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PRELUDE TO:

IIFL Home Loans' Guide to Sustainable Affordable Housing





We know that homes that are designed and built to be comfortable and healthy and cause minimal harm to the environment will be good for the residents and good for society at large. We call these homes 'GREEN HOMES'. What improvements to our usual ways of designing and buildings can we bring to make them Green, and how do we implement them sustainably and affordably? With India in the throes of intense construction to facilitate economic growth and rising urbanisation, it becomes pertinent, rather urgent, to disseminate knowledge that can ensure responsible and sustainable build out in the coming years. IIFL Home Finance Limited (IIFL HFL) and noted architect Dr Ashok B Lall came together to create a handbook — Building Green; IIFL Home Loans' Guide to Sustainable Affordable Housing — to provide guidance.

This handbook will be useful for developers, architects, construction engineers and homeowners. It helps home owners understand the technical aspects of GREEN HOMES. Architects and construction engineers get practical tips on various aspects of design and construction to achieve the desired green rating. With this guidance the developer's task in building green homes is made simpler — the Handbook provides a simple way for all those in charge of the processes of design and construction to have a common and clear understanding of goals and methods.

As professionals, we have a dual responsibility. We must serve, in the best possible way, the legitimate need of our client. Equally, we must see that the means and ends of the building design solutions we propose, also serve a larger beneficial purpose. We believe that the creative practice of architecture would seek to converge this duality into a unity.

Ashok B.Lall

At IIFL HFL, we wish to redefine the industry and act as a catalyst to fulfill the dream of Indians to earn a home across society spectrum. While working towards this goal, we wish to contribute to maximize sustainable development in affordable housing segment. We shall continue to remain nimble and contemporary to technology for achieving this.

Monu Ratra



SUSTAINABLE HOUSING

Indian and Global Perspectives



Global Concerns

Globally, the buildings and construction sector accounted for 36% of final energy use and 39% of energy and process-related carbon dioxide (CO₂) emissions in 2018.¹ While strides are being made towards sustainable buildings and construction, they are still not able to keep up with the ever-growing buildings sector and rising demand for energy services. Buildings are a major consumer of global natural resources, and the largest energy consumers and greenhouse gas emitters in both, developed and developing countries. With climate change and its consequences already showing, it is time that the world shifted its attention to counter-actions and solutions.



Green Building Movement

The green building movement began in the 70s as researchers sought energy-efficient systems in the face of rising oil prices. In 1987, the UN World Commission on Environment and Development set the definition of 'Sustainable Development', leading to Green Building Principles of today. Soon, green rating systems started coming up in leading economies and then spread globally, with countries mandating efficiency metrics in new building stock. Today, many countries not only have elaborate building codes but also deploy stringent enforcement mechanisms to ensure compliance and effective savings.



Green Buildings in India

Buildings in India use up 40% of all energy, 30% of all raw materials and 20% of all land use and thereby generate 40% of all carbon emissions, 30% of all solid waste and 20% of all water effluents.² Apart from being poorly regulated, the building construction industry gobbles up natural resources. With almost 70% of the building stock yet to be completed, the country needs to expedite the adoption of environment friendly practices.



The Affordable Housing Challenge is Being Guided by the Following Four SDGs

1. "2019 Global Status Report for Buildings and Construction" prepared by the International Energy Agency (IEA) for the Global Alliance for Buildings and Construction (GlobalABC).
2. www.cseindia.org/latest-report-of-the-centre-for-science-and-environment-buildings-earthscrappers-environment-impact-assessment-of-buildings-3585

Understanding the Rating System

Green Buildings are structures that ensure efficient use of natural resources like building materials, water, energy and other resources with appropriate management of waste. India has evolved a few excellent green building rating systems, that if followed, not only ensure sustainable construction, but open up an ecosystem of incentives, concessions and support to builders and benefits to users. The focus of this handbook will be to help understand three such rating systems:



IGBC
Green homes for
Affordable Housing



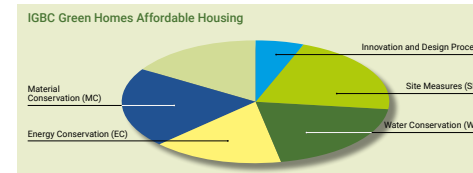
GRIHA
for Affordable Housing



EDGE
for Homes

The threshold criteria for certification/pre-certification levels are as under:

Certification Level	Multiple Units	Recognition
Certified	38 - 44	Best Practices
Silver	45 - 51	Outstanding Performance
Gold	52 - 59	National Excellence
Platinum	60 - 66	World Class




3.4 GRIHA
Green Rating for Integrated Habitat Assessment (GRIHA) is India's own rating system jointly developed by TERI and the Ministry of New and Renewable Energy, Government of India. It is a green building design evaluation system where buildings are rated in a three-tier process. The process initiates with the online submission of documents as per the prescribed criteria followed by on site visit and evaluation of the building by a team of professionals and experts from GRIHA Secretariat.

The GRIHA V 2015 rating system consists of 31 criteria categorized under various sections such as Site Planning, Construction Management, Occupant Comfort and Wellbeing, Sustainable Building Materials, Performance Monitoring and Validation, and Innovation. GRIHA is a performance-oriented 100 point system consisting of some mandatory core points, and some optional points. Different levels of certification (one star to five stars) are awarded based on the number of points earned.

3.5 GRIHA for Affordable Housing
GRIHA has developed a new rating variant called "GRIHA for Affordable Housing" (GRIHA AH) which enables low-income households to reduce operational costs and GHG emissions by improving resource efficiency. The rating evaluates the environmental performance of residences holistically over its entire life cycle. The rating is a dedicated assessment cum rating tool with a pre-fed calculator based system and thus provides a definitive standard for "green building".

GRIHA AH is a 100 point rating system consisting of 30 criteria categorized under six sections - Site Planning, Energy & Occupant Comfort, Water Savings, Waste Management, Sustainable Building Materials, and Social Aspects. Different levels of certification (one star to five stars) are awarded based on the number of points earned. The minimum points required for certification is 25.

Rating Threshold	Griha for Affordable Housing Rating
25-40	★
41-55	★★
56-70	★★★
71-85	★★★★
86 and above	★★★★★



3.6 EDGE for Homes
EDGE is a software application, a global standard, and a green building certification system for more than 130 countries. EDGE offers a set of technical measures that when selected will reduce a building's operational and embodied energy and water use. Only a handful of measures are required for better building performance that result in lower utility costs, extended equipment service life, and less pressure on natural resources. To comply with the EDGE standard a building must achieve a 20% reduction in all three areas when compared to a local benchmark.

Through the use of an online calculation software where the location, type, use and size, and construction materials as well as the water systems are entered EDGE will calculate the savings in water, energy and CO2 emissions as the project progresses.

3.7 Comparison between IGBC Green Homes, GRIHA for Affordable Housing and EDGE for Home
The graph demonstrates the distribution of credits/points of various parameters under IGBC and GRIHA rating systems and their associated incremental cost impacts. For detailed understanding of the respective rating systems, Annexure 1, 2 and 3 may be referred.

EDGE, being an online analysis based software, integrates combined effects of multiple parameters on the project's performance and therefore cannot be tabulated based on individual point based system.

Efficient design can enable the developer to achieve a reasonable rating with negligible / minimal incremental cost.

BEST PRACTICES FOR BUILDING PLANS AND ORIENTATION

Influencing Thermal Comfort

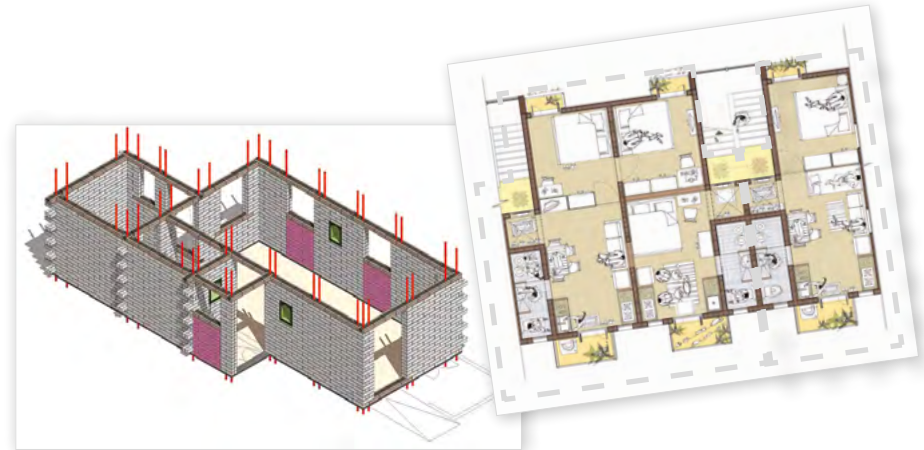
Orientation is the positioning of a building in relation to seasonal variations in the sun's path as well as prevailing wind patterns. Good orientation can increase the energy efficiency of your home, making it more comfortable to live in and cheaper to run. Good orientation, combined with other energy efficiency features, can reduce or even eliminate the need for auxiliary heating and cooling, resulting in lower energy bills, reduced greenhouse gas emissions and improved comfort.

- ◆ Optimizing Soft Ground and Hard Paved Surfaces, Minimizing UHI
- ◆ Efficient Use of Plot area for Environmental Benefit
- ◆ The Economic and Environmental Implications of Building Tall



Building Envelope

Building envelope is the physical separator between the conditioned and unconditioned environment of a building including the resistance to air, water, heat, light, and noise transfer. The building envelope of a usual residential building consists of its roof, sub floor, exterior doors, windows and exterior walls.



- ♦ Minimizing Envelope Heat Gains by Optimizing the Perimeter Wall-to-floor Area Ratio
- ♦ Shading Device (Windows/Balconies)

Water Efficiency

The cost of water in today's world is far lesser than the price of water. Due to lack of adequate management of existing water resources and increased levels of water pollution, access to fresh water continues to be a source of worry in many areas of the world (including India). Water efficiency strategies in green building practices have become paramount to both new and existing construction efforts. Considering water efficiency in Green Buildings, today several technologies are being used including rainwater harvesting, recycling and reuse of grey water, low-flow fixtures, sensors etc. Water efficiency measures in residential and commercial buildings can greatly reduce water waste, yielding lower sewage volumes, reduced energy use, and bring in financial benefits too.

- ◆ Water Resource Planning
- ◆ Strategy for Storage Tank Sizing
- ◆ Raw Water Treatment Systems
- ◆ Water Distribution Management
- ◆ Water Use Optimization
- ◆ Planning and Design of Waste Water Treatment System
- ◆ Typical Water Balance Chart

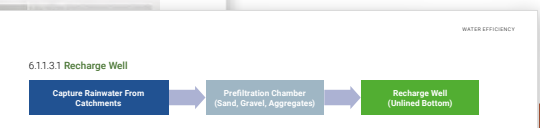
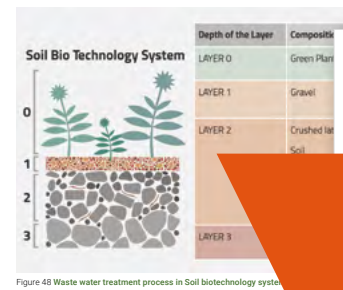
IIFL HOME LOANS' GUIDE TO SUSTAINABLE AFFORDABLE HOUSING

C. Soil Biotechnology (SBT)

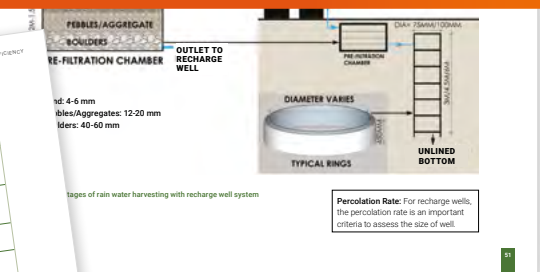
1. Very low energy use intensity due to high natural oxygen transfer in process. (0.06 kWh/KL sewage).
2. Very low space intensity of 0.8-1.0 sqm/KL per day sewage.
3. An engineered evergreen natural process with no moving parts except for pumps.
4. No sludge due to ecology at work.
5. Very high bacteria, BOD, COD, suspended solids, colour, odour, ammonia removal.
6. Practically maintenance free.



Figure 49 Soil biotechnology plant | Image source Prof H.S.Shankar, IIT Bombay



DETAILED DIAGRAMS



6.1.6.4 O&M Requirements of Wastewater Systems

Table 16 O&M Requirements of Waste Water Systems

Technology	Key O&M activities
DEWATS™	<ul style="list-style-type: none"> • Weeding, removal of dead leaf litter and other litter, once in three months • Desludging of the settler, anaerobic baffled reactor, once a year • Cleaning of filter materials at Anaerobic Filter, Planted Gravel Filter once in three years
SBT	<ul style="list-style-type: none"> • Cleaning of pipes • Scraping of the top surface to remove the settled suspended particles • Microbial culture is tested and recommended to be changed every 8-10 years
Phytolid	<ul style="list-style-type: none"> • Plants need to be harvested periodically • Upper layer of media in the inlet zone requires scraping or replacement periodically
SBR	<ul style="list-style-type: none"> • Operating valves and switches for pumps • Regular desludging of solids and monitoring recirculation to maintain MLSS • Disposing sludge regularly • Maintaining pumps/motors
MBBR	<ul style="list-style-type: none"> • Requires membrane replacement approximately every 3 years • Requires higher skill level for maintenance, due to more complex system setup

6.2 Typical Water Balance Chart

Figure 52 Typical water balance chart

Waste Management and Disposal

Waste Water Management

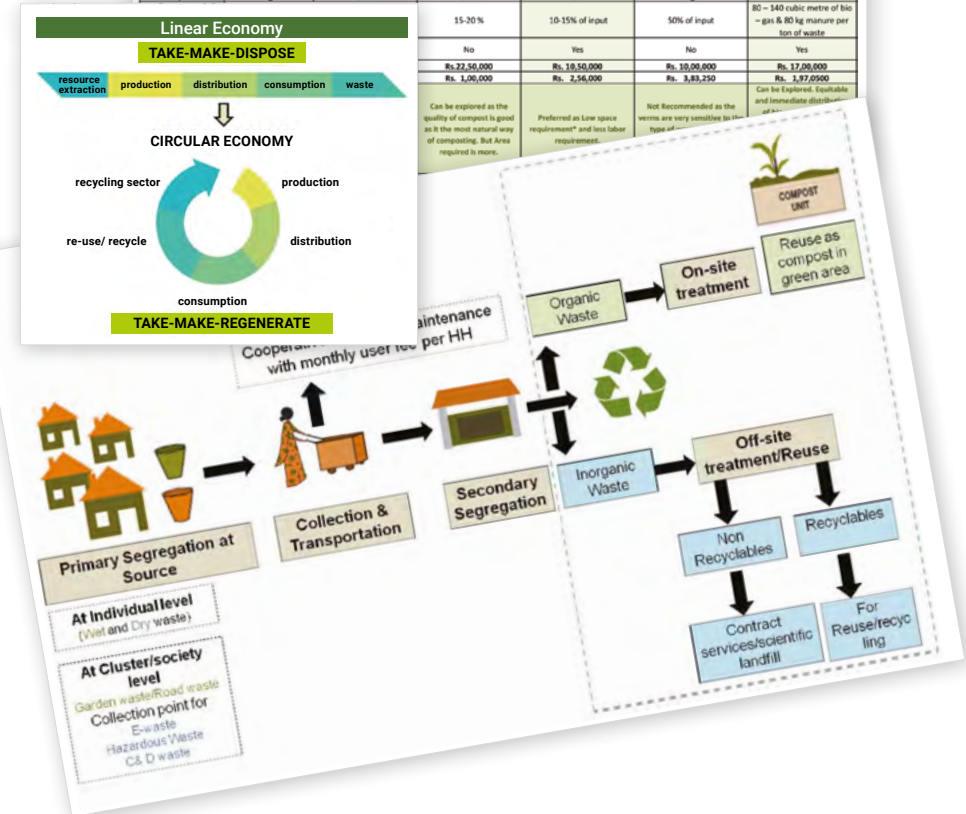
Wastewater is any water that requires cleaning after its most recent use. This includes water that has been used by humans for household and industrial purposes as well as rainwater that may have accumulated pollutants on its way to the rivers and oceans. Wastewater treatment is the process of cleaning and protecting water and to convert it into an effluent that can be reused or returned to the water cycle with minimal environmental issues.

Solid Waste Management

Solid-waste management refers to the process of collecting, treating, and disposing of solid material that has been discarded by people. Improper disposal of municipal solid waste can create unsanitary conditions, and may lead to pollution and outbreaks of vector-borne disease. The task of modern solid-waste management is to not only manage proper disposal mechanisms but to introduce interventions and behaviour changes that reduce the waste itself through recycling and reuse. Solid waste management pose complex technical challenges as well as a variety of administrative, economic, and social problems that must be managed and solved.

- ♦ Waste Management During Construction
- ♦ Reusability/Recyclable Materials
- ♦ Segregation of Waste and On-Site Consumption of Recycled Organic Waste

Decision metrics	Decentralized			Centralised		
	Gambia, Khamba	Leaves-in-pots	Mamhan/Tumbrls	Batch Type CWC	Vermi-composting	Biogas
Illustration/Photo						
Process description	An aerobic composting process where microbes (bacteria and fungi) in the presence of free oxygen convert bio-degradable waste to compost.			Continuous decomposition of waste in the CWC with the aid of culture / saw and temperature control	Natural composting process aided worms and by culture addition	Anaerobic digestion and decomposition of organic material by micro organisms
Applicable at	Per household	At Building Level	At building or cluster level	At cluster level	At building or cluster level	At Cluster level
Waste-mature conversion duration	45 days	First Cycle 4 weeks and then every 2 weeks	First batch 2 months, next batches one month	45 days	15 days	Daily generation of bio-gas
	High	High	High	Low	High	Medium
Area required*	Area required: For 802 HH - 1200 sqm approx	Area required: For 600 kg - 1200 sqm approx	Area required: For 600 kg - 200 sqm approx	Area required for 600 kg: 30-40 sq.m	Area required for 600 kg: 200-300 sq.m	Area required for 600 kg: 70-80 sq.m
Labour requirement	High	Medium	Medium	Low	High	Medium



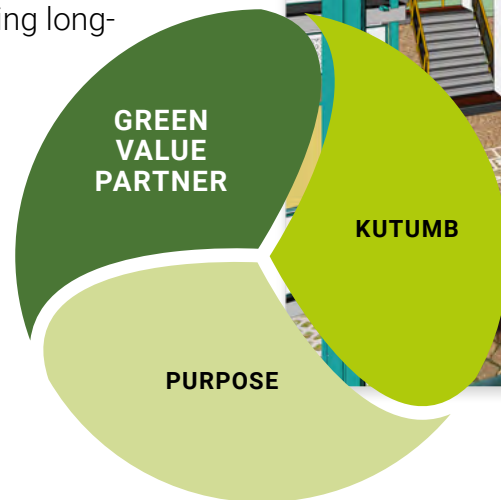
IIFL HOME FINANCE LTD

Championing Green, Sustainable, Affordable Housing

IIFL HFL believes in nurturing the environment through sustainable practices and makes effort to impart positive impact on the environment while seeking its financial bottom-line.

The company aims to spread awareness and adoption of the concept of Green Housing, which refers to methods that make construction more eco-friendly with lower utility costs and improved health outcomes. This makes affordable green housing substantially more beneficial to low-income households, and hence a logical step towards reducing long-term costs and improving stability.

IIFL HFL has constantly looked for ways to incentivise the adoption of green housing in the country. To that end, the company has initiated actions and devised strategies and programs including the Kutumb, PURPOSE and Green Value Partner initiatives.





The Kutumb Initiative

IIFL Home Loans advocates the adoption of Green Housing through 'Kutumb', a platform designed to connect industry experts and housing developers to create a sustainable and dependable model for Green Buildings in the affordable housing segment. The benefits of Green Buildings permeate through to environment, economic and social aspects, and include reduced carbon footprint, conservation and restoration of natural resources, improved air and water quality and reduction in waste, enhanced occupier productivity, optimisation of lifecycle performance and improved health and comfort for residents. The latest awards for Kutumb are the *CSR Initiative of the Year* by Global Marketing Excellence Awards and the *IGBC Green Champion Award* to IIFL Home Loans by IGBC



PURPOSE

PURPOSE (**P**latform for Green Affordable Ho**U**sing & Finance, Through **R**esearch, **P**olicy & Techn**O**logy, for **S**ustainable **E**co-System) brings together experts from building construction, finance and sustainability to influence policies pertaining to green affordable housing and provide strategic and directional inputs to develop an ecosystem for green affordable housing in India. Its mission:

- ◆ Promote evolution of green affordable housing policies and certification
- ◆ Promote innovative, cost-effective green building materials, identify innovative and cost-effective technologies and develop strategies for awareness and market transformation
- ◆ Develop innovative financial structures
- ◆ Create an eco-system for sustainable development with adequate accountability.



Green Value Partnership

This initiative provides end-to-end assistance to developers. Green Value Partners work with the developer throughout a project's lifecycle to ensure successful realization of the project's vision and efficiencies and achievement of Green Building certification.

GVP platform also provides a Monitoring and Audit mechanism to ensure support to the developer throughout the project life-cycle. The GVP programme is delivered by competent technical experts with construction and green building experience.

KUTUMB, GVP and PURPOSE are the key pillars of IIFL HFL's effort to accelerate adoption of Green Building concepts in India, to help create affordable housing at an unprecedented scale in the coming years.

CREATING A GREEN BUILDING ECOSYSTEM IN INDIA



Rating Mechanisms

Good and reliable rating mechanisms are a building block for a favourable ecosystem for green buildings as they provide a standard and a measure of progress of the concept. India has some bankable rating mechanisms recognized by investors and governments, such as IGBC Green Affordable Housing, GRIHA for Affordable Housing and Excellence in Design for Greater Efficiencies (EDGE). The rating mechanisms have evolved in expanse and depth over the years and have significantly aided the green building movement.



Financing Options

By 2040, India will require nearly \$4.5 trillion worth of infrastructure funding, including a full \$1 trillion for affordable green housing.³ Given the ask, innovative approaches are key and green financing strategies such as green bonds, catalytic and transformational financing and impact investing can provide feasible solutions. With the lead taken by specialised development banks, agencies and governments and millennial sensibilities expected to exert further pressure, innovative financing mechanisms are expected to evolve and serve the movement.



Development Bank Support

India's apex housing finance institution, the National Housing Bank (NHB), together with the Agence Française de Développement (AFD) and the European Union, have committed to expand allocation of resources for green and affordable housing projects in India through the SUNREF India Housing Programme. Such comprehensive programmes, that provide competitive funding opportunities for green and affordable housing projects as well as training and orientation for stakeholders, will play a key role in development of the market.



Institutional Support

Many governments and local bodies today incentivise developers who get their buildings green-certified. From fast track environmental clearance and concessional funding to additional floor-to-area ratio (FAR), various steps are in place in India today. Sustainable construction concepts are now an integral part of architectural and engineering curriculums too so that the new builders and developers will be progressively geared towards sustainable building. In just a few years, India has seen a tectonic shift in its approach to green construction and hopefully it will be sustained.

INVALUABLE
INSIGHTS

3. Source: India Economic Survey, 2018



IIFL HFL's Commitment

With an estimated \$4.5 trillion of infrastructure build ahead of us till 2040, of which nearly \$1 trillion will be for affordable housing, it is absolutely important to build an ecosystem that enables enthusiastic adoption of eco-friendly construction technologies by all concerned.

It is IIFL HFL's stated objective to ensure the concepts and practices of green construction permeate the realm of affordable housing, so that multitudes of people who will possibly own their first house, will proudly be part of India's climate change solution-set. We will work with all key constituents of the housing industry, continue to build dialogues, initiatives and partnerships, so that we can together be the change we want to see.



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