



The State of Sustainability in the Built Environment

————— The India Edition —————

Preface

Sustainability in the built environment is a constantly evolving concept, and has been increasingly embraced by the industry. Across the globe, significant research studies have been conducted, assisted navigation and adaption of new standards and protocols. The construction industry is known to contribute significantly to change in the natural environment. Hence, the responsibility that it has towards the environment has always been a concern that has promoted sustainable design over the years. Together with Environmental Design Solutions Pvt. Ltd. (EDS), a sustainability advisory, Gleeds presents this thought paper, the state of sustainability in the built environment in India.

Through a market survey of fellow professionals in the last quarter of 2020, EDS and Gleeds India have attempted to gather the industry's opinion on the concept of sustainability, awareness of the rating system, its opinion on costs incurred and the benefits it possesses. With the recent impact of COVID-19 and the awareness and push towards occupier safety and hygiene, the results indicated that sustainability concepts are not only widely known but are being readily adopted.

However, there is certainly a myth around high capital costs incurred if a building is to be designed sustainably, which has been reviewed and analysed. The industry has learnt quickly and is now more proactive towards creating a sustainable built environment. It is heartening to see that India has expanded its sustainable footprint quickly over the years nearing 10 billion square feet of assets developed or under construction. Most stakeholders seem to be willing to venture further into the concept of sustainability, accepting not only tangible benefits but also intangible ones.

As part of the evolution of sustainable developments, structuring the rating systems and various organisations responsible for it has played a big part. The efforts of organizations such as USGBC, IGBC, GRIHA, have now brought a deeper understanding of the local issues and are providing rating systems that best suit the Indian conditions. The organizations are also hand-holding project teams during the design period and educating future generations thus promoting the sustainable thought process. These efforts have enabled sustainable construction practices and addressed various aspects right from conception to construction and refurbishments.

In line with the Paris Climate Agreement, sustainable design and its requirements are constantly evolving. Sensitivity towards the health and wellbeing of the occupant of the built environment is now of paramount importance. Optimal energy consumption, water consumption, renewable energy, recycling initiatives and optimising whole life cycle costs have been quite concerning to the Industry. Recent concepts such as Net Zero Carbon, embodied carbon concepts and WELL Building concepts which are promoting a healthy environment for its users are gaining traction.

We write this paper together with a common goal of revamping the idea of sustainability as a construction practice and emphasis on its requirement in creating a built environment that will no longer contribute to adverse effects of the environment such as global warming a result of greenhouse gas emission, contamination of natural resources or its unnecessary consumption. Through our analysis, it has been proven that a small but tangible initial Capex investment would help in optimizing the life cycle costs for the assets and investors/owners would reap the benefits long term. We hope you find this insightful and will join hands in preserving our natural environment.

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Introduction

Sustainability needs no introduction. The ongoing environmental impact of global warming, diminishing natural resources, compromised quality of living keeps the spotlight on sustainability which could bring colossal damage to the world, if ignored.

The international community, through the United Nations (UN), has set into motion a historic plan with Sustainable Development Goals (SDG) development goals (SDG) which aim to bring a more equal, prosperous, and secure

world by the year 2030. These goals were adopted by all United Nations Member States in 2015 as a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030.

The 17 SDGs are integrated—that is, they recognize that action in one area, will affect outcomes in others, and that development must balance social, economic and environmental sustainability.

SDG's

Graphic 1:



Figure adapted from UNDP

SDG's are adopted worldwide including India and each country develops its own goals in the mentioned categories.

India as part of its SDG, aims to develop a qualitative, reliable, sustainable and resilient infrastructure. This includes regional and transborder infrastructure, to support economic development and human wellbeing. There is a renewed focus on affordable and equitable access for all. The increase in the access of small-scale industrial

and other enterprises, aims to upgrade infrastructure and retrofit industries to make them sustainable by 2030, encouraging innovation and increasing the number of research and development workers and public and private research and development spending among many of its other goals.

Construction and sustainability

Major considerations for the construction industry regarding the impact to the natural environment include:

- **Alters the layout of the land:** Clearing vegetation, risk of contaminating surrounding water bodies and disturbing the natural ground water table affect the natural environment.
- **Construction and demolition waste:** A large amount of waste can be produced especially during construction, which may be sent to landfill or could contaminate water supplies, harms the existing environment.
- **Pollution:** Construction contributes up to 30% each into land, air and water pollution and climatic change one way or the other.
- **Excess use of energy and water:** USGBC reports that the construction industry uses about 41% of the total global energy consumption. The use of portable water for construction is a key consideration and the gradual reduction of the water table is a red flag for change.

India has always been proactive in contributing to a sustainable environment and as a society, has historically taken conscious environmental decisions in developments. While most rural communities live in sustainable housing close to nature, tier 1 and tier 2 cities has grown rapidly due to urbanization and sustainability has been a part of development for the last 2 decade.



GODREJ ONE, Mumbai

The role of the construction industry

With the united goal of bettering and preserving the environment, the construction industry's role is important being one of the world's largest industries. In a report by C40 Cities, construction is reported to contribute to 11% of global carbon emissions and sustainable construction solutions are therefore paramount to reduce this impact.

The Environmental Protection Agency (EPA) defines sustainable construction as "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".

Sustainable construction methods look to protecting the natural environment, human and ecological health whilst still driving innovation and not compromising our way of life.

There is an increase in energy reliance which leads to dependency on finite resources such as energy and water. Construction material and increased landfill and buildings operations are the primary energy consumers. This is forcing us to re-think design, factoring in low carbon solutions and optimum use of resources.

Incorporation of sustainable strategies in design, construction, and operation of buildings, or retrofitting buildings to improve on energy consumption and water consumption could be the key to a long term sustainable solution.

LEED, IGBC, Energy star, BREEAM, GRIHA, Green Globe to name a few are green building certifications that are sought after in order to create a sustainable building. These certifications have found traction in the country and there has been a considerable rise in the requirement of sustainable buildings.



The rating systems: An easy guide to sustainable development

Sustainable construction and design protocols are a combination of various components, such as selected material, work methodology, consideration for ambient atmospheric conditions, labour welfare, impact on the surroundings, carbon footprint, recycling existent materials, minimise wastages, optimise energy and water usage and so on.

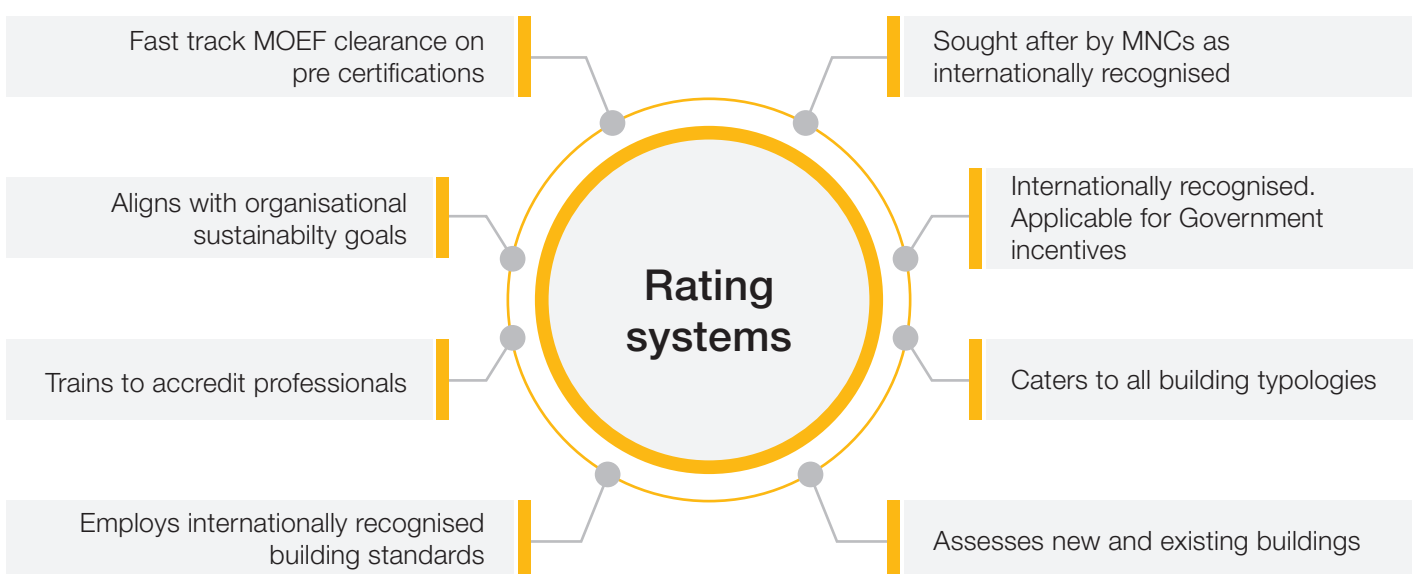
Green building certification systems are a set of rating systems and tools that are used to assess a building or a construction project’s performance from a sustainability and environmental perspective. Such ratings aim to improve the overall quality of buildings and infrastructures, integrate a life cycle approach in its design and construction, and promote the fulfilment of the United Nations Sustainable Development Goals by the construction industry.

What are the rating systems?

The more widely used rating systems in India (known to about a third of the participants in the market survey) for construction are:

- Leadership in Energy and Environmental Design (LEED) was established in 1998 and is managed by the US Green building council (USGBC). Rated as a Silver, Gold or Platinum
- Indian Green Building Council (IGBC) established in 2001 and is managed by the IGBC and Confederation of Indian Industry (CII). Rated as a Silver, Gold or Platinum and,
- Green Rating for Integrated Habitat Assessment (GRIHA) was established in 2007 and is managed by the GRIHA council and is founded by The Energy and Resources Institution (TERI) and endorsed by Ministry of New and Renewable Energy (MNRE). This rating system is applicable mainly in India, Nepal, Bangladesh and Sri-Lanka Star rating, 1, 2, 3, 4, 5 Star

While all three have a common vision to enable a sustainable built environment, factors affecting the selection of the rating system are cost compliance with the company, environmental goals, regulatory incentives amongst others



MOEF - Ministry of Environment and Forest
MNC - Multi-National Company

India's green construction footprint

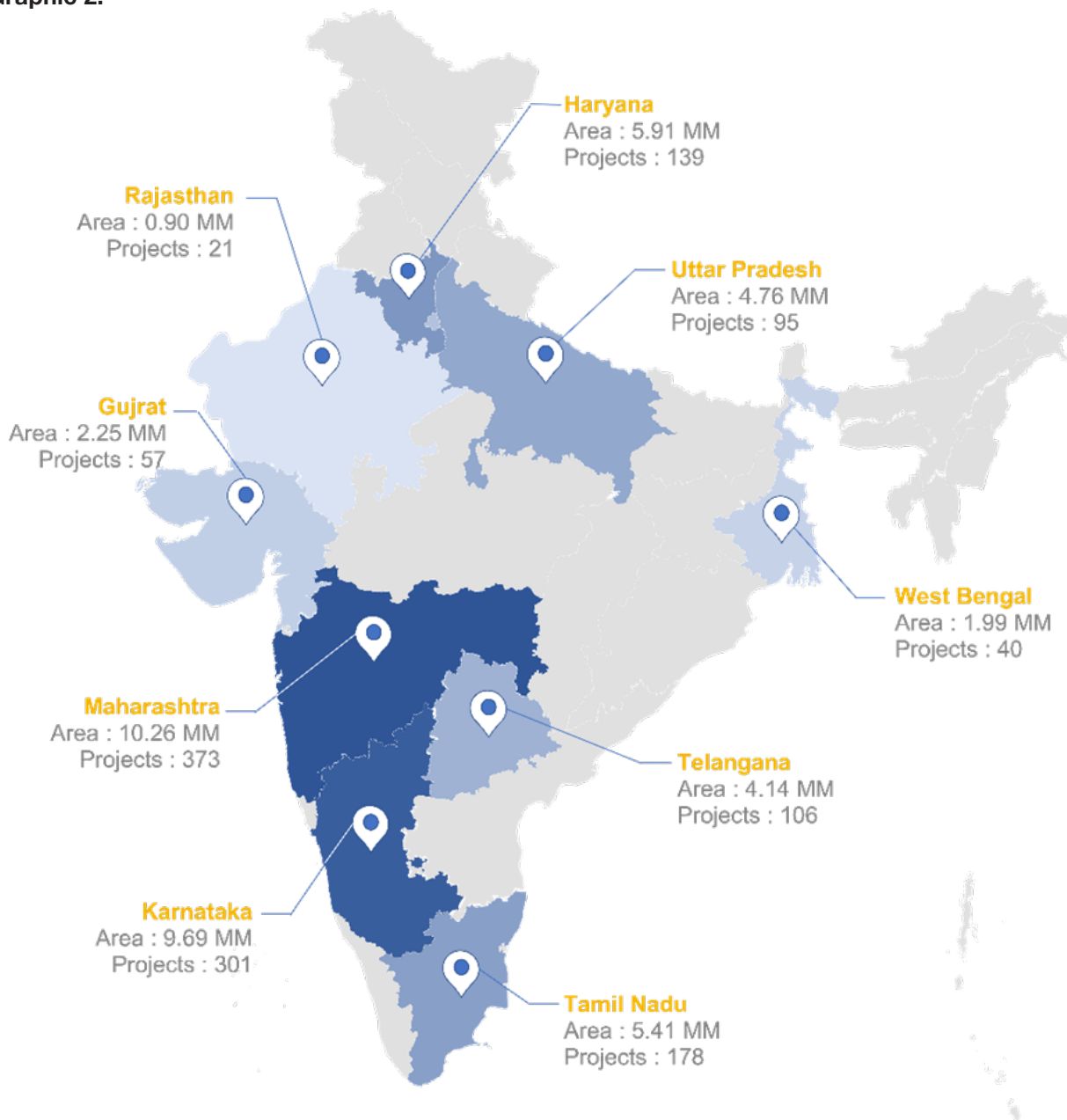
In the world: India is the second in the world after USA in sustainable building construction.

Green building area achieved: 7 billion square feet and still counting.

First green building: The LEED platinum rated Sohrabji Godrej Green Business Centre Building in Hyderabad, in 2004.

Target: 10 billion square feet in the year 2022 set out by IGBC with the Government and its partners.

Graphic 2:



Source: Adapted From ET now (sourced from GBCI, USGBC)

It is inferred that the growth has been quite substantial and there is a good awareness in the market on the concept of green building and the positivity it has to offer. Maharashtra and Karnataka are 2 areas.

Are rating systems a must for a sustainable development?

Green building rating systems are a tool to evaluate the performance of a building and its impact on the environment, however developments which are sensitively designed may not require an accreditation and can still be sustainable.

Design plays a primary role in sustainable construction and operations further down its life cycle. Various design components contribute differently to the sustainability of the building and the environment around it. The key factors of design are to optimise the use of natural resources,

decrease the impact on the environment around either directly or indirectly and maintain the most sustainable aspects of the environment.

Building design strategies as per climatic conditions can be incorporated across site level, building level and building component levels that impact both micro and macro environment. Material specification plays a vital role in overall building performance. Notable material palette for a sustainable development are as follows:

High performance envelope – wall, roof & glazing, optimal glazing, heat reflective paint on terraces or heat reflective paving, Insulation, grass pavers, low VOC paints, water efficient fixtures. Modern technologies when integrated sensibly during design stage can produce a positive impact on environment by using less energy and water. Notable technologies are as follows; high performing HVAC systems, efficient lighting systems – internal & external, drip irrigation systems, rainwater harvesting systems, sewage treatment plants, renewable energy systems, and intelligent systems which further help in overall controlling the resource consumption – sensors, automatic controls, astronomical controls etc

Designers have the technology and modern methods to integrate designs with sophisticated technologies which ensure lower energy consumption, Radiant cooling, geothermal cooling, Solar air conditioning to name a few. Modern and modular construction methods being adapted across the board, also assists in reducing ground level impact and wastage.

Incorporating Sustainable design features right at the design stage not only makes it easier to achieve the Sustainability goals for a project but also make the whole approach cost effective, as the sustainability features become a part of the project and not an afterthought.

VOC - Volatile Organic Compound

HVAC - Heating, Ventilation and Air Conditioning

The Industry's view

Market responses

In the last quarter of 2020, a survey was conducted by Gleeds India and EDS to assess the market outlook of sustainable construction to collect opinions from the construction fraternity about various aspects such as

market status, experience in sustainable construction related projects, various rating systems, capex cost of constructing a green building, return on investment and sustainable related standards.

The results of the survey are tabulated as follows:

General information

1. Survey respondents

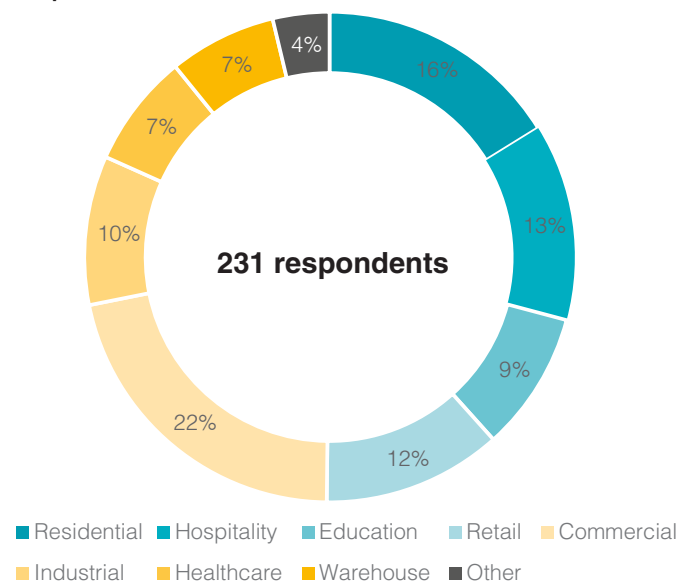
A total of 231 respondents participated in the survey representing all cross sections of the industry pan India. The participant group included various sectors such as Residential, Commercial, Hospitality, Education, Retail, Industrial, Healthcare, Warehouse and Others.

2. Concerns about environmental issues

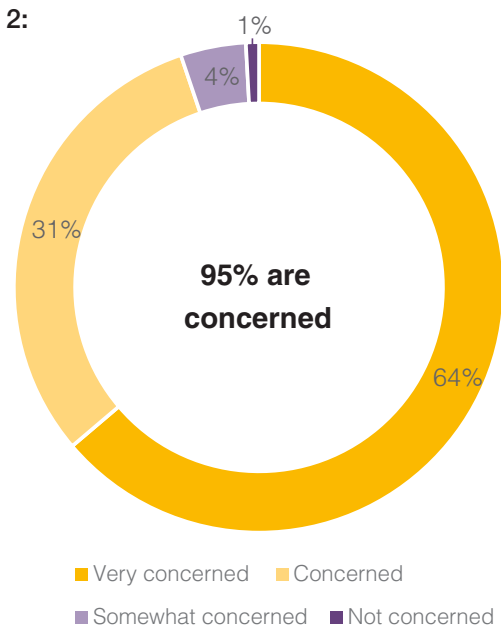
64% of the respondents indicated that they are very concerned on the environmental issues.

The pandemic has brought positive challenges in the construction industry and the industry is perceived to be switching over to sustainable ways of living.

Graph 1:



Graph 2:

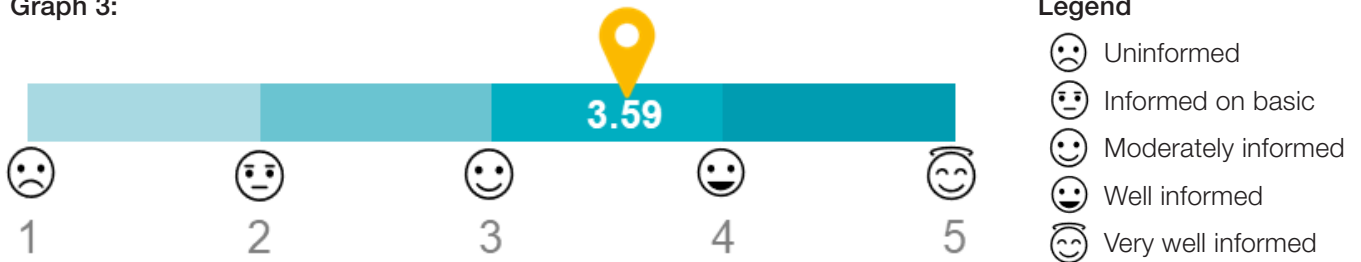


Construction and its impact on the environment

3. The concept of sustainable construction

The respondents were asked how familiar they were with the concept of sustainable construction on a scale of 1-5. The results averaged to 3.59 indicating that the respondents were moderately to well informed.

Graph 3:

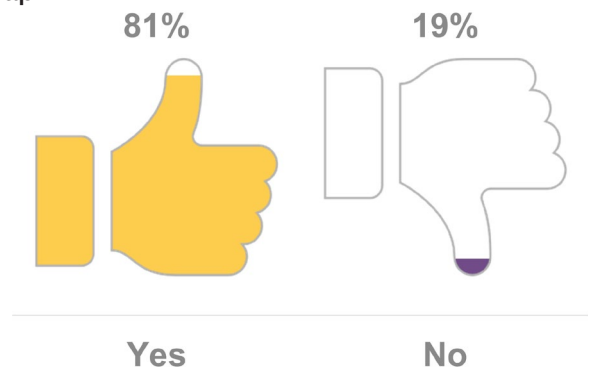


While the respondents were generally aware of the sustainable practice, more outreach by rating organisations and the green building council at grassroots level through universities and colleges would help in upscaling the future work force.

4. Experience working on sustainability-related projects

81% of the respondents confirmed saying they have got the opportunity to work on the sustainable projects and 19% of the respondents are trying their best to get an opportunity to work on the sustainable design projects.

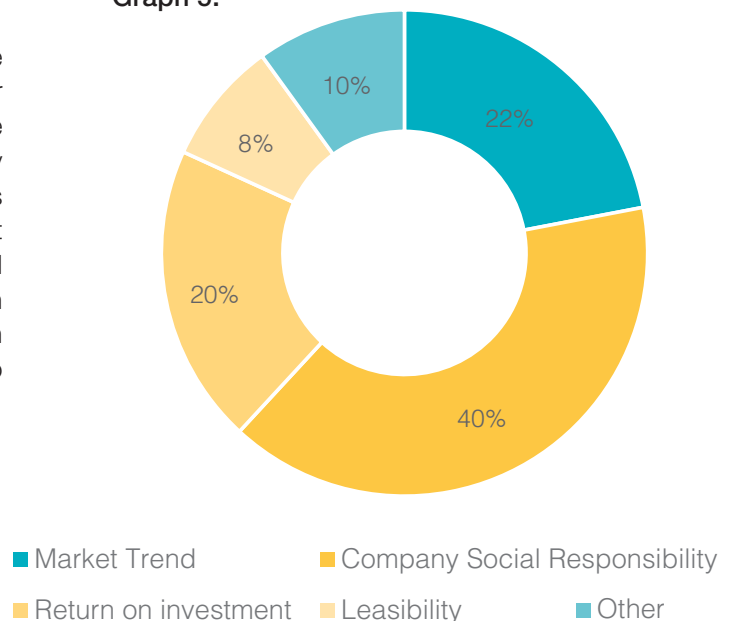
Graph 4:



5. Reason to adopt sustainability

Amongst the 81% that have worked in sustainable construction, when asked what the primary reason for adopting sustainability, 40% of the respondents were seen to work on sustainability as per the company corporate social responsibility, 22% for market trends and around 20% for a return on investment. Again, it would be important for Green Building Councils and rating organization to generate case studies which provides information on return on investment which will push more firms and organization to adapt to the Sustainability agenda.

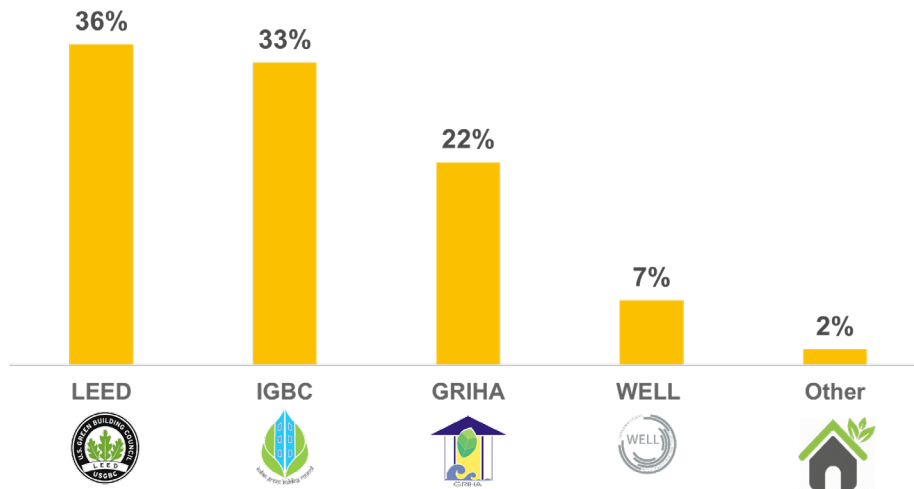
Graph 5:



6. Knowledge of the rating system

The respondents were asked if they have heard of any green building rating systems in India, and 36% were familiar with LEED rating system, 33% IGBC and 22% GRIHA. Therefore, it is inferred that market is generally aware about the rating system, though they may not be aware about the minute differences between various rating systems.

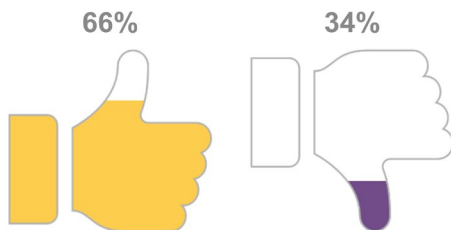
Graph 6:



7. Use of the rating systems in projects

Further, the respondents were asked if they have used any of the above-mentioned rating systems in their projects, 66% of them responded saying they have.

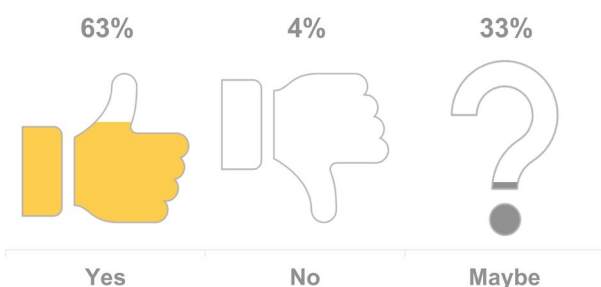
Graph 7:



8. Use of the rating systems in future projects

Amongst the respondents who have not worked on sustainable buildings, 63% were open to consider them for their future projects.

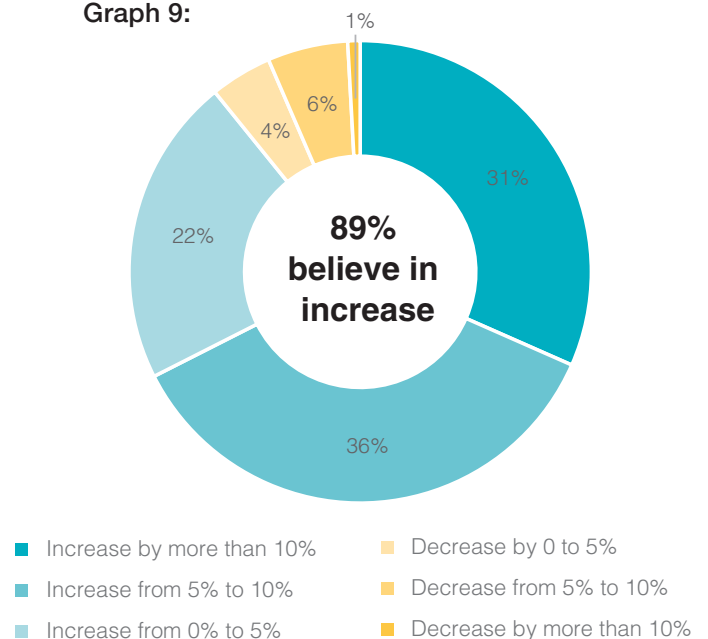
Graph 8:



9. Green building capex cost

The respondents were asked their opinion on the capex cost for constructing a green building. The majority which is about 89% opine that there will be an increase in the capex cost for a green building with 36% who believe in an increase from 5% to 10%. The detailed breakup is as shown in the graph below. Gleeds and EDS believes thought papers about cost differential information would help the stakeholders and industry so more informed decisions can be made.

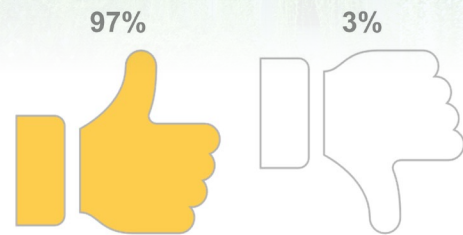
Graph 9:



10. Return on investment

The respondents were asked if sustainable construction is a good return on investment. 97% agree it is. However, it must be noted that there is limited information available for the Indian built environment landscape.

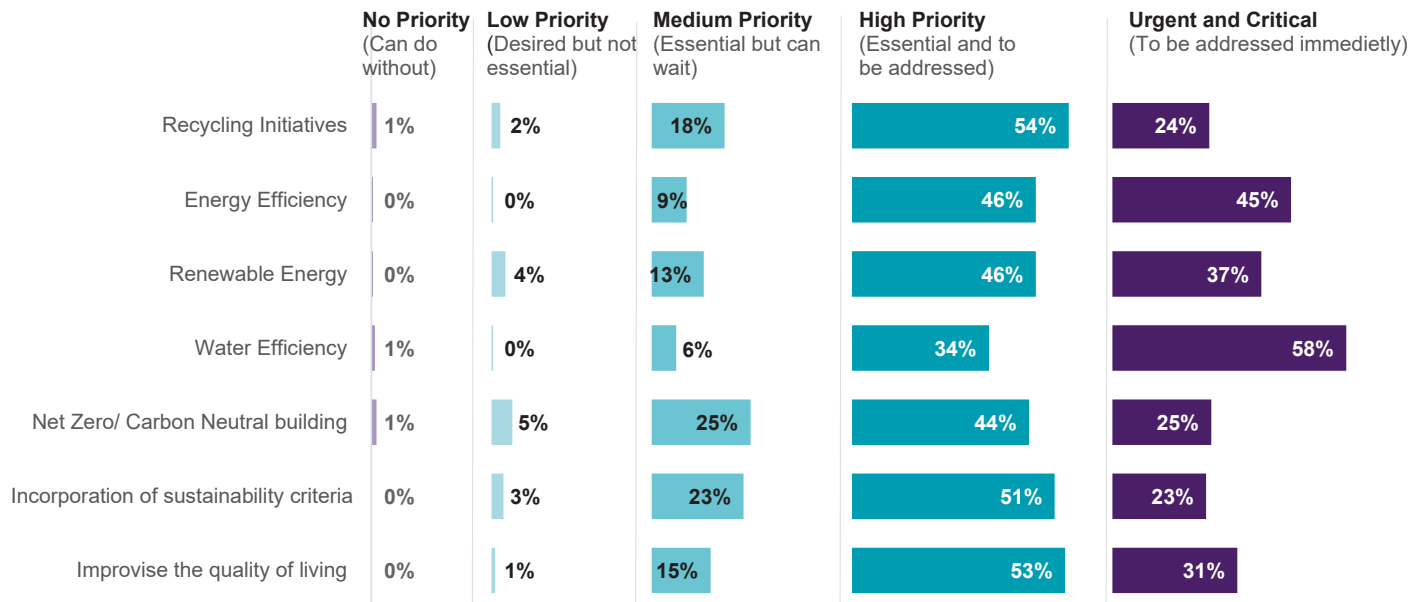
Graph 10:



11. Future Initiatives

The respondents were asked to prioritize on a scale of 1-5 to the following initiatives in the future of construction industry where 1= No Priority, 2= Low priority (Desired but not essential), 3= Medium priority (Essential but can wait), 4= High Priority (Essential and to be addressed), 5= Urgent and critical (To be addressed immediately)

Graph 11:



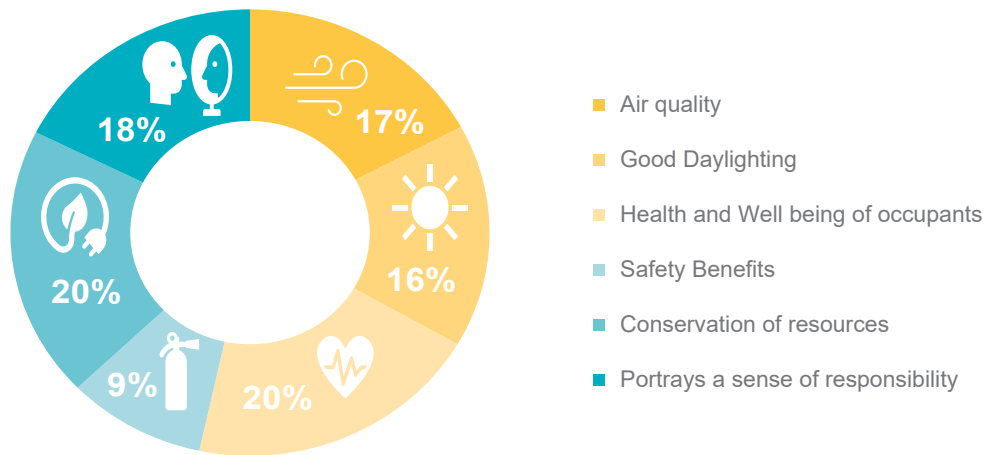
These sustainable initiatives are believed to achieve traction post pandemic.

Water and energy efficiency seem to be the top on the respondents list, which is to be addressed immediately, followed by renewable and improved quality of living. All initiatives are have been inferred to be of high priority.

12. Intangible benefits of a green building

When the respondents were asked about the intangible benefits of a green building, maximum respondents selected health and wellbeing of occupants as an important benefit post COVID-19. The world has collectively learned valuable lessons due to the pandemic and organizations are reprioritizing on the building essentials.

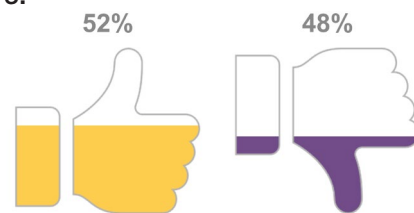
Graph 12:



13. Post COVID-19

When the respondents were asked if COVID-19 had pushed their organizations to look at sustainability in their upcoming projects 52% responses were positive and are believed to be implementing sustainability in their future projects.

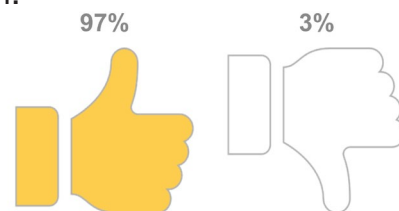
Graph 13:



14. Future designs moving towards high performance, sustainable and healthy building.

A further, 97% of the positive respondents agree that future designs will move towards high performance, sustainable and healthy building.

Graph 14:



The survey indicates that a large portion of the respondents were aware and moving in the path of sustainable solutions for their projects. However, there is the apprehension of increased CapEx costs for implementing sustainable construction, but with a note of encouragement that the majority believe it is a good return of investment. Most respondents seem informed and have prioritised initiatives which can certainly be an indicator for what to address on priority for sustainable construction.

Are green buildings an expensive solution?

Design and costs are the wheels of a bicycle, for the construction of green buildings, and its success depends on how well the two are executed. A good design in optimal costs!

From the market survey, the respondents believe that there is a definite increase in the capex cost for a given project. However, it is known that incorporating sustainability at an early design stage optimizes costs.

For a quick analysis, Gleeds and EDS studied a commercial building in Bengaluru, Karnataka with a built-up area of circa 18,00,000 sqft. The building consists of, four basements, a ground floor and ten top floors. Located in Central Business District, the building fulfils all requirements of a Grade A asset to be considered by corporate tenants. The building features includes efficient envelope – walls, insulation, high performing double glazing, electric car charge points, efficient HVAC and lighting systems, water

efficient fixtures, rainwater harvesting, rainwater harvesting pits, sewage treatments plants, etc. The building design and projected performance meet MOEF requirements of energy efficiency and water conservation.

This building with its original design has been the base for our cost analysis.

A detailed cost estimate ing was prepared carried out based on with base design, with additional design inputs and a further assessment was then made to understand what would be the add-on or extra over base cost when this same building is designed for:

- A green certified Building for LEED Gold/GRIHA 3 Star Rated
- A LEED Platinum/ GRIHA 5 Star Rated
- And a possible Net Zero building

Considerations for the three scenarios

The LEED Gold and GRIHA 3 Star Rated design requires for an additional electric charge points, rainwater storage tanks, an irrigation system to save usage of water, additional water meters to monitor water consumption, solar plant, MERV 13, CO2 sensors to conserve the use of energy, heat reflective paint for terraces for heat control and outdoor air intake monitors for air quality control. With the inclusion of consultancy fees, registration and certification fees, on the additional building requirements, the extra cost incurred on the already existing grade A designed building is 2.3%.

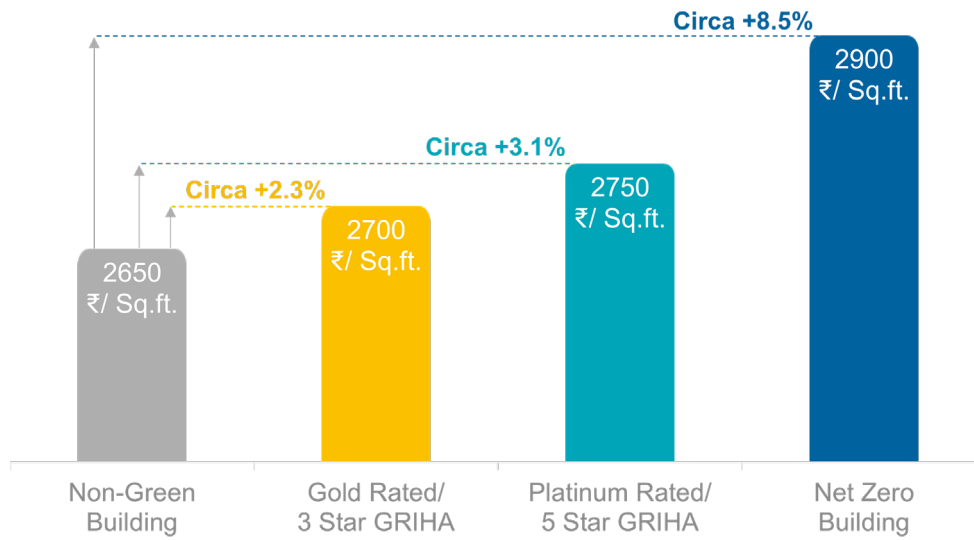
The LEED Platinum and GRIHA 5-Star design called for inclusion of all elements that formed part of the above Gold Rated design with additional high performing high-side HVAC systems i.e. chillers and Air handling Units and a higher capacity solar plant which would reduce the energy consumption of the building. Envelope commissioning for the building is also introduced to track the energy consumption and interior comfort of the building. This results in a 3.1% cost increase from the grade A designed building.

A possible net zero building, all the design elements incorporated for the Gold and Platinum Rated building holds good. In addition to the same a solar plant equivalent to 100% of the project energy requirements was proposed. This results in an 8.5% cost increase from a grade A designed building.

MERV - Minimum efficiency reporting values

The graph below compares the three scenarios.

Graph 15:



*Values rounded to nearest 50

Source: EDS and Gleeds

High CapEx costs, as a result of sustainable design is a proven to be myth. Costs can be optimized if the vision for the building is clearly outlined and sustainable design is incorporated at inception. Key parameters such as daylight optimal uses, environmentally friendly materials, safe

methods of construction, waste management, optimal use of resources such as energy and water and energy efficient building design may increase CapEx cost slightly but will have a positive effect on the environment preservation and may also result in savings in operational costs.



Surat Diamond Bourse, Surat

The aim for the future

Sustainable construction means aiming for better energy efficiency, renewable energy, use of recycled materials, net zero building and increase the quality of living in general. The industry perceives these to be prioritized elements to work with.

Zero waste

Zero waste in India is being adopted by all rating systems. In India, Mahindra World City, Chennai has become one of the first integrated city in India to receive third-party Zero Waste to Landfill (ZWL) certification. Projects that are TRUE platinum certified and LEED certified are allowed a waive off their zero waste certification fees, encouraging this aspect of achieving zero waste.

To achieve zero waste the four R's are the key, reduce, reuse, recycle and refuse.

Net zero

Net zero is an upcoming focus area in Indian developers and occupiers, whose first net zero building which was developed in India is the Indira Paryavaran Bhavan, a building under the Central Government. Net zero promotes the use of renewable energy and the energy efficiency of the building, making it self-reliant and self-sufficient for its energy and lighting needs, disallowing wasted energy and harmful environmental impact in the long run.

As per the Bureau of Energy Efficiency, Net Zero-Energy Building (NZEB) is defined as a building whose Energy Performance Index (EPI) is less than 15 kwh/m²/year.

Embodied carbon

Embodied carbon is the carbon dioxide (CO₂) or greenhouse gas (GHG) emissions associated with the manufacture and use of a product or service. For construction products, this means the CO₂ or GHG emission associated with extraction, manufacturing, transporting, installing, maintaining, and disposing of construction materials and products. Embodied carbon is gaining increasing attention from both industry and government where it is now recognised that embodied carbon emissions make up a large fraction of the emissions from the construction sector. Embodied carbon on release into the atmosphere

One of the key requirements is the provision of land for the dumping of waste after strict and clear waste segregation. Waste management technology is largely imported and not suited for the local conditions. Affordable solutions and customized solutions are the key requirement to address the localized landfill and waste dumping problems. While necessary equipment addresses the removal, strong policies are required for actioning this problem. The central and state Governments are required to introduce such policies to allow a systematic and clear plan of action to address this requirement.

These buildings generate as much clean, renewable electricity as they consume, thus lending a net-zero annual energy impact achieved by assimilating environmentally maintainable aspects like rooftop solar panels that can collect rainwater to condense the usage of treated water, battery storage, solar water heating, electric vehicle charging stations, geothermal heating, wind turbines, heat recovery systems, energy efficient LED lighting and airtight insulation to curb the dependency and usage of the HVAC system. These technologies can be used to attain a net-zero status. In some of the projects, it may not be feasible to generate the energy on site, so required shortfall would need to come from off the grid solutions.

cannot be reversed and its adverse effect thereon is a consequence on must face. Realisation on the importance of this factor, therefore, is now becoming more and more relevant and most companies are coming to assess its effect globally.

Reducing the carbon footprint does not really affect capital costs and more often would only require the reassessment of the supply chain. Many tools are out in market based on various global data which aide in the assessment of embodied carbon which might prove helpful to many companies that seek this assessment.

Sustainability evolves

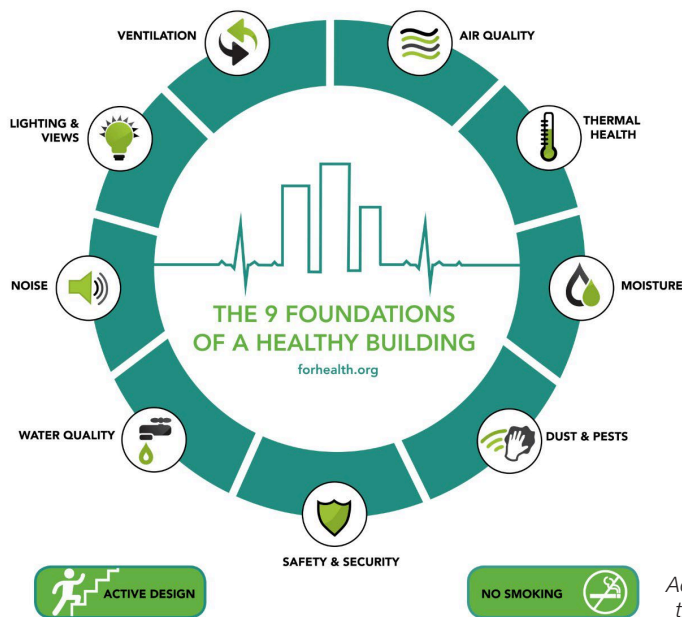
Sustainability has been on the agenda for a long while and there is a fairly good understanding of its benefits for the environment from conception to build has been the main focus. However, the health of the building throughout its

life cycle, reflects on the wellbeing of the person residing or being part of the building process. This has become more evident in the past few years and is being considered more prominently now.

Healthy buildings

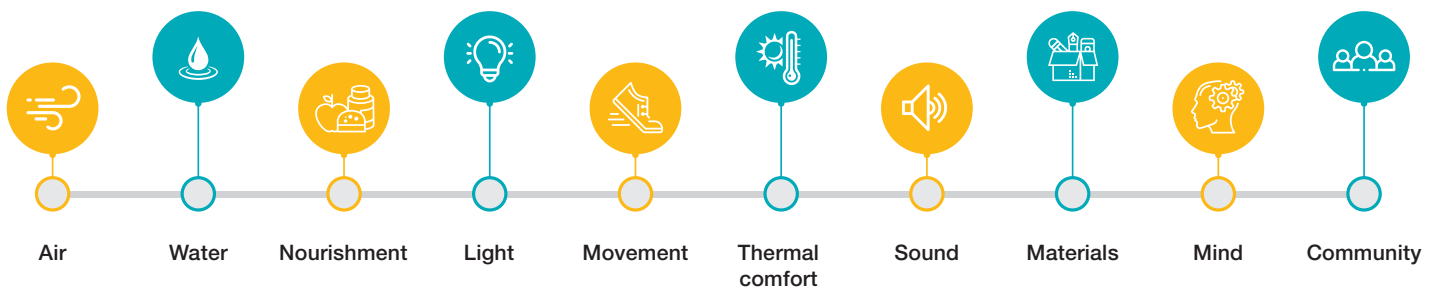
Healthy buildings are primarily buildings that are designed to consider the health and wellbeing of the people who reside in it. The nine foundations for a healthy building as per the experts from Healthy Buildings Program at the Harvard T.H. Chan School of Public Health are as demonstrated below. In a nutshell it describes the key components

that constitute majorly to the health of a person and the elements that they are exposed to, which influence highly on the productivity of a person. This practice is known as biophilic design, which “seeks to connect our inherent need to affiliate with nature in the modern built environment.”



Adapted from the Healthy Buildings Program at the Harvard T.H. Chan School of Public Health

In the certifying of healthy buildings 10 concepts are generally considered as listed below.



India is on the way to adopting healthy buildings. This concept is becoming more popular with global when a person’s productivity and efficiency enhancement as a consequence of a healthy building is brought to the forefront. The COVID-19 situation has also accelerated this concept and awareness of this concept is growing.

Conclusion

Sustainability concepts have been improving as the world understands the effects of the built environment on the human race. With the United Nations leading the way to set the emissions target, governments along with several global multinational firms have declared ambitious sustainability goals towards preserving the planet and leave a better legacy for future generations.

Historically, India always had design thought processes that embraced progressive sustainability thinking through 'Vastu' and traditional architecture. However, a newer and deeper understanding of the impacts of sustainability criteria on the built environment is helping in creating stronger zeal to make a real difference. Exploration of new materials, technologies, adaption to the changes in the natural environment, reduced carbon footprint, planning and procurement methods which has a less environmental impact, will go a long way in creating a sustainable built environment and will translate actions into visible results from all stakeholders.

Most progressive owners and developers clearly understand the benefits of sustainability. With a small premium initially in capital costs, there are substantial tangible and intangible benefits such as operational cost optimisation efficiency in the system, an increase of workforce productivity, and improved wellbeing of occupants/users which are now being widely adopted worldwide. Early design adaptation incurs less Capex with very fruitful and demonstrable results.

Invariably, the construction industry has to press onward in creating a larger green footprint, saving natural resources and creating a healthy building translating to the health and wellbeing of its occupants. There is also a need to make project stakeholders completely aware of the benefits of sustainable development. The benefits and understanding must to be explained to top management executives and percolate down till the site execution team ensuring complete onboarding of the processes.

Core elements of waste management, use of environmentally friendly materials, safe construction practices, occupant health and well-being are still evolving however it is important that goals for the proposed developments are established well, much earlier on in the project life cycle and all stakeholders are well informed and aligned to have the common goal of producing an environmental as well as a healthy product.

Apart from the efforts of project owners and design team members, it would be beneficial if the sustainability and green building professionals can take additional steps to reduce the myth of excessive cost premiums in general and increase awareness.

As per this joint study, the rate of return for the nominal CapEx cost increase to achieve better sustainability scores is achievable and with long-term benefits and analysis, it would be easier to buy-in stakeholder confidence across the board for asset management and life cycle cost approach.

Pandemics such as the COVID-19 has only hastened the sensitivity towards environment pushing project stakeholders and decision-makers to rethink their strategies and approach on how best to adapt to changing needs of mankind. As seen previously, if one looks at the whole life costs of the building, only 20% of costs are towards CapEx while 80% of the costs occur during the operational period. Advances in building materials, instrumentation, and control, IoT devices, real-time sustainable building performance data being made accessible through digital twin models, allows quick decisions and will only further optimise operational costs.

With sustainability, construction processes also evolve to adapt to the needs of the environment with the sole vision to preserve the course of nature.

References:

[GRIHA | Green Rating for Integrated Habitat Assessment \(griha.org\)](https://griha.org/)

[U.S. Green Building Council \(usgbc.org\)](https://www.usgbc.org/)

[IGBC - Smart Cities & Green Building Concept in India](#)

[India aims green buildings footprint - The Hindu BusinessLine](#)

[Definitions - NZEB](#)

[Embodied Carbon](#)

[Construction Waste Management](#)

About EDS



Environmental Design Solutions Pvt. Ltd. [EDS] is a sustainability advisory firm focusing on the built environment. Since its inception in 2002, EDS has worked on over 500 green building and energy efficiency projects worldwide. The diverse milieu of its team of experts converges on:

- Climate change mitigation policies,
- Energy efficient building design,
- Building code development,
- Energy efficiency policy development,
- ESG compliance,
- Energy simulation,
- Building commissioning,
- Green building certification and
- Healthy building certification.

EDS has extensive experience in providing sustainable solutions at both, the macro level of policy advisory and planning, as well as a micro level of developing standards and labeling for products and appliances. The scope of EDS projects ranges from international and national level policy and code formulation to building-level integration of energy-efficiency parameters. EDS team has worked on developing the Energy Conservation Building Code [ECBC] in India and supporting several other international building energy code development, training, impact assessment, and implementation. EDS has the experience of data collection & analysis, benchmarking, energy savings analysis, GHG impact assessment, and developing large scale implementation programs.

EDS' work supports the global endeavor towards a sustainable environment primarily through the following broad categories:

➤ **Sustainable Solutions for the Built Environment:**

Green building certification - LEED, GRIHA, IGBC, Health building certification - WELL, FITWEL, IGBC, energy simulation, design assistance, thermal & air flow simulation, third party reviewer for USGBC, Indian Green Building Council [IGBC] and Green Rating for Integrated Habitat Assessment [GRIHA] projects, Audit & commissioning, Air and Water Quality testing and compliance with WELL and IGBC requirements, ESG compliance.

➤ **Strategy Consultancy for Policy & Codes, and Research:**

Policy Design Advisory and Codes, Manuals and Publications, Market Research, Product Research, Program management and Implementation, Manuals and Publications, Sustainability Advisory, Standards and Labeling.

➤ **Outreach, Communication and Training:** Training, Software Development



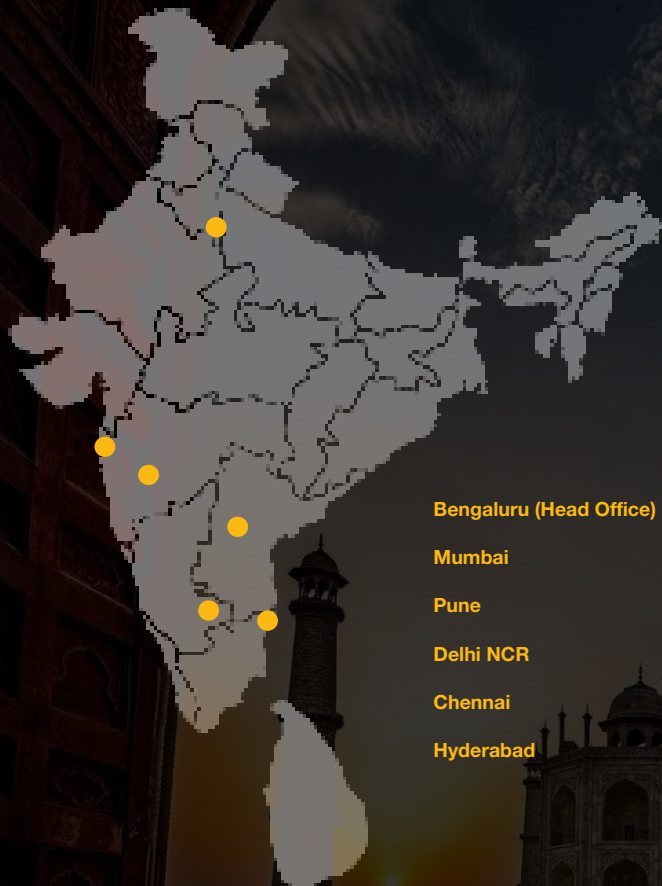
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Gleeds operates a partnering principle with clients and project teams, offering impartial advice across an extensive range of services to provide solutions for every stage of the property life-cycle.

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India overview



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For more information please visit www.edsglobal.com or write to **Gleeds India Insight and Analytics** at insights@gleeds.in for any further queries:

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