from brown discounts and consequently it may affect the resale value of the conventional buildings in the future.

The builders were asked to evaluate a list of possible reasons for undertaking green residential projects by ranking them on a scale of 5 with descending order of importance. Results of the survey indicated that the builders proffer two broad reasons in order of importance: fulfilling social responsibilities (such as corporate image and prestige value/ reputation, compliance with legislation and corporate social responsibility) and catering to business relevance (such as lower transaction fees, ability to secure finance, higher return on investment and organizational productivity and profitability).

Next, the builders were asked which among the given list of factors drive value in their respective organization. The complete list with their preferences is given in Figure 5.

Marketability of their products portfolio and enhancing return on capital are two of the highest rank factors as indicated by the responders.

**Figure 5. Factors driving the value of the construction companies**

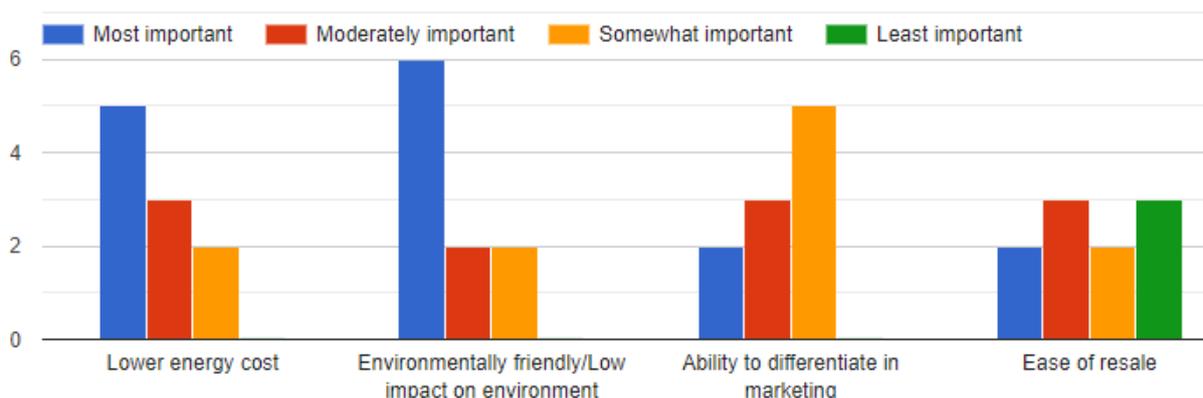


Source: Authors own creation based on the Builder’s survey

The builders were asked about the important factors to take into consideration while constructing a green residential building. Among the list of broad choices provided, most of them indicated water savings, indoor environment quality and appropriate material selection as the important factors to take into consideration. Their responses reflect on the importance of choosing appropriate green features like autoclaved aerated concrete blocks instead of traditional bricks, roof insulation and reflective paints on the roof among many such green attributes. These green features are likely to keep the rooms cool during the hot tropical months in the country. This in turn will improve the indoor environment quality of the green building.

The builders were also asked what according to them are key benefits of green residential buildings? Figure 6 gives the results of the survey findings. Most of the builders were of the opinion that green residential buildings accrue lower energy cost over the lifecycle of the building and the construction and usage of the buildings are environmentally friendly. From the business point of view, the builders were of the opinion that green building as a product has the ability to differentiate in marketing of their product portfolio.

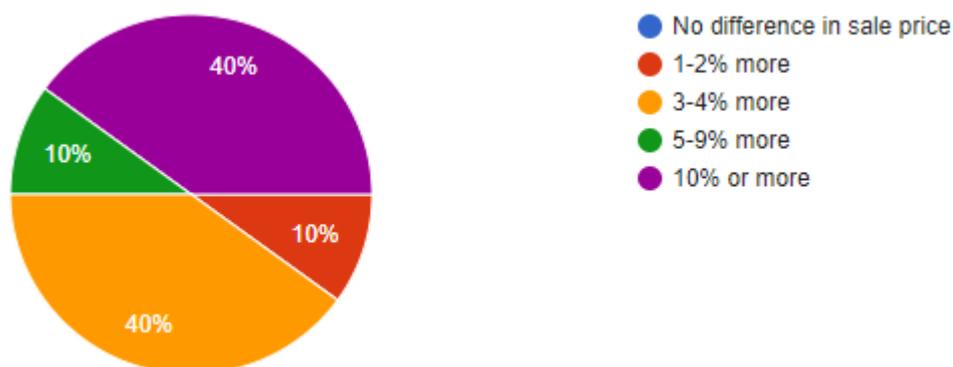
**Figure 6. Benefits of green residential builds as perceived by building community**



Source: Author’s creation based on Builder’s survey

To check for the saleability of the green buildings, the builders were asked what percentage of sale price premium do green residential buildings command over a similar functional and quality non-green residential building. Results as depicted in Figure 7 shows that the builders are reasonably optimistic about the prospect of green buildings with 40% of them stating that a typical green building will command a premium of 3-4% over conventional building. Another 40% of the builders even stated a premium of greater than 10%. The weighted average of the sale price premium is around 6.25%.

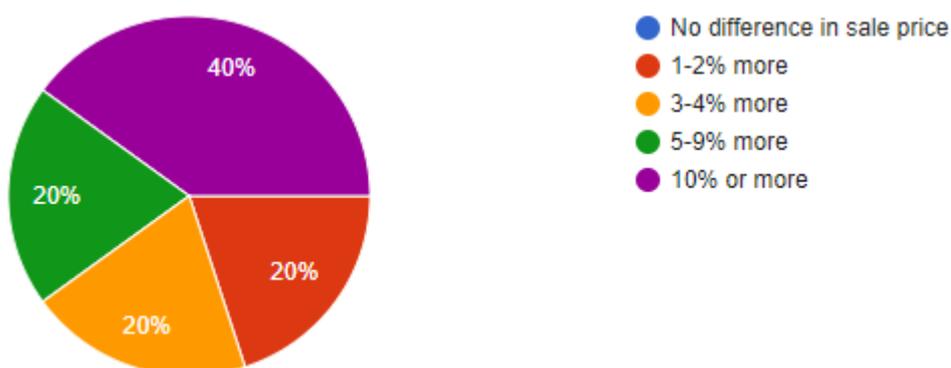
**Figure 7. Sale price premium as perceived by the building community**



Source: Author's creation based on Builder's survey

The builders were asked about their expected percentage change in operating cost of a green residential building in comparison to conventional unit of similar functional and quality. Results as shown in Figure 8 suggests that there is a variation in their expectations with 40% of the responders stating that the percentage reduction in operating cost may be as high as 10% or more. The weighted average of the expected percentage cost reduction is approximately 6.5%. This aligns well with the sale price premium reported above.

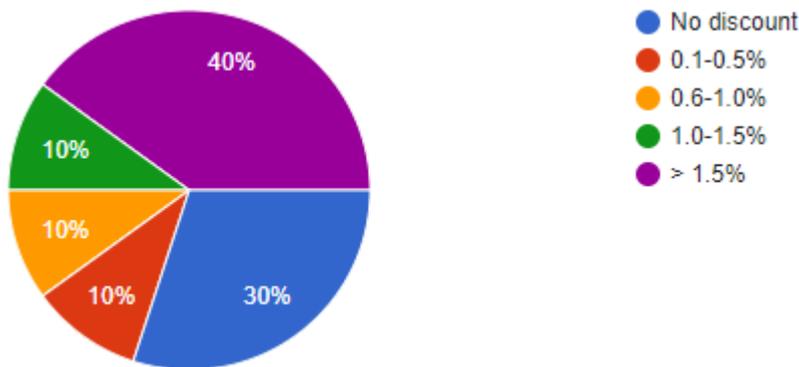
**Figure 8. Percentage change in operating cost of green building**



Source: Author's own creation based on Builder's survey

In order to probe further whether the builders face any constraints while credit loans for green building construction, the builders were asked whether they find favourable loan terms while developing green buildings. 50% of the builders were uncertain whether they will be able to get any favourable loan terms, while only 30% of them replied in affirmative. Quizzed further, as to how much discount the lenders are willing to offer on interest rates for construction loans for green buildings, 40% of the builders reported to get a discount of 1.5% or more while 30% of them reported of not getting any discounts. The weighted average is calculated to be approximately 0.85% as derived from Figure 9.

**Figure 9. Discounts available on interest rate for construction loans**



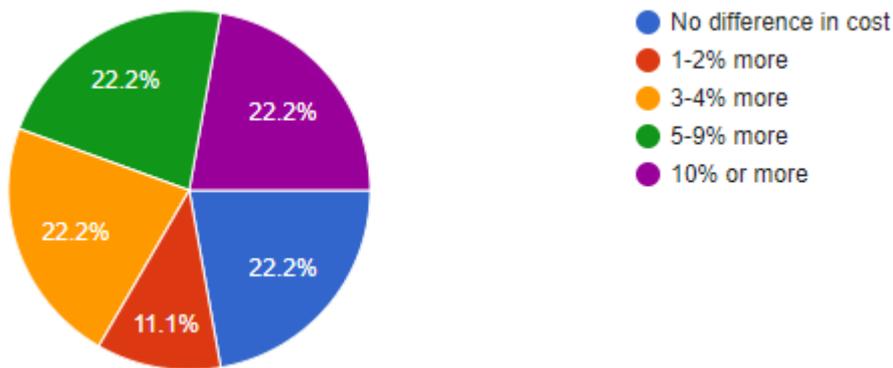
Source: Author's own creation from Builder's survey

The builders were also asked if the banks charged lower loan fee amount for developing green residential building. 50% of them reported to get some form partial waiver to the extent of 1-2% while the rest clearly denied getting any such waivers at all. Besides deriving some sort of benefits on the cost of borrowing, the builders may also be incentivised by government programs or through regulatory incentives. It is revealed that builders take advantage of various government/ regulatory incentives like tax breaks, favourable zoning per the regulated master plans of the cities.

Of particular importance to the study, the builders were asked if a green building incur extra expenditure to design and build. Responses show (Figure 10) that around 80% of the builders report a cost surge of around 1% to 10% or more. Rest of the builders are able to internalise the extra cost of green building without reporting any cost increase. The weighted average cost premium is approximately 4.5%. A detailed cost analysis reported later in the report suggests that choice of additional green features may differ both qualitatively and quantitatively, invariably increasing the cost of a green building.

Given the positive vibes surrounding green residential buildings, the builders were asked what factors are driving green efforts in the country. The three broad factors as outlined by the builders are (a) energy cost savings accruing to the residents over the lifetime of the building, (b) favourable government programs and (c) increase in potential investor demand for green residential buildings.

**Figure 10. Cost premium to design and build a green residential building**



Source: Author's own creation based on Builder's survey

Asked about the source of capital to fund new development projects, the responders exhibited proclivity towards issuance of equity and generating surplus from operating profits. Large entities avail short term debt as well. While assessing the returns on investments, the entities usually take a long-term perspective of around 10 years. This seems to be a very reasonable timeline and alludes to the fact that the entities have a long-term vision and intend to stay in the business for a longer time period.

The building entities do exhibit a varied perspective while taking an investment decision. Half of the responders said that they separately assess the unlevered project cash flow/ returns and then decide on the mix of the capital requirement while other half said that they assess the investment cash flow/ returns with the capital funding costs included (levered). It is not clear whether the two different behaviours actually affect the profitability or the business sustainability in the long run. Lastly, we note a matter of concern. When asked how the general public perceive green residential buildings compared to conventional buildings, the builders expressed their anguish over the lack of enthusiasm about green building among the general public. This reflects the lack of momentum in demand for green buildings and points to need for more comprehensive efforts to generate demand for green residential housing in India.

### ***7.3 Interest rate survey***

This phone survey is conducted to check whether in reality the households are able to avail of any incentives on the interest payments of the housing loan. Posing as a prospective client, wishing to take a housing loan, an associate will be contacting the lender by phone to enquire whether the lender is willing to provide a housing loan. If the answer is the affirmative, the associate will be asking whether the lender is willing to give any discounts on the interest rate for a green building. A partial list of responses is provided in the Table 5. The results show that only two banks, Bank of Maharashtra and ICICI bank offer discounts on the interest rate payments.

How does this square with the responses from the Lender's survey, where the lending institutions are willing to offer discounts on housing loans. The most likely interpretation of this apparent anomaly is although it is an accepted policy at the higher echelon of the

management to grant discounts on the housing loans, the lower level management are not sufficiently trained or advised to implement the same. Perhaps regular retraining of the personnel at the first point of contact may mitigate the problem to a certain extent.

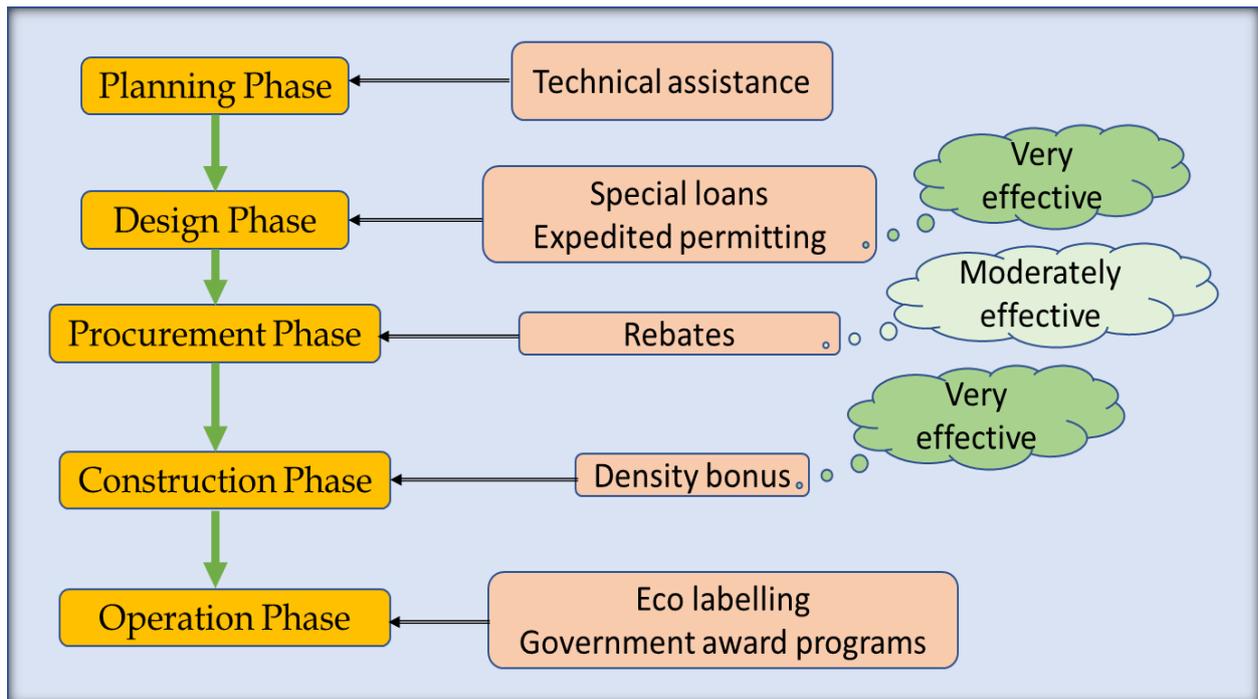
**Table 5. Responses of the phone-based survey of the lending companies**

<b>Public Sector Banks</b>	<b>Discount</b>	<b>Home loan rate (min)</b>	<b>Green residential loan rate</b>	<b>Response</b>
SBI	No	8.40%	NA	Yes
PNB	No	8.50%	NA	Yes
<b>Bank of Maharashtra</b>	<b>Yes</b>	<b>8.60%</b>	<b>8.50%</b>	<b>Yes</b>
Bank of India	No	8.30%	NA	Yes
Canara Bank	No	8.55%	NA	Yes
Bank of Baroda	No	8.4	NA	Yes
Central Bank of India	No Response			
<b>Private Sector Banks</b>	<b>Discount</b>	<b>Home loan rate (min)</b>	<b>Green residential loan rate</b>	<b>Response</b>
HDFC	No	8.35	NA	Yes
ICICI	Yes	9.5	9.25-9.50	Yes
Axis Bank	No	10.5	NA	Yes
Bandhan Bank	No	9.15	NA	Yes
City Union Bank	No	12.25	NA	Yes
CSB Bank	No	9.69	NA	Yes
DSB Bank	No response			
Dhanlaxmi Bank Ltd	No	9.9	NA	Yes
IDFC Bank Ltd	No	8.75	NA	Yes
IDBI Bank Ltd	No	8.55	NA	Yes
Indusland Bank Ltd	No	8.5	NA	Yes
Karnataka Bank	No	8.75	NA	Yes
KBS Local Area Bank	No response			
Kotak Bank	No	8.75	NA	Yes
RBL Bank	No	8.9	NA	Yes
TamilNad Mercantil Bank	No	9.35	NA	Yes
The Federal Bank Ltd	No	8.8	NA	Yes
Jammu Kashmir Bank Ltd	No	8.75	NA	Yes
The Karur Vysya Bank Ltd	No	9.2	NA	Yes
The Nainital Bank Ltd	No	8.65	NA	Yes
The South Indian Bank Ltd	No	9.57	NA	Yes
Yes Bank Ltd	No	9.4	NA	Yes
<b>Housing Finance Companies</b>	<b>Discount</b>	<b>Home loan rate (min)</b>	<b>Green residential loan rate</b>	<b>Response</b>
Poonawalla Housing Finance Limited	No Response			
LIC HFL	No	8.4	NA	Yes
Sundaram Housing Finance Loan	No	9	NA	Yes
Repko Home Finance	No	8.5	NA	Yes
Chola Mandalam Home Finance	No Response			
Sahara House Finance	No	8.75	NA	Yes
Aaavas Financers	No	8.5	NA	Yes
L&T Finance	No	8.6	NA	Yes
Star House Finance	No Response			
Mahindra House Finance				
Reliance Housing Finance				

## 8. Existing instruments for Green residential buildings

Saka et al (2021) outlines a comprehensive list of incentives and evaluates their effectiveness based on the timeline and chronological order of phases of the green building construction. Based on the timeline of a green building project, five distinct phases may be delineated: Planning, Design, Procurement, Construction and Operation as outlined in Figure 11. There are a plethora of rewards and compensation available for green building and administered across the countries. Some of them are outlined below.

**Figure 11. Phases and effectiveness of programs in Green Buildings**



In case of **rebates**, the government purchases green efficient features like water and energy conservation features and provides them to beneficiaries at reduced prices. Or the government reduces the fee or make refunds to beneficiaries for legitimate purchases. For example, there is a program in Canada, whereby in the city of Charlottesville, the building permit fee is reduced by 50% if green roof is constructed for a building. Available in many countries, developers and contractors are able to get **loans** from building institutions at reduced interest rates for achieving Green standards in the buildings. In order to support innovative ideas that reduce energy and water use, governments provide **grants** to beneficiaries as incentives to implement these features in buildings. For example, in many European countries and also in Australia a building innovation fund is in place to support the developers/ builders for the high initial cost for inducting green features in the buildings. The Green Roof Incentive Programme in Canada provides a grant up to \$10 Cdn/ m<sup>2</sup> for green roof installation. Rebates on energy efficiency attributes and small grants for buying renewable energy technologies for example solar panels are ways to support the contractors and retrofitters of green building during the procurement phase. Governments also provide **technical assistance** in education and implementation of green attributes to the builders/ potential owners of buildings. Verification and standardisation of green attributes are attained by **eco-labelling** of green products along with quantitative

specifications for use of these products. Eco labelling increases the value of the brands and the marketability of the green products.

Governments may create social good by tinkering with specifications which affect the building/ construction spaces by way of height bonuses, reduced landscaping requirements and floor/ area ratio (FAR) also known as **density bonuses**. Developers and owners of green buildings availing of density bonuses can increase the floor space of building projects and increase profits. During the construction phase, density bonuses are considered to be highly effective to increase the stock of green rated buildings. For example, in the USA, builders and developers can claim more building space through density bonuses if they achieve high green building ratings. Incentives towards green buildings may also be in the form of recognition through **government awards**, which may spur more research and induction of these buildings. Green buildings usually experience long delays in issuance of permits. **Expedited permitting** during the design phase, only if green features are integrated in the building application, can help developers to kickstart the construction with possibility of early profits. Governments may also decide to install prototype projects to illustrate and demonstrate green building concepts. Potential owners and developers learn about new green features and may choose to induct them during the design phase of the green building.

There are also policies which affect the affordability of housing. For example, housing shortages in the city of New York, US is nothing new. There is a severe dearth of affordable housing. To address this shortage, the city administration of New York introduced a new scheme, Mixed Income Market Initiative (MIMI). Specifically, MIMI encourages new construction of mixed-income, multifamily rental projects in areas without many low-cost housing options. Under this new scheme, subsidies will be given to projects that include homes – from extremely low income and homeless set-aside units, to moderate income and even market rate units. This new financing model leverages market rate rental units to help finance affordable housing development. To qualify for subsidies, at least 70% of the apartments should be “affordable”, among which, 15% of the apartments are to be reserved for formerly homeless people and at least 10% more affordable to people with limited incomes.

## **9. Government schemes and rating mechanism in India**

Based on the submissions made by India at the 26<sup>th</sup> session of the Conference of the parties (COP26) with regards to impending climate related actions, it is imperative for India to emphasize on green buildings to fulfill the commitments within the specified timelines. Based on this study, it has been found out that considering the lifecycle of the building, more energy is consumed while the building is in use. Hence the importance of green buildings, which rely on the increase in energy efficiency at the end-use level. Various departments of the central government are involved in formulating policies on making cities green.

For example, Bureau of Energy Efficiency (BEE) has developed Green Building Star Rating Program to achieve energy and cost savings in providing various municipal services. Government institutes also offer incentives/ benefits for green rating complaint houses. These are as follows:

- a) Additional Floor Area Ratio (FAR). Also known as density bonuses, this is prevalent in many countries. The Jaipur Development Authority have approved an additional

5% FAR for Gold rated green buildings per IGBC rating system. Kolkata Municipal Authority and New Kolkata Development Authority offer 10% additional FAR for the construction of Gold or higher rated green buildings. The Housing and Urban Planning Department in Uttar Pradesh and the Greater Noida Industrial Development Authority offer 5% additional FAR for green building development.

- b) Fast track environmental clearance for green building projects. The Ministry of Environment, Forests and Climate Change has a policy to fast-track environmental clearance permission for GRIHA pre-certified projects.
- c) Financial assistance at concessional rates from Small Industries Development Bank of India (SIDBI) for green rating buildings. The government of Andhra Pradesh offers 25% subsidy of total fixed capital investment of the project (excluding cost of land, land development, preliminary and preoperative expenses and consultancy fees) for buildings which obtain a green rating from IGBC. This incentive is applicable for micro, small and medium enterprises (MSME) and large industries.
- d) Reimbursement of certification and consultation fee
- e) Refinance at competitive interest rate
- f) Reduction in one time building tax, reduction in stamp duty and property tax.

The National Housing Bank (NHB) as an apex institute for refinance offers 100 basis points concession for loans under Green Housing. Notably, in partnership with European Union, it launched SUNREF (Sustainable Use of Natural Resources and Energy Facility) Green Housing India Programme in the Residential Sector in August 2017. The Government of India (GoI) also issued guidelines for Sovereign Green Bonds in the Union Budget 2022-23. These bonds will be issued for mobilizing resources for green infrastructure in the country<sup>1</sup>. The facilitation center of BEE compiled a compendium of financing schemes offered by financial institutes such as SIDBI, IREDA, AXIS Bank, Bank of Maharashtra, Bank of Baroda, etc., for energy efficiency and renewable energy projects<sup>2</sup>.

Along with enhancing the stock of green buildings, there are steps taken to build regulatory capacity to enable certification of green buildings. Institutions such as Leadership in Energy and Environmental Design – LEED (US Green Building Council), Green Rating for Integrated Rating Assessment – GRIHA, Indian Green Building Council – IGBC (earlier LEED India), as well as WELL and EDGE rating systems, and regulations such as Energy Conservation Building Codes (ECBC) along with BEE Star rating awards have evolved.

The most widely used rating system in the world is the US “Leadership in Energy and Environmental Design” (LEED) system. In India, the IGBC have adapted LEED to create LEED India and later IGBC ratings and is responsible for certifying buildings under this system. India has five green rating systems for buildings, namely: LEED, IGBC, GRIHA, EDGE, BEE and WELL. While LEED/IGBC and GRIHA have strong presence in the Indian market, EDGE and WELL systems are only slowly catching up.

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<sup>1</sup> chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://dea.gov.in/sites/default/files/Framework%20for%20Sovereign%20Green%20Bonds.pdf

<sup>2</sup> chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.adeetie.beeindia.gov.in/uploads/upcoming-trainings-pdf/1f7e70e3ba7c133d040790c390aad8bb.pdf

## 10. Conclusion

The research examined the cost, affordability and financing strategies for green residential buildings in Indian cities.

Calculations suggest that cost of green housing unit is higher than conventional residential buildings by approximately 3.5-4%.

Housing affordability is low and only HMIG and HIG households can afford a median house in India. Rise in cost due to green attributes would further strain affordability.

Builders anticipate a rise in cost of green buildings and opine that a favourable financial market that recognises low risk of green buildings in future could offer loans at lower interest rate.

Lenders do have provisions for discount on interest rates for housing loans and construction loans for green buildings as evinced in the findings of the Lender's survey. However, additional verification by other surveys as mentioned in this study suggest that rarely do the households are able to avail of these discounts. Corrective measures such as regulatory strictures may help in this regard.

Some more suggested policies are listed below:

Programs such as PMAY should offer subsidy for green buildings, especially for BPL/ EWS and LIG households.

Stamp duty reduction and higher FAR could be a possible way to offset additional cost to home buyers and developers respectively.

Secondary mortgage market that can develop securities based on pool of green residential loans could attract investors who prefer to invest in green bonds. This would reduce the cost of capital for lenders.

Lenders may also avail of green deposits as some banks have taken recourse to that may reduce the cost of capital.

Since the future regulatory risks are lower for green residential buildings, the lending institutes may be able to charge less risk premium on loans or even be able to provide discounts on interest rate based on reduced risk premium.

Regulations requiring green features in building construction and home appliances could steer households and developers to adopt green aspects in residential properties.

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## Appendix

**Table 1. Key assumptions of the costing model**

<b>Assumptions</b>	<b>Conventional</b>	<b>Green</b>
Number of days in a year	365	365
Number of months in a year	12	12
Electricity consumption per person per month (KWH)	75	26.25
Electricity tariff per kwh (INR)	10	10
Number of persons in household	4	4
Water consumption per person per day(litre)	40	20
Water charges per litre (Rs)	0.5	0.5
Maintenance cost per month	500	1000
CapEx per year	0	10000
Construction cost psm (INR)	18500	20716.113
Size of house (sqm)	60	60
Size of land (sqm)	70	70
Land cost psm (INR)	20000	20000
Solar panel rating (kwh)	0	1
Solar panel unit cost (INR)	0	16000
Rainwater harvesting unit cost(INR)	0	25000
Interest rate	9%	9%
Discount on interest rate	0.50%	0
Discount rate	5%	0.05
Loan to value ratio	100%	100%
Loan term in months	300.00	300
CPI Growth	5%	5%