

Shashwat

Let Nature Be

Accelerating Climate Action in the Built Environment



A GRIHA Council Publication



COVER STORY

DO YOU STILL DREAM OF
THE RED CLAY BRICK HOME?

IN-TALKS

MAY-ELIN STENER

START-UP STORY

uBreathe
CoolAnt



GRIHA TIMELINE

2005-2007 »

- 2005: TERI GRIHA released as an indigenous green building rating in India
- 2007: MNRE adopts GRIHA as a National Rating System for Green Buildings



2008-2010 »

- 2008: National Mission on Sustainable Habitat
- ◆ 2009: Acknowledged as an innovative region-specific green building assessment tool by the UN
- 2009: Committee of Secretaries: 3-star GRIHA rating mandatory for all government buildings
- 2009: CPWD embraces GRIHA
- 2010: Commencement of Evaluators' & Trainers' Programme



2014-2016 »

- 2014: GRIHA for Existing Day Schools rating
- 2015: GRIHA v.2015 rating and GRIHA LD rating
- 2016: GRIHA Help Centre, ACE membership & CATALYST Programme
- 2016: MPPH & IDC, IICCI

2017 »

- 2017: GRIHA for EB rating & GRIHA for AH rating
- 2017: MPPH & IDC, PMC, BESTECH, IREO, Vatika, CONSCIENT, ADANI Realty, Vilas Javdekar Developers and Godrej Properties
- 2017: EESL, NHB & ISHRAE
- 2017: SPARSH installed at the UN office on UN Day



2019 »

- 2019: GRIHA v. 2019
- 2019: GRIHA for Existing Day Schools rating (version 2)

2018 »

- 2018: PWD, Maharashtra
- 2018: Orange County
- 2018: Extended with NASA, India
- 2018: Paryawaran Rakshak Programme for RWA
- ◆ 2018: GRIHA Council felicitated with Green Excellence Award

2020 »

- 2020: GRIHA Product Catalogue Brochure
- 2020: First Construction Council, EMC, CIMSME, KIIFB & IIA, Northern Chapter
- 2020: Release of policy brief on Sustain the Sustainable Change



2022 »

- 2022: NHB manual, SVA GRIHA V.3, JAN GRIHA, Decarbonizing Habitat Programme & GRIHA Water Positive certification
- 2022: Planning Insights, GEV, ICA, USG KNAUFF, Bhopal Smart City, NIUA, Sheffield Halam University, The 2000-Watt Smart Cities Association, Home First Finance Company India Limited & Life Insurance Corporation of India (LIC)

2021 »

- 2021: IIFL HFL & Council of Architecture (Renewal)

GRIHA recognized as India's own green building rating system in **INDIA's INDC** submitted to the **UNFCCC**

- Launch/Events
- Memorandum of Understanding (MoU)
- ★ Projects
- ◆ Awards and Recognitions

2024 »

- ★ 2024: Successfully rated 350+ NVS schools
- 2024: GRIHA manual on Good Construction Management Practices
- 2024: GRIHA Regional Conclaves in Lucknow, Hyderabad, and Jaipur
- 2024: BVDU College of Architecture, Pune; University of New South Wales (UNSW), Australia; Indian Institute of Architects (IIA), Uttar Pradesh Chapter; Institute of Indian Interior Designers (IIID), Lucknow Regional; Bangalore Metro Rail Corporation Limited (BMRL); Vellore Institute of Technology (VIT); Indian Plumbing Association (IPA); ASHRAE Rajasthan Chapter & Fire & Security Association of India (FSAI)

2023 »

- 2023: Navodaya Vidyalaya Samiti (NVS); Smart Surfaces Coalition (SSC); Natural Resources Defense Council (NRDC) & NASA India
- 2023: Fast-track process for GRIHA Product Catalogue
- ◆ 2023: GRIHA Council was awarded the 'Best National Brand of the Year' under the Solutions Category at the 6th edition of the GSBSA
- ◆ 2023: GRIHA Council became network member of UNCTCN
- 2023: GRIHA for Interior Spaces

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MESSAGE FROM THE PRESIDENT, GRIHA COUNCIL

On this momentous occasion, I am pleased to share this year's theme of the annual national 16th GRIHA Summit and GRIHA Council's annual Shashwat Magazine 2024 - 'Accelerating Climate Action in the Built Environment'. The theme holds profound significance against the backdrop of the evolving global climate landscape. Each one of us has a unique role to play in combating climate change impacts & building communities that thrive sustainably and exhibit climate resilience. It is now more than ever that we must transform our words into actions.

The GRIHA Council has been steadfastly moving ahead in advancing sustainable built environment through its diverse ratings and certifications, multi-stakeholder capacity-building training, awareness and outreach programmes. Aligning with national commitments, evolving market transformations and industry standards, GRIHA Council continues to adapt and advocate for innovation and best practices in the building and construction sector. Empowering stakeholders through knowledge and training, GRIHA Council continues to remain indispensable in navigating the intricacies of the built environment and building sustainable habitats through its expertise and experience.

I acknowledge the overarching support of the Members of the Managing Committee of GRIHA Council for their continuous guidance and invaluable insights into strengthening our initiatives. I commend the leadership at GRIHA Council for their pivotal role in guiding the organization towards continual growth and advancing the vision of sustainable habitats. Inevitably, the team's persistent dedication and commitment have enabled the progress achieved thus far.

My sincere gratitude to the various ministries and departments of the Government of India for their trust and confidence reposed in the brand 'GRIHA' to propel the sustainable habitat movement across the country and beyond. I acknowledge the steadfast support and invaluable contributions of our distinguished partners, collaborators, and well-wishers for their faith in GRIHA Council.

With the trust and commitment of GRIHA Council, I am assured that the collective efforts of the entire GRIHA Community will unlock substantial opportunities, wherein our built landscapes are not just concrete jungles, but a reflection of resilience and sustainability.

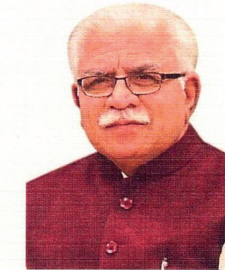
Best wishes to everyone for a Happy and Prosperous New Year 2025!

Dr Vibha Dhawan
President, GRIHA Council &
Director General, TERI

मनोहर लाल
MANOHAR LAL



आवासन और शहरी कार्य मंत्री एवं
विद्युत मंत्री
भारत सरकार
**Minister of
Housing and Urban Affairs; and
Minister of Power
Government of India**



Message

I extend my heartfelt congratulations to the GRIHA Council (Green Rating for Integrated Habitat Assessment) for organizing the 16th GRIHA Summit and releasing its annual magazine, "*Shashwat – Let Nature Be*", this December at the India Habitat Centre, New Delhi. The Summit, themed "Accelerating Climate Action in the Built Environment," addresses a critical and timely issue, as the building sector remains the largest contributor to carbon emissions.

In response to this pressing challenge, the Ministry of Power and the Ministry of Housing and Urban Affairs, Government of India, are actively encouraging low-carbon development pathways and the adoption of energy-efficient materials and technologies. The GRIHA Council has been a vital partner in advancing sustainable habitat development across India. It is commendable to see the Council consistently raise the bar by integrating national codes and regulatory frameworks into its suite of green building rating tools. These rating systems cater to diverse building typologies, from individual residential units and large housing developments to commercial buildings and city-level planning. Through its steadfast commitment, the GRIHA Council is making significant contributions towards the vision of a greener, more sustainable nation.

My best wishes to the entire team at the GRIHA Council for the success of the 16th GRIHA Summit and the launch of this year's magazine. I am confident that the deliberations of the Summit will inspire innovative solutions, advance climate action, and bolster sustainable development in the built environment

(Manohar Lal)

New Delhi
26.11.2024

ROYAL DANISH EMBASSY
New Delhi



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It is a great honour to extend my warmest congratulations to **GRIHA Council** on occasion of the annual event - 16th GRIHA Summit. This annual gathering has consistently been a cornerstone in advancing sustainable practices in India and the Royal Danish Embassy is proud to be associated with such a transformative initiative.

Denmark and India share a profound and enduring commitment to sustainability, with our collaboration rooted in a shared vision of building a greener and more resilient future. One of the cornerstones of our bilateral cooperation is the Green Strategic Partnership, a pioneering agreement between Denmark and India. This partnership establishes a framework for collaboration on the green transition across multiple areas, with energy cooperation and sustainable water management serving as its central pillars.

Beyond these areas, the Royal Danish Embassy has been a key facilitator in the exchange of knowledge and best practices in sustainable building. We have actively supported initiatives that aim to design and construct energy-efficient buildings, that not only reduce carbon footprint, but also enhance climate resilience. Through workshops, training programmes and joint ventures, we have contributed to the creation of a built environment in India that is more sustainable, adaptable and aligned with global climate goals.

Through this year's GRIHA Summit, centred on the theme 'Accelerating Climate Action in the Built Environment', I am reminded of the vital importance of cooperation at all levels in addressing the challenges posed by climate change.

Over the years, **GRIHA Council** has emerged as a beacon of sustainability, championing green building practices and advancing environmental management across India. Your efforts have significantly contributed to reducing the carbon footprint of the built environment, enhancing energy efficiency and promoting the use of renewable energy sources.

I convey my best wishes to the entire team of **GRIHA Council** for a successful 16th GRIHA Summit. May this summit serve as an invaluable platform for stakeholders to come together and chart a path forward for a sustainable future for all and for India as India is moving towards Viksit Bharat.

Freddy Svane
Ambassador



प्रशांत कुमार सिंह, भा.प्र.से.
सचिव
P.K. SINGH, IAS
Secretary



भारत सरकार
नवीन और नवीकरणीय ऊर्जा मंत्रालय
GOVERNMENT OF INDIA
MINISTRY OF NEW AND RENEWABLE ENERGY



Message


I am honoured to extend my greetings for the 16th **GRIHA Summit** and the release of the 11th edition of Shashwat Magazine by GRIHA Council, dedicated to the vital theme of "**Accelerating Climate Action in the Built Environment**" during December 2024 at India Habitat Centre, Lodhi Road, New Delhi.

As we face the increasing urgency of climate change, the role of sustainable practices in the built environment becomes more crucial than ever. At the Ministry of New and Renewable Energy (MNRE), Government of India, we are committed to advancing clean energy solutions and promoting green building practices to meet our climate goals. Our recent initiatives, including the expansion of renewable energy infrastructure and the enhancement of policies supporting energy efficiency, are testament to our dedication to combating climate change. The buildings and construction sector are indeed a significant contributor to global greenhouse gas emissions, responsible for 37% of the total emissions. This highlights the critical need for sustainable construction practices to achieve the "Net Zero" carbon emission target by year 2070.

Aligning with the principles of minimizing carbon emissions in India, MNRE is actively promoting the use of renewable sources of energy. National Solar Mission aims to establish India as a global leader in solar energy, while the National Bioenergy Programme promotes the use of bioenergy to generate power. India's solar power installed capacity is 85.47 GW as of June 2024, making it the 3rd largest producer of solar energy globally. By integrating renewable energy resources into the construction sector, India can significantly reduce its carbon footprint and move towards sustainable development.

It is heartening to note that **GRIHA Council** consistently raises the bar for sustainable development and ensures that all building segments are well addressed through their rating variants. These rating variants provide a ready-reckoner framework for carbon reduction in buildings designed with green measures. I am delighted to share our noteworthy achievement of the **Atal Akshay Urja Bhawan**, which has recently been awarded the prestigious **GRIHA 5-Star Rating**. This milestone reflects our commitment to setting exemplary standards in sustainable building practices and demonstrates the potential for integrating renewable energy solutions effectively within our built environment.

My best wishes to the team at **GRIHA Council** for the success of 16th GRIHA Summit and the launch of this publication.


(P. K. Singh)

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AJAY MATHUR, Ph.D
Director General



Message

It is with immense pleasure that I extend my warmest greetings to ‘**GRIHA Council**’ for hosting the 16th edition of its annual GRIHA Summit from 4th – 5th December 2024 at India Habitat Centre, New Delhi.

As we stand at the edge of this era of climate change, it is imperative that we stand together, share knowledge and foster a community committed towards climate action. At International Solar Alliance (ISA), we are dedicated to fostering solar energy adoption globally to combat climate change and promote sustainable development. With a coalition of 120 countries, ISA works to address energy needs and challenges of its member countries and scale up solar energy integration through multiple flagship interventions. The initiatives of advancing energy-efficient building practices and integrating renewable energy solutions align seamlessly with ISA's mission to promote solar energy, as a vital component of the global transition to clean energy.

We aim at mobilizing USD 1000 billion by year 2030 to scale up solar energy deployment, reduce power generation costs & advance solar finance, technology, innovation, R&D and capacity building. ISA's commitment to accelerating solar energy deployment is reflected in our collaborative efforts with member countries, stakeholders, and partners. At COP28, we launched the SolarX Startup Challenge for the Asia-Pacific region to drive entrepreneurship and local solutions for solar deployment. ISA has also taken various other initiatives like STAR-C, Corporate Advisory Group, Country Solar Energy Profiles, Global Solar Facility, Solar Compass, etc., which illustrates our shared synergies towards accelerating climate action. ISA has been implementing various solar technology demonstration projects in 27 LDC/SIDS of which Projects in 22 Countries have been completed. Implementation of these

demonstration projects would open the potential for scaling of such solar applications which can immensely benefit the countries in fulfilling the twin benefits of increasing energy access and promotion of sustainable growth.

The built environment, encompassing residential, commercial and institutional spaces, represents a significant opportunity for impactful climate action. Solar Energy is a critical component in this context, offering a scalable solution for reducing carbon footprints and enhancing energy efficiency. By integrating solar power into building design & operations, there is potential to achieve substantial reductions in greenhouse gas emissions and contribute to the creation of sustainable and resilient infrastructure.

ISA looks forward to collaborating with GRIHA Council to explore opportunities for advancing solar integration in building practices, sharing knowledge and driving collective action towards a sustainable future. Together, through such collaborative efforts and shared visions, we can build a world where sustainability, resiliency and prosperity go hand in hand. I send my best wishes to the team at GRIHA Council for a successful event.

(Ajay Mathur)

Gurugram
28th November 2024

International Solar Alliance

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Date : 04 December, 2024

Message

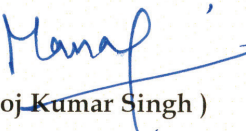
I am glad to learn that Green Rating for Integrated Habitat Assessment (GRIHA) Council is releasing its annual magazine "Shashwat – Let Nature Be" on December, 2024.

A threat such as climate change calls for timely & coherent response and action that will help reduce vulnerability and build resilience. As we continue to modernize, we must embed sustainability as a core element of growth and development. The Government of India (GoI) has laid down a robust framework of policies and programmes aligning with the global and national vision of sustainable development and climate action.

Uttar Pradesh is proud to be actively implementing and contributing to these initiatives. The Government of Uttar Pradesh is steadfastly working to accelerate the integration of solar-based power generation in residential, commercial & industrial spaces; ensure rooftop rainwater harvesting in existing and planned institutional (Govt. /Semi-Govt.) and commercial buildings in rural & urban areas; promote reuse of wastewater in residential and industrial facilities, develop state cooling action plan in line with the India Cooling Action Plan (ICAP); implement residential building codes for thermal comfort in new buildings, as per the Eco Niwas Samhita notification etc.

The Smart City Mission (SCM) and Atal Mission for Rejuvenation and Urban Transformation (AMRUT) have been yet another catalyst for creating a sustainable urban environment through smart solutions. Cities like Lucknow now have integrated intelligent traffic management systems; energy-efficient street lighting & green public spaces; water conservation and waste management. The integration of technology with sustainability principles is helping Uttar Pradesh evolve into a modern, environmentally responsible state.

I extend my best wishes to the entire GRIHA Council team for the successful release of the magazine.


(Manoj Kumar Singh)

Dr. Ravi Kota, IAS
Chief Secretary
Government of Assam



ড° ৰবি কোটা, ভাঃ প্ৰঃ সেঃ
মুখ্য সচিব
অসম চৰকাৰ



MESSAGE

It is a pleasure to address the distinguished members and partners of the industry at the '16th GRIHA Annual Summit' to be held on 4th – 5th December 2024 at India Habitat Centre, New Delhi.

As we confront the pressing challenges of climate change and environmental degradation, the importance of embracing sustainable building practices have never been more critical. Assam, with its rich natural heritage and diverse ecosystems, recognizes the urgency of integrating sustainability into urban development to preserve our environment for generations to come.

I am confident that through **GRIHA Council's** increasing footprint and regional conclaves held at multiple locations, the initiatives will reach at grassroots of society to create a future, where development and sustainability are seamlessly integrated, ensuring a better quality of life for our people. The **GRIHA Council's** approach to encourage locally sourced material, affordable designs and the integration of innovative technologies is essential in creating resilient and eco-friendly communities.

The launch of Green Innovation Fund by the Government of Assam has been another measure to encourage the adoption of green technologies, enhance research & development of infrastructure and the implementation of best practices by architects, developers and urban planners.

I wish the **GRIHA Council's** continued success at the summit and all its future endeavours.

I am excited about the lasting positive impact this work will have on Assam and look forward for extended collaboration for making Assam's future development sustainable.

Date: 25.11.2024


(Dr. Ravi Kota)

Dr. K.M. Abraham CFA

Former Chief Secretary to
Government of Kerala &
Former Whole Time Member, Securities
and Exchange Board of India (SEBI)



CHIEF EXECUTIVE OFFICER

Ex-Officio Secretary to Government
Finance (Infrastructure)

September 28, 2024

On behalf of the Kerala Infrastructure Investment Fund Board (KIIFB), I extend our heartfelt wishes for the upcoming 16th GRIHA Summit themed "Accelerating Climate Action in the Built Environment" and for the release of the GRIHA magazine "Shashwat - Let Nature Be."

KIIFB finances public projects primarily in the sectors of healthcare, education, transportation, water supply, energy, social and commercial infrastructure, IT and telecommunication. While investing in these vital sectors, the fund aims to keep sustainable development as its core and improve the overall quality of life in the state of Kerala. KIIFB has successfully garnered support from global agencies by following international standards and aligning with global frameworks. This achievement is rooted in our ability to ensure that KIIFB-financed projects remain viable in the long-term.

Since our association with GRIHA Council in 2021, we have promoted and implemented green and sustainable buildings in Kerala through the GRIHA rating framework. This partnership has been instrumental in guiding our efforts towards building infrastructure that not only meets but exceeds environmental standards. With our strong portfolio of green building projects, KIIFB successfully raised ₹300 crore in Green Domestic Bonds. Moving forward, KIIFB plans to include non-building infrastructures also into the ambit of eligible green finance, by developing a National Rating System.

GRIHA Council's efforts in putting together this summit demonstrate the organisation's remarkable commitment to advancing our collective efforts and implementing climate-friendly practices. By bringing together thought leaders, innovators, and stakeholders, we expect that the discussions and insights shared during this summit will drive significant progress and inspire further innovations in the field.


K M Abraham

HARICHANDANA DASARI, I.A.S.,
Special Secretary to Government



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Message

I am privileged to extend my congratulations to '**GRIHA Council**' on the occasion of the 16th GRIHA Summit, centered around the theme "Accelerating Climate Action in the Built Environment," as well as the unveiling of the 11th edition of their annual publication, "Shashwat – Let Nature Be" during 4th – 5th December 2024 at India Habitat Centre, Lodhi Road, New Delhi.

As a 'Special Secretary' of Roads and Buildings Department in Government of Telangana, I am proud of our strides in aligning with GRIHA's vision. We are dedicated to sustainable infrastructure by implementing eco-friendly, resource-efficient & climate-resilient practices in the design, construction and maintenance of buildings.

Traditionally, India's sustainable building designs relied on local materials, but this valuable knowledge is at risk of being lost with modern construction trends. Waste Management is another critical issue and addressing it has been a priority. While government regulations play a vital role, public involvement is key to effective waste management. Emphasizing innovative approaches to reduce, reuse and recycle is strongly recommended to address this crisis. Our efforts are in full harmony with GRIHA's mission to promote green building standards and integrate climate action into urban development. Through these initiatives, we strive to create a sustainable legacy that benefits both present and future generations.

As we face the global challenges of climate change, it is truly inspiring to witness organizations like the **GRIHA Council** leading impactful initiatives. During August 2024, GRIHA Council hosted a regional conclave in Hyderabad and our department participated in the event. The event provided us with a valuable opportunity to collaborate toward our common goals, engage in meaningful discussions and contribute to several constructive suggestions. We are excited about the upcoming 16th GRIHA Summit and look forward to actively participating and continuing to contribute to its success.


(Harichandana Dasari)



VICE PRESIDENT & CHIEF EXECUTIVE OFFICER, GRIHA COUNCIL

Dear Friends,

In recent years, the vulnerability of urban and rural settlements has become glaringly evident owing to the higher occurrence of extreme weather events such as heatwaves, urban heat island effect, excessive rainfall leading to unwarranted flooding & landslides leading to loss of lives & ecosystem and damage & deterioration of infrastructure. Perhaps, these complexities have increased with escalating urbanization.

With respect to the built environment, energy demand and emissions from the building & construction sector represent over a 5th of global emissions. In the year 2022, the sector accounted for 37% of global operational energy and process-related CO₂ emissions, rising to just under 10 Gt CO₂ (UNEP, 2024). With more than half of the buildings yet to be built by year 2050, there is a major opportunity for the sector to relook at the buildings of the future. The time is now to prioritize planning and development of a resilient & sustainable built environment in harmony with the natural environment, whilst enhancing human well-being and addressing social inequalities.

Aligning with the global and national commitments, I am pleased to announce the theme for this year's 16th GRIHA Summit and the annual Shashwat Magazine 2024 - 'Accelerating Climate Action in the Built Environment'. The theme has been conceived keeping in mind the growing need and demand for adopting sustainable practices across diverse segments of society. The

16th GRIHA Summit featured sessions on critical topics such as sustainable energy transition, urban heat island mitigation, biophilic architecture, climate policy advocacy, sustainable construction practices, community-based adaptation, green building incentives, etc. Through these discussions, we seek to catalyze actions that address emission reduction, build community resilience for climate adaptation and conserve biodiversity and ecosystems.

As a prelude to the 16th GRIHA Summit, GRIHA Council organized the 'Paryavaran Rakshak Programme 3.0' for schools across India. Under this initiative, a 'Green Carnival' was organized for school students to engage in various activities such as plogging, drama carnival, musical parody, reel competition and model making exhibition.

Over the years, GRIHA Council has steadfastly established its green footprint in the country with more than 4700 projects registered across India exceeding the 1 billion square feet of built-up area.

The fiscal year 2023-2024 has been one of the most momentous years for GRIHA Council. I am glad to share that this year GRIHA Council introduced GRIHA Regional Conclaves. We have successfully hosted '3 GRIHA Regional Conclaves' in the cities of Lucknow, Hyderabad and Jaipur under the overarching theme of 'Accelerating Climate Action in the Built Environment'. These conclaves align with the vision of becoming Viksit Bharat@2047 by strengthening climate mitigation

and adaptation strategies & promoting the development of climate-resilient communities and sustainable & inclusive infrastructure at the regional level. I am glad to share that the regional conclaves have been well received by the state governments, building and construction professionals, academicians and local communities. GRIHA Council intends to continue with this endeavour and host regional conclaves at various locations across India in the coming years.

Along with the extensive stakeholder capacity building and training programmes, GRIHA Council organized Green Building Tours for educational institutions at Light House Project, Lucknow; Civil Aviation Research Organization, Hyderabad; KMT Logistics HQ Building, Jaipur for architecture, urban planning and engineering students.

Keeping pace with the market transformation and sustainable infrastructure development, GRIHA Council has launched a diverse range of publications this year which includes specialized ratings for road Infrastructure and ports. Both the rating variants delve into aspects related to eco-friendly materials, energy-efficient designs and innovative sustainability measures, contributing to India's green building efforts, while balancing economic growth and ecological sustainability. In addition, GRIHA V.2019 has been amended to GRIHA V.6 taking into account on the current market trends, regulations and industry feedback.

Along with this, GRIHA Council introduced a Manual on Good Construction Management Practices, crafted to provide extensive guidance on adequate practices for construction activities on-site, that not only ensure resource efficiency & safety and also well-being of our workforce & safeguard our environment. Additionally, a booklet titled, 'Mindful Impressions- Targeting 2070 Workforce' was released which is a compilation of the sustainable initiatives undertaken by the schools of Navodaya Vidyalaya Samiti (NVS), Ministry of Education, Government of India in the fields of energy efficiency, renewable energy integration, waste & water management, health & hygiene, occupant comfort, etc. with an intent to reduce their carbon and ecological footprint. A 'Guide to Effective Documentation' has been

developed as part of the GRIHA Technical Manual series. This manual offers comprehensive guidance on best practices for submitting documents to ensure credibility, transparency and a smoother evaluation process by GRIHA Certified Evaluators.

Welcoming new partnerships, which have been inked this year include, Indian Institute of Architects (IIA), Uttar Pradesh Chapter; Institute of Indian Interior Designers (IIID) Lucknow Regional Chapter; Bangalore Metro Rail Corporation Limited (BMRCL); Vellore Institute of Technology (VIT); Indian Plumbing Association (IPA) Jaipur Chapter; ASHARE Jaipur Chapter; Fire & Security Association of India (FSAI) and Kendriya Vidyalaya Sangathan (KVS), Ministry of Education, Government of India.

I take this opportunity to convey my deepest gratitude to the Members of the Managing Committee of GRIHA Council for their constant support and guidance in steering the initiatives of the involved organizations. I extend my sincere gratitude to our esteemed clients and associates from various industries with whom we share profound partnerships based upon shared principles, values, vision and goals. I extend my appreciation to my ever-committed team at GRIHA Council for their unwavering support and hard work, which is instrumental in turning every critical project into a resounding success.

Pursuing sustainable transition in the building & construction sector can unlock substantial opportunities that drive sustainable economic growth and social development. It is imperative to take decisive & swift actions today to foster inclusive growth, secure a sustainable future and drive long-term value creation.

As we enter into the New Year 2025, we look forward to strengthening networks for betterment of both the environment and society. GRIHA Council will continue to contribute as a catalyst for making the built environment resilient and sustainable. Together, let us reaffirm our commitment to safeguarding our environment, whilst ensuring human well-being.

Season's Greetings and Best Wishes to All for a Happy and Healthy New Year 2025.

Sanjay Seth

Senior Director – Sustainable Infrastructure Programme, TERI &
Vice President & Chief Executive Officer, GRIHA Council



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CHIEF EDITOR

Sanjay Seth
Vice President and CEO,
GRIHA Council

EDITORIAL TEAM

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DO YOU STILL DREAM OF THE RED CLAY BRICK HOME?

Article by **Sheen Pandita** is autobiographical in nature. It discusses our unquestioned reliance on red clay bricks despite availability of the environmentally benign materials. In this regard, flay ash bricks have emerged as a sustainable option. They are lighter, easier to work with, and offer better insulation than traditional red bricks. Additionally, the hollow structure of these bricks abate the amount of mortar needed, resulting in a lower overall cost over time. These options not only reduce the carbon footprint of construction but also improve building performance, making them ideal for modern, sustainable homes.

Sheen Pandita



Sheen Pandita, Research Associate, TERI, is passionate about creating sustainable built environments that prioritize wellbeing of the planet and people. She has a keen interest in finding solutions for industry in moving towards the circularity. She could be communicated through <sheen.pandita@teri.res.in>.

Last month, as has become a family tradition, I received the annual panicked call from a relative. He wanted my advice on extending his home. Being the only architect in my large, extended family, one rooted in the belief that careers should be in either engineering or medicine, I am frequently sought after for construction-related questions. This call was no different, and after what felt like endless rounds of discussion and design revisions, we were finally ready for the next step—meeting with the contractor, Sitaram.

Sitaram, the trusted contractor in the neighbourhood, had a reputation for being diligent and efficient. True to form, as soon as I arrived, he jumped straight into action. “*Toh madam, Bhatti phone karke mangwale ek trailer eenth?*” (Madam, shall I call the kiln and order a trailer of bricks?), he asked, without skipping a beat. His assumption that we would be using red clay bricks immediately caught me off guard.

That simple question sent my mind spinning, as I began to reflect on the enduring presence of red clay bricks in Indian construction. Being deeply entrenched in the sustainability sector, I couldn’t help but wonder why, in this modern age, we were still so reliant on red clay bricks when more sustainable materials are available. It seemed to be an unshakable tradition.

Where Did the Red Clay Brick Come From?

The use of red bricks in South Asia has deep historical roots. It stretches back as far as the

Mehrgarh civilization (7000–3300 BC), one of the earliest examples of settled human habitation in the region. By 3000 BC, in the cities of Mohenjo-daro (Image 1), Harappa, and Kalibangan of the Indus Valley Civilization, kiln-fired bricks had become a standard material. These bricks were crafted with precise dimensions using a 1:2:4 ratio for thickness, width, and length—a feat of engineering that showcased the advanced knowledge of the era.

As the Indus civilization declined, this expertise in brickmaking spread eastward, contributing to the development of cities such as Pataliputra, Kausambi, and Ujjain.

Even today, when we think about constructing a home, the red clay brick remains the first material that comes to mind.

However, our world today is vastly different from that of our ancestors. In an age of innovation, where technology dominates, and our urban landscapes are shaped by controlled environments, why are we still so attached to the red clay brick?

Modern World with the Historic Brick

Red clay bricks have undeniably stood the test of time. They are durable, fire-resistant, and

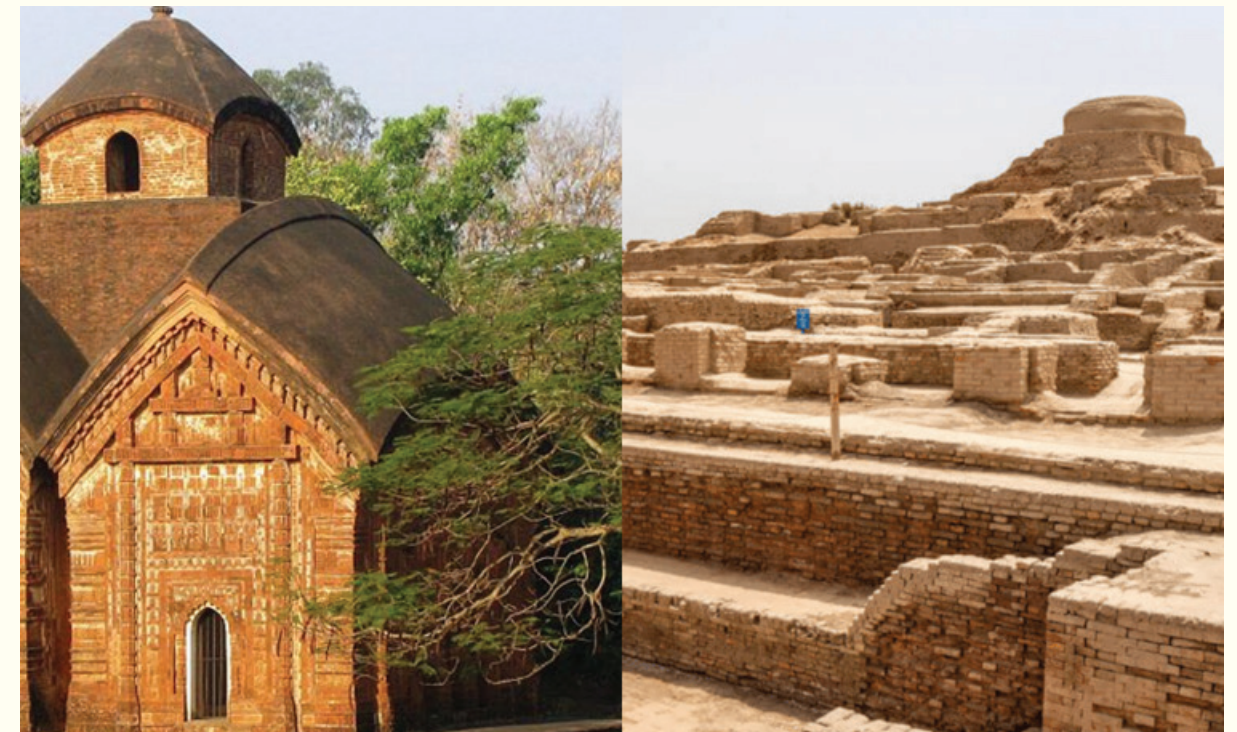


Image 1: Image from Mohenjo-Daro excavation (right), evident use of fired bricks; Jor Bangla Temple, Bishnupur, red brick temple from 1655 (left)

Source: Harappan Civilization: a quick overview; Jore Bangla Temple, Bishnupur



Image 2: Some examples of new-age bricks available in the market: ceramic bricks, recycled plastic bricks, hollow AAC blocks and self-insulated composite blocks

have played a significant role in shaping modern urbanization. For centuries, they have served as the backbone of our homes and cities. But we no longer live in agrarian societies where these bricks were essential. Instead, we live in a world that has drastically changed—one where climate change, sustainability, and resource management have become pressing concerns.

The traditional method of making red bricks, particularly in India, has significant environmental impacts. Brick kilns burn fossil fuels and emit vast amounts of greenhouse gases (GHGs).

The brick industry in India alone produces 66 to 84 million tonnes of carbon dioxide annually, along with 100,000 tonnes of black carbon, contributing significantly to local air pollution and global warming. Additionally, the brick-making process requires fertile agricultural soil for clay, which puts further pressure on already strained natural resources. The industry is also notorious for the exploitation of migrant labourers, adding a human rights dimension to the problem.

Returning to my relative's house extension project, I was left speechless by Sitaram's

immediate assumption that we would use red clay bricks. "*Nahi nahi, hum flyash ya cement wali hollow brick lagayenge,*" I quickly countered (No, no, we'll use hollow fly ash or cement bricks instead).

My suggestion threw Sitaram into a frenzy. "*Fly ash bricks? Yeh area mein nahi milte,*" he said, insisting that these materials weren't available in the suburban neighbourhood where the house was located. But I wasn't about to back down. A quick phone call to a supplier confirmed that fly ash bricks could be delivered the next day. Sitaram, visibly

flustered, looked defeated for a moment.

But his objections weren't over yet. He started explaining that the local masons weren't experienced in working with fly ash bricks and that the hollow structure would cause mortar to fall through the gaps, making construction more complicated. He even warned that using these materials would double the cost of the project. My relatives, who were standing nearby, began whispering to each other, expressing concern about the potential increase in expenses.

Convincing Sitaram was a challenge. I explained how fly ash bricks would be better option. They are lighter, easier to work with, and offer better insulation than traditional red bricks. Additionally, the hollow structure of these bricks reduces the amount of mortar needed, resulting in a lower overall cost over time, despite the initial investment.

After much back-and-forth debate, I managed to persuade Sitaram to try fly ash bricks, at least for this project. My relatives, though still wary of the upfront cost, eventually agreed when I broke down the long-term financial and environmental benefits. The reduced energy bills from better insulation and

the eco-friendliness of the materials helped tip the scale in favor of my argument.

Where Does the Wall Ahead Lay?

As a professional in the sustainability built environment domain, I often find myself balancing tradition with progress. The red clay brick, while cherished in our architectural history, may no longer be the most suitable choice for modern construction. Fly ash bricks, which recycle industrial waste, offer a sustainable alternative. However, the supply of fly ash bricks is limited to major urban centres, making them difficult to source in smaller cities and towns.

Fly ash bricks aren't the only sustainable alternative. Builders today have a wide range of eco-friendly materials to choose from. Autoclaved aerated concrete (AAC) blocks are lightweight, insulating, and reduce energy costs. Compressed stabilized earth blocks (CSEB), made from local soil with cement or lime, offer a low-energy, cost-effective option. Agri-waste-based blocks, offer carbon-negative products and provide excellent insulation.

Composite blocks, combining materials like fly ash, sand,

and cement, can include built-in insulation layers, improving energy efficiency and soundproofing. Recycled waste bricks repurpose waste into durable, weather-resistant materials. These options not only reduce the carbon footprint of construction but also improve building performance, making them ideal for modern, sustainable homes.

In today's world, where climate change and resource depletion are urgent global issues, we must rethink our construction methods. The red clay brick, while historically significant, is becoming increasingly unsustainable.

Before we blindly order another trailer of bricks, it's worth asking ourselves: Are we holding onto the red brick because it's the best option, or simply because it's what we know? By embracing new technologies and materials, we can create buildings that are not only more environmentally friendly but also better suited to the evolving needs of our time. So the next time you embark on a construction project, take a moment to think beyond tradition. Sustainable alternatives are readily available, and they might just be the building blocks of a better future.



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Sustainable Development

Nature conservation is our earthly goal
Peace and prosperity our motive sole

Sustainable development is our common aim
An uniform policy for the environment to reign

Climate change a colossal loss
Dreaded competition, destroying the environment in a way gross

Controlling the water pollution is a major concern
Saving the marine eco systems is of vital importance

Conservation of land, forests, mountains, fresh water resources an agenda prime
Safeguarding terrestrial eco systems, a prerequisite to human well-being

Air pollution deteriorating life in urban areas
Green hubs and green buildings be a compulsive obligation in urban areas

Renewable energy a boon to survival
To replace the dwindling polluting resources for revival

Poverty and inequality a curse to defeat
Increase in quotient of happiness will be a major feat

Women empowerment a major challenge to achieve
Equal opportunity to all in the world let us strive

Religion, caste, colour, creed, sect creating a divide
Let humanity take the world in its stride

Laws of nature are of universal attribute
Creating a world, in harmony with laws of nature absolute

Let all hands in the world join together
For the nature's grace of our earth to survive forever.



Prasad Salvi

General Secretary, Marathi
Bandhkam Vyavasayik
Association Mumbai



In this interaction with the GRIHA Council, **Ambassador May-Elin Stener**, shares her invaluable insights on how Norway is progressing towards becoming emission free by elevating its reliance on renewables, adopting relevant policies and innovative initiatives, to mitigate the repercussions of the climate change—a global threat. The country stands as an exemplification of implementation of sustainable development in true means.

MAY-ELIN STENER

Ambassador of Norway to India



“

“Resilient infrastructure will be the key in preparing society to adapt to a changing climate. The infrastructure sector can and will contribute to the decarbonization and increasing circularity of the economy and do its part to fulfil the Paris Agreement.”

”

1. Norway is often seen as a leader in sustainability. Could you share some key initiatives or policies that have helped Norway achieve this reputation, especially in terms of reducing carbon emissions and promoting green energy?

Climate change will have serious and irreversible impacts on nature and society throughout the world. Changes are already occurring, and the harmful impacts are becoming apparent in Norway and painfully obvious in other parts of the world, not least India, which is one of the countries where the largest proportion of people will see their livelihood affected.

Acknowledging these realities, and the fact that combating climate change requires a vigorous and concerted global effort to reduce greenhouse gas emissions, has made Norway decide to cut 55% of all Norwegian emissions by 2030, and ensure a rapid transition to a sustainable, environment-friendly low emission society by 2050. These goals have been passed as law by the Norwegian Parliament.

I believe that Norway has earned its reputation as a leader in sustainability through ambitious

policies and innovative initiatives, aimed at reducing emissions and promoting green energy. Key highlights include the transition to renewable energy, leadership in electric mobility, carbon capture and storage (CCS), taxation and carbon pricing, protection of natural resources, a green maritime sector, and our international collaboration initiatives.

Norway generates over 90% of its electricity from hydropower, making its energy grid one of the greenest in the world. We have invested heavily in offshore wind development and are exploring green hydrogen as a future energy source.

In electric mobility, Norway is at the global forefront, with more than 88% of new cars sold being electric, and 8% hybrid. Incentives include tax exemptions, free parking, and access to bus lanes for EVs.

Norway is pioneering CCS technology through projects like Northern Lights, which aims to store industrial CO₂ emissions under the North Sea. These initiatives are critical to achieving net-zero emissions by 2050.

Norway introduced one of the world's first carbon taxes

in 1991, currently among the highest globally. This incentivizes businesses and industries to adopt cleaner technologies.

At the same time, Norway has policies to conserve its forests, waters, and biodiversity, ensuring that development does not come at the expense of good ecological condition.

The Norwegian Sovereign Wealth Fund invests significantly in renewable energy and excludes companies with high environmental risks.

Within heavy goods transport, we subsidize the replacement of old vehicles, with support for both zero-emission vehicles and charging infrastructure. Norway is advancing electric and hydrogen-powered ferries, targeting emission-free coastal shipping. Initiatives like the Green Shipping Programme promote sustainable maritime practices.

For Norway, climate and environment is a priority area in our collaboration with India. The Norway-India partnership agreement focuses on renewable energy, pollution reduction, and ocean sustainability.

Internationally, Norway contributes to large-scale emission reductions through

efforts to preserve tropical forests in developing countries through the Norwegian International Climate and Forest Initiative (NICFI). The NICFI aims to contribute to reducing and reversing the loss of tropical forest, providing a more stable climate, more conservation of biodiversity and more sustainable development in a number of forest countries concentrated around the three major rainforest basins in the world—the Amazon, the Congo Basin, and Indonesia. Since the beginning in 2008, Norway has paid out more than 5 billion USD in total support through these partnerships.

All in all, Norway is trying to show how strong policies, innovation, and international cooperation can align economic growth with environmental stewardship.

2. What legacy do you aspire to create in your role as Ambassador, especially concerning sustainability and collaboration within the built environment? What kind of impact do you envision as a result of your work in the years ahead?

As Norway's Ambassador to India, I hope to inspire meaningful partnerships that drive sustainability and innovation in the built environment. My focus is on promoting collaborations that merge Norway's expertise in green technologies and environmental management with India's ingenuity, scale and growing technological capabilities. By connecting



stakeholders across academia, industry, and government, I would like to inspire projects that can transform energy efficiency, climate resilience, and inclusivity.

In the years ahead, I envision impacts such as greener cities, reduced carbon footprints, a more circular economy, and empowered young professionals leading sustainable development. Ultimately, I hope to strengthen the foundation for lasting cooperation between Norway

and India in shaping a sustainable future.

Beyond immediate results, I hope to be part of creating a culture of Indo-Norwegian collaboration, inspiring decision-makers at all levels to prioritize local and global sustainability. This legacy would demonstrate the power of united efforts in addressing our shared challenges.

I am happy to say that the Norwegian Embassy is already supporting many concrete collaborations that point the way towards this.

In the INDEE+ project, the Norwegian University of Science and Technology (NTNU) is working with Indian partners on sustainable cooling and refrigeration. The project works on the phase out of hydrofluorocarbons (HFCs), and the implementation of more environmentally benign CO₂-based refrigeration. Demonstration projects are being carried out in a shopping mall,



a hotel, and a data centre, and is set to expand to fishing boats and food storage and transport facilities.

The Norwegian Geotechnical Institute (NGI) has been cooperating with institutions in India for a long time within geotechnical and geo-engineering work. Their current project focuses on climate-resilient infrastructure, working on tunnel construction in the fragile mountain terrain of Uttarakhand.

3. What role do you see Norway playing in the global push for creating inclusive and climate-resilient infrastructure? Are there any specific areas of expertise that Norway can offer in terms of research, technology, or best practices?

Resilient infrastructure will be the key in preparing society to adapt to a changing climate. The infrastructure sector can and will contribute to the decarbonization and increasing circularity of the economy and do its part to fulfil the Paris Agreement. We know it will be a challenge. Much of the technology we need exists today, but not yet at the scale we need it. But I am convinced that this industry, which has always been led by innovators and pioneers, loves a good challenge.

Working together, Norway and India can cooperate on technology, management approaches and policy options for sustainable, low-emission and resilient cities. An example of this that is already having impact, is the project where the Norwegian

research institute, SINTEF, is working on treatment, recycling and utilization of construction and development (C&D) waste in the Indian construction sector. Their collaboration partners are the Goa Waste Management Corporation, the Central Public Works Department, and the construction industry. As 500 million tonnes of C&D waste is left untreated every year in India, the potential for increased circularity and lowered emissions in construction is great.

India and Norway can further deepen collaboration by continuing to explore joint research projects in areas like renewable energy or climate technology, using student exchange programmes to build a skilled workforce, and facilitating knowledge-sharing platforms that combine Norway's experience in sustainability with India's scalability potential. Already today we are facilitating research and development in information technology (IT),



artificial intelligence (AI), and smart city technologies through joint efforts, allowing Norway's innovation-driven model to interact with India's vibrant start-up ecosystems.

I am convinced such partnerships hold promise for addressing global challenges like climate change, energy transition, and sustainable infrastructure, showcasing how bilateral research can yield impactful solutions.

4. Norway has set an ambitious goal to become carbon-neutral by 2030, and the construction and built-environment sector plays a crucial role in achieving this target. How is Norway addressing the challenge of decarbonizing its construction industry, and what innovative practices or technologies have emerged to support this effort?

In Norway, 12-15% of emissions come from the construction industry, and about half of

this is from the production of construction materials. One way to achieve emission reductions is to set requirements for the lowest possible greenhouse gas emissions over the life cycle when acquiring buildings and facilities. More and more public and larger private developers want a high environmental profile and therefore make such demands, requiring manufacturers to provide third-party Environmental Product Declarations.

There are also many good initiatives within recycling and upcycling, which reduces the need for new materials. One company is using decommissioned ships and oil rigs, transforming this into environmentally friendly building products.

The public sector is responsible for 50-70% of emissions from

construction and buildings in Norway. Therefore, new requirements in the public procurement processes of buildings are considered, demanding that 30-40% of energy consumption must be emission free. For us, public sector procurement plays an important role in maturing the market, and we want it to be at the forefront of the green shift.

Among other measures, I want to mention Enova, which is a government enterprise responsible for promoting environmentally friendly production and consumption of energy. Their support programmes are open to both the public and private sector.

Going forward, we are always looking for new approaches. Soon, municipalities will be empowered to set their own requirements to limit greenhouse

gas emissions from construction and work sites. We are considering banning new fossil fuel construction machines from 2035. The government is also reviewing a ban on fossil gas for permanent heating in buildings from 2028, replacing this with energy sources or energy carriers such as biogas, bio-oil or solid biofuels, district heating or electricity.

So, as the Norwegian Government, we are trying to play our part. But support programmes and regulations alone will not get us all the way. We need an ambitious market which is looking for new solutions and is willing to innovate and help develop the technology that we need. That's why it's encouraging that policymakers and industry representatives come together to discuss these challenges and collaborate on these efforts.

5. What role do you believe younger generations—especially students, architects, and urban planners—will play? And how can countries like Norway and India empower them to take leadership in this space?

Younger generations, including students, architects, and urban planners, will play a transformative role in shaping sustainable and inclusive cities for the future. I truly believe their fresh perspectives, creativity, and growing environmental awareness position them as key drivers of innovation and change in urban development. I am sure that Norway and India can work



together to create opportunities for young talents.

Young architects and urban planners are often interested in new innovative ideas and can bring cutting-edge ideas to the table, such as green architecture, circular design, and renewable energy integration. Norway and India can ensure their young people are increasingly exposed to global best practices, which they can adapt to their local contexts.

With their savvy in technology and digital tools, younger generations can leverage data analysis, AI, and modelling tools to address complex urban challenges like traffic, pollution, resource management, and climate adaptation.

A standout example of collaboration that involves young talent is the Indo-Norwegian Marine Pollution Initiative, which focuses on research collaborations to tackle marine plastic pollution, a significant issue for both nations. Young

architects, planners, and students from both countries are engaged in:

- Designing waste management systems, as Indian urban planners work with Norwegian counterparts to create sustainable solid waste systems tailored to coastal cities.
- Developing eco-friendly urban designs, as students and young professionals co-develop urban waterfront projects that integrate clean water technologies and public awareness campaigns.

Through workshops, joint field studies, and internships, the initiative equips young talent with practical skills and global perspectives. This partnership empowers the next generation to take leadership in sustainable urban development.

6. Looking ahead, what are your hopes for the future of international cooperation in sustainability, especially between nations like Norway and India that are at different stages of economic development but share common environmental goals?

I think that our greatest common global challenge is preventing temperatures rising beyond a safe level, while at the same time promoting sustainable economic development in the countries that need it. Access to clean and renewable energy is a precondition for low-carbon, green development. It is really important that countries like India, get access to sufficient

capital to develop renewable energy.

To achieve this, blended finance mechanisms are the key. Using public funding to mobilize private capital will help reduce risks for commercial investors on projects that contribute to sustainable development. This is exactly what Norway does through its Climate Investment Fund, with India as a priority country. The Fund's investments in renewable energy development in India have so far reached 267 million USD.

A recent example from the Climate Investment Fund is an investment with Indian companies to develop wind power plants, and upgrade transmission lines. One of the projects will contribute to connecting 5 gigawatts of wind power capacity to the grid. The investments in new renewable energy projects in India will help avoid emissions of 6.2 million tonnes of CO₂.

I hope for a future where nations like Norway and India build deeper partnerships that combine Norway's advanced expertise in sustainability with India's dynamic innovation and scalability. By leveraging our complementary strengths, we can address global challenges like climate change, renewable energy, and biodiversity conservation. Such cooperation would not only foster mutual growth but also set a global example of how countries at different economic stages can unite for shared environmental goals, ensuring a sustainable and equitable future for all.



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SCAN FOR DETAILS

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Sustainable Journeys: exploring India responsibly

As the Project Officer at GRIHA Council, New Delhi, my work takes me on frequent site visits across India. While our official tours are focused on assessing project sustainability, I've come to realize that our travels can also be an opportunity to embrace eco-friendly practices.

On our whirlwind site visits, we often find ourselves with a few hours to spare, which we utilize to explore local cuisine and culture. But even in these brief moments, we strive to make conscious choices. We opt for public transport or carpool, reducing our carbon footprint. We choose local eateries serving traditional cuisine, supporting the community and savouring flavours unique to each region.

Our site visits themselves are a testament to sustainable development. We assess projects on parameters like energy efficiency, water conservation, and waste management.

Witnessing innovative solutions firsthand reinforces our commitment to environmentally responsible practices.

While our official tours may not be traditional holidays, they offer valuable insights into India's cultural and environmental landscape. By embracing sustainability in our travels, we not only minimize our impact but also contribute to a larger movement. As we journey across

India, we're reminded that even small choices can collectively make a significant difference.

In conclusion, our travels may be work related, they also serve as a reminder of the importance of sustainable practices. By incorporating eco-friendly habits into our official tours, we demonstrate that responsible travel is not only possible but also essential for a better future.

Ar. Srishti Gaur



CoolAnt: accelerating climate action in the built environment



Image 1: Making of CoolAnt Beehive at DEKI Electronics in Noida

Over the last few decades, the world has faced unprecedented climate change, making artificial conditioning to achieve thermal comfort a necessity. Many space cooling products today are designed without considering their complete lifecycle and long-term impact. It is crucial to ensure that this necessity does not exacerbate global warming.

Our journey began in 2015 when a client approached us to help passively cool their factory space suffering from overheating due to a diesel generator (DG) set. The excessive heat from the DG set was causing significant discomfort to the workers. As an architectural practice, we

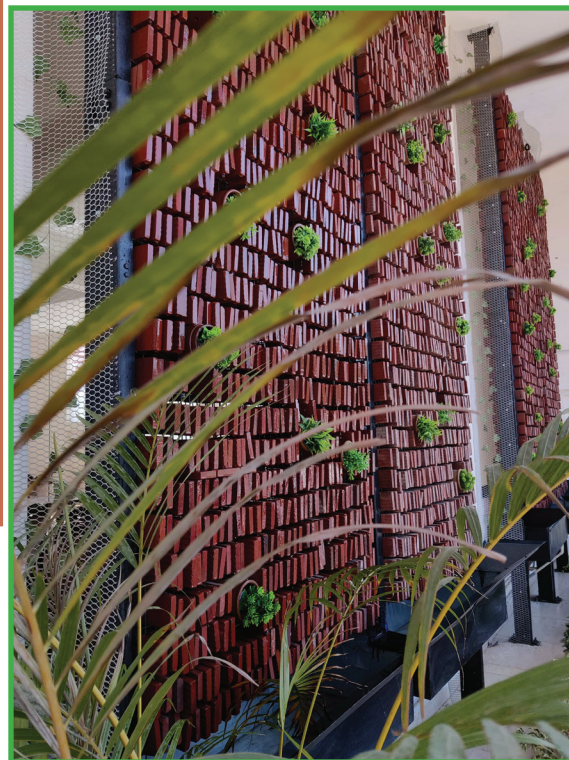


Image 2: CoolAnt Binary at Command Officers' Mess in Army Cantonment, Jaipur



Image 3: Ant Studio's Twin Toilets in Noida, with CoolAnt Terrabyte (a gabion wall filled with damaged terracotta pots and other construction debris)

had already been experimenting with new forms and natural properties of terracotta for a while before this project came to us. This brief led to the inception of Beehive (a terracotta-based low-energy natural cooling solution), which was placed in front of the DG set and helped improve the working conditions of the labour. After this project, we got recognized by the United Nations Environment Programme (UNEP) which gave us the push to establish CoolAnt.

At CoolAnt, we aim to address the necessity of thermal comfort holistically. We are developing nature-inspired, climate-responsive building systems using natural materials such as terracotta, providing an eco-friendly and sustainable cooling solution for building spaces. The effectiveness of a building envelope is crucial for energy efficiency, occupant comfort, and the durability of the building

structure. CoolAnt's envelopes reduce the air conditioning load in buildings, promoting energy efficiency and sustainability.

We see immense potential in combining traditional systems with modern advancements in material science and technology. Our processes are thoughtfully designed to minimize environmental impact during manufacturing, usage, and after the product's lifecycle. Using vernacular materials like terracotta reduces embodied energy, passive energy strategies lessen environmental impact, and incorporating craft gives CoolAnt a distinct artistic character.

Our primary goal is to expand from climate-responsive envelopes to climate-responsive buildings, ensuring that all future buildings globally are sustainable and that these solutions are accessible to everyone. In India, less than 1% of buildings are designed by architects,



Image 4: CoolAnt is trying to revive the art form of pottery and generating employment opportunities for potters all across the country

highlighting a significant gap in sustainable design. We aim to bridge this gap by providing the masses with access to sustainable construction and cooling solutions, reducing carbon emissions significantly.

We have made a significant social impact by making our Beehive solution open source, creating employment opportunities for potters across the country and improving the quality of life for individuals in diverse communities. Noteworthy projects in Chandigarh, Assam,



Image 5: CoolAnt Binary at Vidya and Child NGO in Noida

and even Mexico have benefited from our open-source model. We wish to democratize climate-responsive designs and to achieve this, we've shared simplified literature with clients from low-income groups, ensuring that even those with limited resources can implement sustainable and efficient design solutions.

Looking ahead, we are committed to expanding our reach and impact, providing accessible, sustainable solutions, creating more employment opportunities, and positively transforming communities through our innovative designs. Our target is to cater to at least

10,000 buildings in the next three years, potentially reducing carbon emissions by up to 400 million kg CO₂e/year.

Our efforts directly align with the following Sustainable Development Goals:

- SDG 11: Sustainable cities and communities
- SDG 12: Responsible consumption and production
- SDG 13: Climate action

Our measurable outcomes include:

- Operational energy savings: 30-70%

- CO₂ emission reduction till now: 1.9 million kg CO₂e/year
- Social impact: 137+ jobs created as a result of the solution
- Thermal comfort beneficiaries: 5600+ individuals (direct and indirect)

CoolAnt is dedicated to driving sustainable change, making a substantial impact on the environment, and contributing to a sustainable future through education, awareness, and innovative technology.

ग्रीन बिल्डिंग: प्रकृति के साथ तालमेल

विकासशील देश है अपना भारत, नित-नए भवनों के निर्माण का है यहाँ स्वागत।

किन्तु प्रश्न यह है नए भवनों को सतत बनाएं कैसे, वायु, जल, भूमि का प्रदूषण होने से बचाएं कैसे?

ग्रीन बिल्डिंग या हरित भवन है इस प्रश्न का उत्तर, क्यों न हम पर्यावरण को बचाने के लिए बढ़ाएं, हरित निर्माण का स्तर?

ग्रीन बिल्डिंग में होता है सौर ऊर्जा जैसी प्राकृतिक ऊर्जा का उपयोग, जिससे पर्यावरण पर पड़ने वाले नकारात्मक प्रभाव को समाप्त करने का बनता है सुयोग।

अपशिष्ट पदार्थों का इस्तेमाल भी किया जाता है हरित भवनों में, विद्युत, जल, गैस ऊर्जा के खर्च भी कम हो जाते हैं चुटकियों में।

ग्रीन बिल्डिंग उच्च गुणवत्ता वाली हवा बढ़ाकर वायु प्रदूषण को कम करने में है फायदेमंद, इनके निर्माण से मनुष्य बनता है सुखी और सेहतमंद।

रेनवाटर हार्वेस्टिंग और वाटर रीसाइक्लिंग का भी होता है हरित भवनों में पूरा इंतजाम, इससे हम दे सकते हैं प्राकृतिक संसाधनों को बचाने के काम को बखूबी अंजाम।

इसलिए ग्रीन बिल्डिंग ही हैं पर्यावरण अनुकूल आवास, आशा है आप सभी को भी हो गया होगा इस बात का अच्छी तरह आभास।



आभास मुखर्जी

द एनर्जी एंड रिसोर्सेज इंस्टीट्यूट (टेरी) में संचार और प्रकाशन प्रभाग में संपादक के रूप में कार्यरत

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Community-driven Nature-based Solutions as a Super Strategy Against Climate Change

Article by **Arshan Hussain** establishes how natural climate solutions work against climate change, either by putting a cap on energy emissions or by sequestering carbon from the atmosphere. Inclusion of the case studies authenticates how nature-based solutions (NbS) are helping local communities fight against climate change. Local communities have a sound knowledge of their ecosystems. By inviting their early participation in designing these initiatives, NbS is bridging the gap between them and the state to fight climate change even on the smallest possible level.

Arshan Hussain



Arshan Hussain writes extensively on about architectural history, sustainability, cinema, pop culture, and art. He is a contributing writer for *Architectural Digest* and *LA Journal of Landscape Architecture*. The principal areas of his research include the intersections of built environment, cinema, and politics.

There is no denying that unstable climate is the biggest challenge that the world faces today. According to the World Health Organization (WHO 2023), 3.6 billion people inhabit areas that are more likely to fall prey to the effects of climate change. That is close to half the population of the world which is living in cities. It is well understood that cities have a fair share in contributing to this change, with almost 75% energy-related emissions that lead to increasing temperatures coming out of urban areas. Scientists and experts have established that planet earth needs to maintain a 1.5°C (2.7° F) warming average, beyond which the consequences can be far more catastrophic than the recurring wildfires and floods of recent times. They have also pointed out that the gradual loss of green cover with the advent of urbanization has aggravated the problem. At this point, cities need a radical shift in their course towards the future through a rigorous

reconsideration of construction, habitation, and transportation.

The last many decades have seen a significant surge in world governments taking interest in proposing long-term goals and plans that aim at mitigating the global effects of climate change. City councils, authorities, and small communities have demonstrated that local-level efforts can also usher the world towards a climate-positive

future. There are innumerable examples across different scales that deserve global attention as models that (if adopted contextually) can bring a sea change in positively healing the planet and averting the biggest challenges of our time.

Over the last few years, studies and experiments have turned many practitioners of the built environment towards vernacular means of building as they were

more suited to the local climates. For instance, in some cases, mud construction is more preferable to carbon-intensive concrete for low-cost housing.

Similarly, nature-based solutions (NbS) are also gaining popularity as super solutions against climate change for their cost-effective and easily executable approach. Any intervention that uses nature or natural functions for protecting, conserving,



Image 1: Recurrent wildfires and floods have been a wakeup call for the climate change action

Source: rawpixel



Image 2: Seychelles local community is working with the government to restore their depleted mangrove forests
Source: UNEP/Flickr

restoring, or sustainably using or managing ecosystems may fall under the umbrella term of NbS. To specifically address climate change, a subset of NbS known as natural climate solutions is gaining widespread adoption in public and private spheres worldwide, especially in the Global South. Natural

climate solutions work against climate change either by putting a cap on energy emissions or by sequestering carbon from the atmosphere.

A story from east Africa shows how the coming together of governments and local communities can help

implement such strategies efficiently. The Seychelles archipelago faced the disappearance of almost 70% of its mangroves due to human activities. These wetlands were the island folks' shield against imminent threats like soil erosion and rising sea levels. The Government of Seychelles is now working with the indigenous people to restore the disappearing mangroves. Once replenished, the mangroves have the potential of sequestering approximately 2.5 million tonnes of carbon dioxide, which is equivalent to getting rid of 500,000 cars off the road for a year.

Rwanda's capital city Kigali is another commendable case from east Africa. The city carried out the restoration of a 120-hectare wetland by clearing industrial infrastructure that had taken its place. It is now thriving with an ecotourism park that helps the inhabitants with revenues through tourism.

With the cities heating up at a rapid rate, there are many cases where natural climate solutions were effective in bringing down local temperatures. In a similar effort in India, the Maharashtra state government has proposed a 3.2-acre urban forest in Mumbai that would address urban heat island effect and help bring down temperature by 3°C (5.4°F) (SEforALL 2023).

A little farther north, in the city of Jaipur, the World Resources Institute initiated nine NbS interventions that entailed



Image 3: A glimpse of the workshops conducted on rooftop urban farming in Jaipur to educate the students and local community

Source: WRI India

implementing urban forests and farming across institutions like prisons, universities, and schools. Besides using workshops to empower the communities with local heat mitigation know-how, the initiatives also supported them with food security and employment (Kapoor and Thyagarajan 2023). In such cases, local communities have a sound knowledge of their ecosystems. By inviting their early participation in designing these initiatives, NbS is bridging the gap between them and the state to fight climate change on the smallest level possible.

The NbS comes with multifold benefits, from open recreation spaces for communities, ensuring food security and a clean atmosphere to uplifting local economies and disease control. Practices like NbS can help cities spread climate change awareness on a grassroots level from where positive change can emerge and scale up. When taking strides towards the arduous battle of saving our planet, it is vital to know that every step counts. Everything that makes us more dutiful towards our planet and has the potential to drive the posterity to being mindful is worth the effort.

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The Symphony of Sustainable Dreams

In the quiet dawn, where hope begins to gleam,
We gather together, to build a shared dream.
A future of balance, where earth and life align,
A symphony of sustainable dreams, by hearts
that intertwine.

With each brick laid, a promise we make,
To nurture our planet, for the future's sake.
Solar panels catch the golden sun's kiss,
In this vision of tomorrow, nothing is amiss.

Rivers run clear, free from the stain of past,
Forests stand tall, resilient and steadfast.
Wind whispers through turbines, a melody so
pure,
In this journey of ours, of one thing we're sure.

We walk this path, hand in hand,
Across cities and deserts, through every land.
Communities rise, in unison they stand,
Building resilience, with every grain of sand.

From bustling streets to serene countryside,
We weave the threads of a world with nothing
to hide.
Green roofs flourish, gardens grow wild,
In this symphony of dreams, the earth smiles.

Electric cars hum softly, a gentle refrain,
On roads where nature and technology sustain.
Buildings breathe with life, clad in nature's attire,
Each one a testament to our burning desire.
To heal, to mend, the wounds of yesteryears,
To forge a future, free from fears.
Every small effort, every grand scheme,
Contributes to the symphony of sustainable
dreams.

Children's voices ring out, clear and bright,
In schools that teach respect for nature's might.
They learn to cherish, to guard and to protect,
A legacy of love, in every project.

The night sky, unpolluted, reveals its stars,
Guiding us forward, no matter how far.
We rest beneath its canopy, in peace,
Knowing our efforts will never cease.

For this is the dream we strive to achieve,
A world of harmony, where we all believe.
In the power of unity, in the strength of our cause,
Together we advance, without pause.

The symphony of sustainable dreams, a melody
so fine,
A collective effort, a shared design.
In every action, in every voice,
We find our purpose, we make our choice.

To live with compassion, to act with care,
To leave a legacy of which we're aware.
A sustainable future, where all can thrive,
In this beautiful symphony, we come alive.



Ar. Kiranjeet Kaur

Environmental Architect
and Researcher with a
master's in environmental
architecture from MGM
University



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An MoU was signed between UNSW and TERI to promote collaborative research, knowledge sharing, and capacity building

DEAKIN UNIVERSITY IN MELBOURNE, AUSTRALIA

GRIHA Council and TERI team during their visit to Deakin University in Melbourne, Australia



The Buildings and Climate Global Forum in Paris, France

GRIHA Council and TERI team at The Buildings and Climate Global Forum in Paris on 7-8 March 2024 which was the first of its kind. It was co-organized by France and UN Environment Programme (UNEP), with the support of the Global Alliance for Buildings and Construction (GlobalABC)



COP 29, Baku

GRIHA Council and TERI at the COP29 Baku

15th GRIHA SUMMIT



Dr Vibha Dhawan, President, GRIHA Council and Director General, The Energy and Resources Institute (TERI); Shri Pramod Kumar Tiwari, Director General, Bureau of Indian Standards (BIS), Ministry of Consumer Affairs, Food & Public Distribution, Government of India; Prof. Ar. Abhay Vinayak Purohit, President, Council of Architecture (COA); and Mr Sanjay Seth, Vice President and Chief Executive Officer, GRIHA Council and Senior Director, The Energy and Resources Institute (TERI), lighting the lamp at the inauguration of the 15th GRIHA Summit



Welcome Address by Dr Vibha Dhawan, President, GRIHA Council and Director General, TERI



Thematic Track by Ms. Shabnam Bassi, Deputy CEO-cum-Secretary & Treasurer, GRIHA Council & Director, TERI; Ms Steffi Elsy Xavier, Artist (Visual/Performing); Prof. Bhaskar Mitra, Director - School of Design, Presidency University Bangalore; and Mr. Kaushlendra Narayan, Director Garmenting Operations & Outsourcing, Raymond Ltd.



Felicitation of rated projects during the GRIHA Summit



Special Address by Dr Ajay Mathur, Director General, International Solar Alliance (ISA)



Cultural night at the 15th GRIHA Summit



Inauguration of GRIHA exhibition 'Vikalp' by Shri Pramod Kumar Tiwari, Director General, Bureau of Indian Standards (BIS), Ministry of Consumer Affairs, Food & Public Distribution, Government of India; Prof. Ar. Abhay Vinayak Purohit, President, Council of Architecture (COA); Dr Vibha Dhawan, President, GRIHA Council and Director General, The Energy and Resources Institute (TERI); and Mr Sanjay Seth, Vice President and Chief Executive Officer, GRIHA Council and Senior Director, The Energy and Resources Institute (TERI)



Plenary Session by Ms. Urmi A Goswami, Assistant Editor, The Economic Times; Ms. Varsha Raikwar, RJ at Radio Bundelkhand, Development Alternatives; Mr. Aalekh Kapoor, Actor and Influencer; Mr. Anuj Ramatri, Founder, EcoFreak & Sustainability Influencer; Mr. Khurafati Nitin, Radio Jockey (RJ), BIG FM 92.7; Mr. Ayushman Pandita, Digital Creator & Founder, Growth Rocket; and Ms. Navya Singh, Climate Action Journalist



Students at the felicitation ceremony of the GRIHA trophy at NASA



A Memorandum of Understanding was signed between GRIHA Council and Smart Surfaces Coalition (SSC) by Mr. Sanjay Seth, CEO, GRIHA Council & Mr. Greg Kats, Founder and CEO, Smart Surfaces Coalition



Valedictory address by Ms. Leena Nandan, Secretary, Ministry of Environment, Forest and Climate Change (MoEFCC)



Release of the GRIHA Annual Magazine 'Shashwat - Let Nature Be' in the presence of the eminent dignitaries. Ms. Shabnam Bassi, Mr. Greg Kats, Ms. Sunaina Singh, Mr. Sanjay Seth, Dr Vibha Dhawan, Ms. Dipa Bagai and Mr. Sameer Pandey



Team GRIHA at the closing ceremony of the 15th GRIHA Summit

Pushpangan: a model of sustainable living in Noida, India

This piece of writing, contributed by **Vaishaly** makes us aware of a sustainability model—Pushpangan—developed by Doodle Studio Private Limited. The Pushpangan, amidst the urban landscape in Noida, is one-of-its-kind architecture that has been thoughtfully developed and includes nearly every parameter of sustainability—from optimum daylight to water conservation, to energy conservation, to waste management, and much more. Every reader after going through this article would agree that Pushpangan is a source of both light and sight when it comes to conventional approaches to building design and construction, offering a blueprint for creating resilient, energy-efficient, and environmentally responsible homes in the 21st century.



Image 1: Night view showcasing key features and savings

Vaishaly



Vaishaly is an architect and sustainability consultant, founder at Doodle Studio. With global experience, she envisions a harmonious world with sustainable building techniques, focusing on design leadership, high-performance building optimization, and energy efficiency. She is a B. Arch. from the Birla Institute of Technology. She could be approached via <vaishaly.archi@gmail.com>.

Pushpangan

In the bustling city of Noida, India, amidst the urban landscape, Pushpangan emerges as a testament to sustainable architecture and innovative design. Designed and executed by Doodle Studio Private Limited, this net zero-energy residence spans on a 200-m² plot area in a row-housing settlement with shared walls. Erected as a G+3 structure, including a semi-basement, it stands as a model of environmental stewardship and energy efficiency, adhering to local building bye-laws while integrating passive and green technologies.

Thoughtful Site Selection and Orientation

Pushpangan's journey towards sustainability begins with its strategic site selection and orientation. Situated on Noida Development Authority-approved

land previously graded for residential-cum commercial use, the site was chosen for its east-facing orientation, optimizing natural sunlight and ventilation, supplemented by its proximity to amenities and public transport, including multiple metro stations and an auto stand within easy reach. Despite the absence of

mature trees except for one roadside specimen thoughtfully retained, the architects maximized the site's potential by incorporating a rooftop garden and green spaces strategically placed to minimize heat island effects and maintain a conducive microclimate.

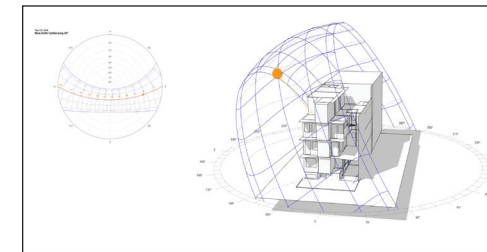


Figure 1: Sunpath and shading analysis

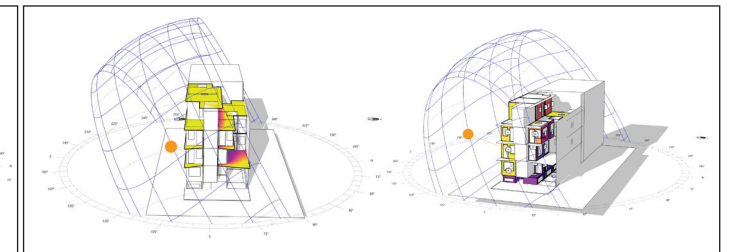


Figure 2: Radiation analysis on walls, roof and windows

Design for Optimum Daylight and Ventilation

Central to Doodle Studio's design philosophy is optimizing natural daylight and ventilation. The architects have eschewed the need for ducts or exhausts in washrooms by strategically placing them along exterior walls, aided by a bamboo screen on the staircase that promotes airflow while mitigating heat gain, creating interesting play of light and shadow throughout the day. A first-floor terrace garden not only serves as a tranquil outdoor space but also acts as a thermal buffer, reducing indoor temperatures and enhancing overall comfort. Meanwhile, a

double-height ceiling on the ground floor fosters a stack effect, improving air circulation and allowing natural light to permeate deeper into the living spaces.



Image 2: Bamboo screen allows light and ventilation in non-habitable area



Image 3: First floor terrace garden allows light and ventilation in interiors while maintaining microclimate

Innovative High-performance Building Design

Pushpangan pioneers sustainable solutions through a combination of passive design strategies and advanced technologies. High solar reflective index (SRI) flooring on the roof and high SRI white paint on

the exterior minimize heat absorption, while strategically placed shading devices and vegetation reduce direct solar radiation. The integration of a solar photovoltaic (PV) system on the roof, designed to offset energy consumption, also helps reduce heat gain. Detailed radiation analyses guided the placement of these elements, ensuring optimal performance

and aesthetic harmony. This comprehensive design approach achieves 71% appropriate daylighting and approximately 70% views, creating a well-lit and aesthetically pleasing environment throughout the residence. Supported by software simulations, these strategies effectively reduce the building's overall carbon footprint.

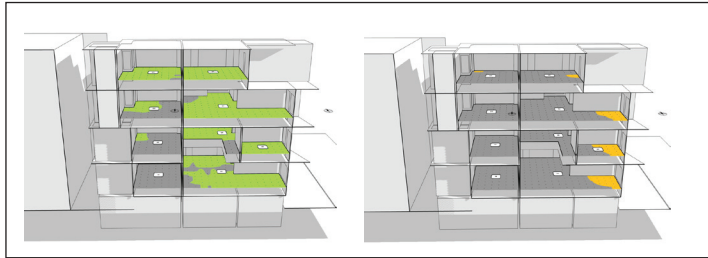


Figure 3: Annual daylight analysis

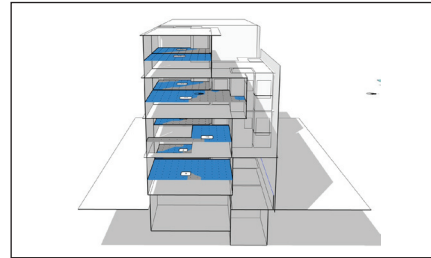


Figure 4: Views analysis

Water Conservation and Sustainable Practices

Water conservation is paramount at Pushpangan, with all bathroom fixtures boasting low-flow rates and water closets that consume a mere four litres per full flush. Wastewater from the reverse osmosis (RO) system is repurposed for cleaning and irrigation, achieving over 32% water savings. Green spaces are strategically designed not only to enhance aesthetic appeal but also to promote groundwater recharge, reducing the burden on municipal resources and fostering a more sustainable urban ecosystem. By maximizing green spaces, Pushpangan not

only mitigates the heat island effect but also maintains a conducive microclimate around the residence.



Image 4: Retained existing tree while increasing landscape area



Image 5: Increased green area to allow groundwater recharge

Sustainable Building Materials and Interiors

The construction of Pushpangan emphasizes eco-friendly materials sourced locally within a 400-kilometre radius, minimizing transportation emissions and supporting regional economic growth. Key materials include fly ash bricks, Pozzolana Portland Cement (PPC), rapidly renewable

bamboo, and UPVC doors and windows, which enhance thermal insulation and soundproofing. Structural optimization reduces reliance on steel and concrete, while bamboo and gypsum in false ceilings, along with natural stone, Indian granite, and ceramic tiles for flooring, further lower the building's carbon footprint. Reclaimed and Forest Stewardship Council (FSC)-certified wood and refurbished furniture are integral

to the design, emphasizing sustainability. Use of minimalistic mild steel railings and gates complement the commitment to energy efficiency and environmental stewardship. The thoughtful selection of materials extends to adhesives, paints, and sealants with low volatile organic compounds (VOC) content, ensuring a healthy indoor environment for occupants by maintaining indoor environmental quality.



Image 6: Use of natural FSC-certified wood



Image 7: Use of refurbished furniture in the interiors

Energy Efficiency and Waste Management

All appliances meet 4 to 5-star Bureau of Energy Efficiency (BEE) ratings and Energy

Conservation Building Code compliance standards. BLDC fans and exhaust systems further minimize energy consumption, while energy-efficient light-emitting diode (LED) lighting maintains optimal illumination

levels throughout the residence. The building's total energy consumption is capped at 11,491 kilowatt hours (kWh) annually, achieving an impressive energy performance index (EPI) of 26 kWh/m²/year. The seamless

integration of 10 kW on-grid solar PV system not only offsets this energy consumption but also generates surplus energy, leading to substantial long-term savings

and contributing positively to the environment along with the return of investment of less than 4.5 years. Waste management practices include daily

segregation of waste into dry and wet categories, promoting responsible disposal and recycling within the community.

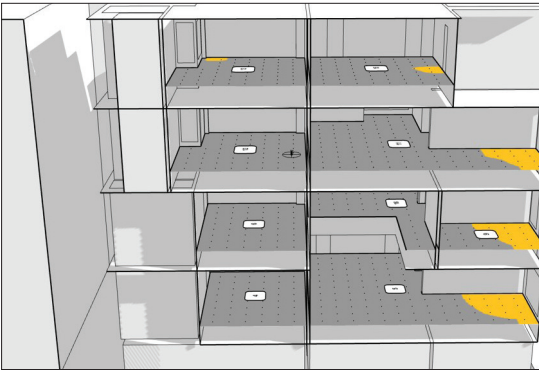


Figure 5: Energy model

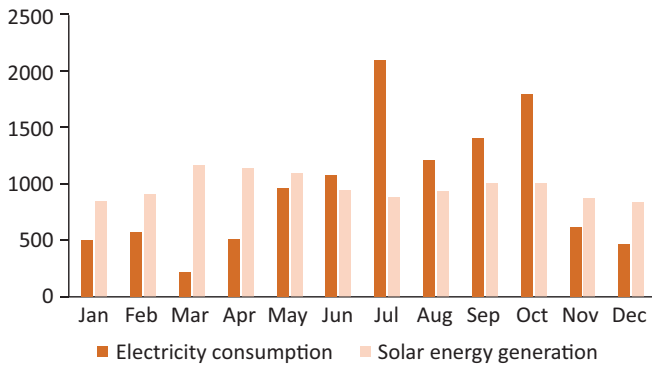


Figure 6: Monthly energy consumption v/s solar energy generation



Image 8: Solar PV (10kW) installed on the rooftop

Vastu Compliance and Inspiration for Sustainable Living

Pushpangan is designed not only for sustainability but also for cultural harmony, adhering to Vastu principles that align with traditional Indian architectural beliefs. This holistic approach ensures that the residence promotes well-being and positivity among its occupants. Pushpangan stands as a testament to the potential of sustainable architecture

in addressing contemporary environmental challenges. By integrating innovative design, passive strategies, and advanced technologies, Doodle Studio Private Limited has created a residence that not only meets the highest standards of energy efficiency but also enhances quality of life for its occupants.

As a model of sustainable living, Pushpangan, demonstrates that through thoughtful site selection, strategic orientation, and the conscientious use of materials and resources, it is possible to achieve net zero-energy goals

while minimizing environmental impact. This net zero-energy residence not only serves as a home but also as an inspiration for future developments in sustainable urban living. By adopting similar principles and practices, individuals, and communities can contribute to a greener, more sustainable future. Pushpangan invites us to rethink conventional approaches to building design and construction, offering a blueprint for creating resilient, energy-efficient, and environmentally responsible homes in the 21st century.



Image 9: Day view of the residence flaunting its minimal yet sustainable design

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18,69,208 kL

Water reduction achieved



27,142 tonnes

Organic waste treated



28,414 kL
Rainwater recharge



65,129 tonnes
Waste diverted from Land fill



15,659 kWp
Total capacity of renewable energy Installed



19,780 tonnes
CO₂ Reduced



7,18,706
Trees planted



Ancient Wisdom, Modern Science, Climate Disaster: an understanding of the Himalayan Manjistha

This article penned by **Mehak Kaur** and **Dr Mayurika Goel** enlightens us about the relevance of medicinal plants found in India. At the same time, the authors are making us aware of the consequences of the climate change which itself is a consequence of anthropogenic activities on these medicinal plants. The Himalayan Manjistha is one such plant that has been brought nearly to the verge of extinction because of unsustainable practices.

Mehak Kaur



Mehak Kaur is Research Scholar in Sustainable Agriculture Programme at TERI. She is a gold medallist in Masters, TERI-SAS and recipient of DST-INSPIRE Fellowship, 2024. She has been exploring sustainable products like pigments and nutraceuticals from natural resources since her association with TERI. She can be contacted through <kaurmehak0789@gmail.com>.

Dr Mayurika Goel



Dr Mayurika Goel, Fellow, Sustainable Agriculture Programme, TERI, is a recipient of DST-SERB-Early Career Research Award (2016), European Union's Erasmus Mundus Fellowship (2012-13) and Visiting Research Scholar (2009-10) at George August University of Goettingen, Germany. She has contributed extensively to the research fraternity with 35 research publications, international/national conference papers, proceedings (28) including 12 high impact factor peer-reviewed international publications, 6 book chapters, and 1 book to her credit. She can be reached at <mayurika.goel@teri.res.in>

India is renowned for its traditional medicinal knowledge and its repository of medicinal plants used in Ayurveda (1400-1800 species), Siddha (500-900 species), Unani (400-700 species), Homeopathy (about 372 species), Sowa-Rigpa (about 250 species), and 7500 medicinal plants in Indian Folk Medicine. One of the four biodiversity hotspots of the country, the

Himalayan mountain region, is home to unique medicinal flora on which its indigenous population relies on for sustenance, health care, and economic activities. Approximately 95% of the medicinal plants utilized in India's herbal industry are harvested from the wild, with about 10% being actively traded and facing the threat of extinction. Among these vulnerable species is *Rubia*

cordifolia, a member of the coffee family, commonly referred to as Indian madder, aromatic madder, madderwort, manjistha, or manjith (Image 1). It is one of the highly traded medicinal plants with an annual demand of 100-200 metric tonnes in Uttarakhand alone and the roots priced around INR3000 per kilogram. Traditionally cultivated in the north-western Himalayas as living



Image 1: Parts of Manjistha plant

fences to deter livestock, Indian madder has been a historically significant and vital source of red pigment across Asia, Europe, and Africa.

Traditional Knowledge: when an elder dies, a library burns

The traditional knowledge of local tribes passed across generations as heritage is supporting around 60–80% of the world’s population with natural resources. Historically, Manjistha’s roots were the natural red dye for textiles, paints, and cosmetics while the crushed fruit juice was a unique greenish-blue ink. Manjistha has a deep-rooted history in traditional medicine for curing scabies, joint pains, chest pains, rheumatism, fungal foot infection, and dermatological conditions such as hyperpigmentation, acne, allergies, eczema and other disorders. Ethno-medicinal practices utilize the roots for urinary tract infections, fevers, ocular ailments, liver dysfunction, menstrual irregularities, and splenomegaly while exhibiting astringent, blood purifying and antibacterial activities. Crushed roots are applied to insect bites, including those from venomous species such as cobras and scorpions. Leaf and stem pastes serve as a traditional vermifuge, potentially expelling parasitic worms (Figure 1). The plant was used as feed for lepidopteran larvae, humming birds, hawk

moths, and grazing animals. Ethno-veterinary practices employ its leaves to treat inflammation in cattle mammary glands, haemorrhagic diarrhoea in new-born calves, and as a topical treatment for fleas, ticks, and mites. Its ecologically significant extensive root system contributes to soil conservation efforts, particularly on slopes, by preventing erosion (Wen, Chen, Chen, *et al.* 2022).

Modern Science Steps in: Madder mystery solved!

Manjistha is not only colouring the traditional medicinal

knowledge but also spreading its hues in the current world through modern science validations. The roots of the plants are used in several Ayurvedic formulations for various skin ailments, gastrointestinal problems, blood purification, kidney and liver diseases, urinary tract infection, and other general illness. Its ethno-medicinal applications have been linked to the identification of secondary metabolites (nature’s defence knights) such as alizarin, mollugin, munjistin, purpurin, rubiadin, cordifoliol, and their derivatives. These complex compounds have been verified to possess various pharmacological activities including anticancer,

antioxidant, hepatoprotective, nephroprotective, radiation protection, antimicrobial, wound healing, antidiabetic, antineoplastic, antiulcer, anti-inflammatory, antidyenteric, neuroprotective, antimalarial and wound-healing either alone or in consortium. Purpurin, alizarin, and munjistin bridge the gap between traditional and modern applications. Not only do they contribute to the plant’s characteristic hues, but they have also been identified as the colouring agents utilized in dyeing processes. This captivating synergy between nature’s pigments and therapeutic potential exemplifies Manjistha’s multifaceted essence (Kumari, Kaurav and Choudhary, 2021). The plant has established

its importance in several herbal and cosmeceutical products as shown in Figure 2.

Threatened Wisdom: stranger dangers of climate change and anthropogenic practices

Manjistha is one of the most important Indian medicinal plants identified in the Red List of International Union for Conservation of Nature (IUCN) (Gowthami, Sharma, Pandey, *et al.* 2021). It has been classified as the species utilized in the

high-volume trade that urgently need conservation efforts. Despite its presence across varied conditions, climate change is causing habitat degradation and fragmentation, posing a threat to its survival. Research suggests that climatic shifts could drive the species towards extinction or force its migration to cooler, higher altitudes, impacting remote local and tribal communities. Moreover, elevated carbon dioxide levels may disrupt its life cycle, medicinal efficacy, and distribution (Manish 2022). Reduction in key metabolites such as purpurin and mollugin with increasing altitude, poor soil conditions, and rising temperatures has also been noted (Wang, Liu, Zhang, *et al.* 2024). Putting oil in the fire by the overexploitation and unscientific harvesting of the plant for commercial purposes is leading to drastic decline in its number in certain environmental niches. The lack of stringent regulatory measures designed to safeguard indigenous knowledge and ensure sustainable extraction of medicinal plants has failed to protect these resources from exploitation by the paws of opportunists.

Manjistha’s future: a gateway to sustaining the Himalayan ethno-medicine

Despite significant research on the pharmaceutical potential of

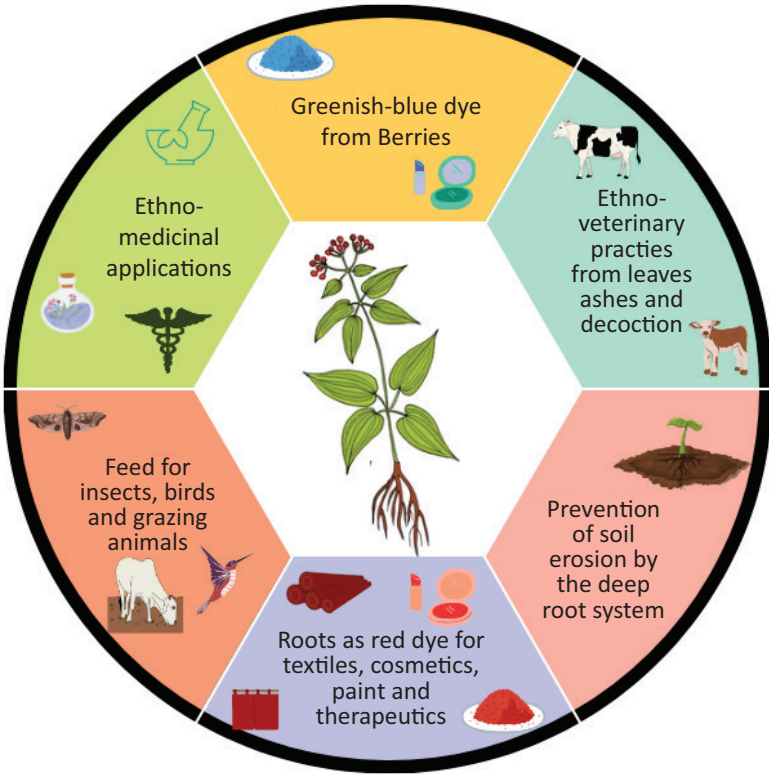


Figure 1: Traditional uses of Manjistha

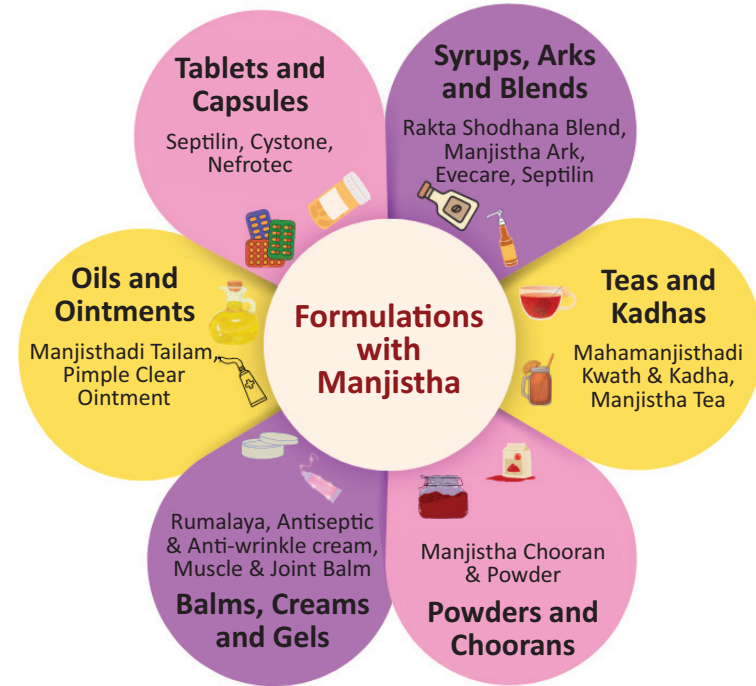


Figure 2: Products from Manjistha

Manjistha, further investigation is needed to explore its long-term synergistic effects with other drugs. The Himalayan ecosystems are especially susceptible to climate change, yet studies on its impact on medicinal plants remain only a handful. To counteract this decline, measures such as *in-situ* habitat mapping for manjistha, exploring endophytes for microbial metabolite production, establishing herbal gardens for *ex-situ* conservation, implementing sustainable harvesting protocols, training locals in sustainable practices, educating youth on medicinal plant conservation, and long-term monitoring and documentation should be employed. Conservation strategies must be revamped integrating climate change impacts, especially since the Himalayas are warming three times faster than the global average. The Indian government, through initiatives such as the Ministry of AYUSH (Ayurveda,

Yoga and Naturopathy, Unani, Siddha, and Homoeopathy), the National Medicinal Plant Board (NMPB), the e-charak platform (e-Channel for Herbs, Aromatic, Raw Material, and Knowledge), and cultivation subsidies, is promoting the conservation of threatened and endangered traditional medicinal plants including Manjistha. By ramping up cultivation of medicinal plants and safeguarding traditional herbal knowledge, we will be preserving the rich biodiversity of the Himalayas while sowing the seeds for a sustainable and prosperous future.

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परिंदे कैद हैं

पढ़े लिखें परिंदे कैद हैं, माचिस से मकान में।
9 से 6 की ड्यूटी, और मानसिक थकान में॥

मन गांव में ही रह गया, शरीर शहर का वासी है।
ताजा बस, ख़बर यहाँ, तासीर बासी-बासी है॥

दो जन दोनों कमाने वाले, बच्चों को कौन संभाले।
टारगेट के पीछे भाग रहे हैं, तन को कर, बीमा के हवाले॥

यारों का न संग रहा, न न्योता न व्यवहार।
खुद के घर जाते हैं बन, जैसे रिश्तेदार॥

कर बंटवारा एकड़ बेचा, वर्ग फीट के दरकार में।
बिछड़े, पिछड़ा कह के, खो गए अगड़ों के कतार में॥

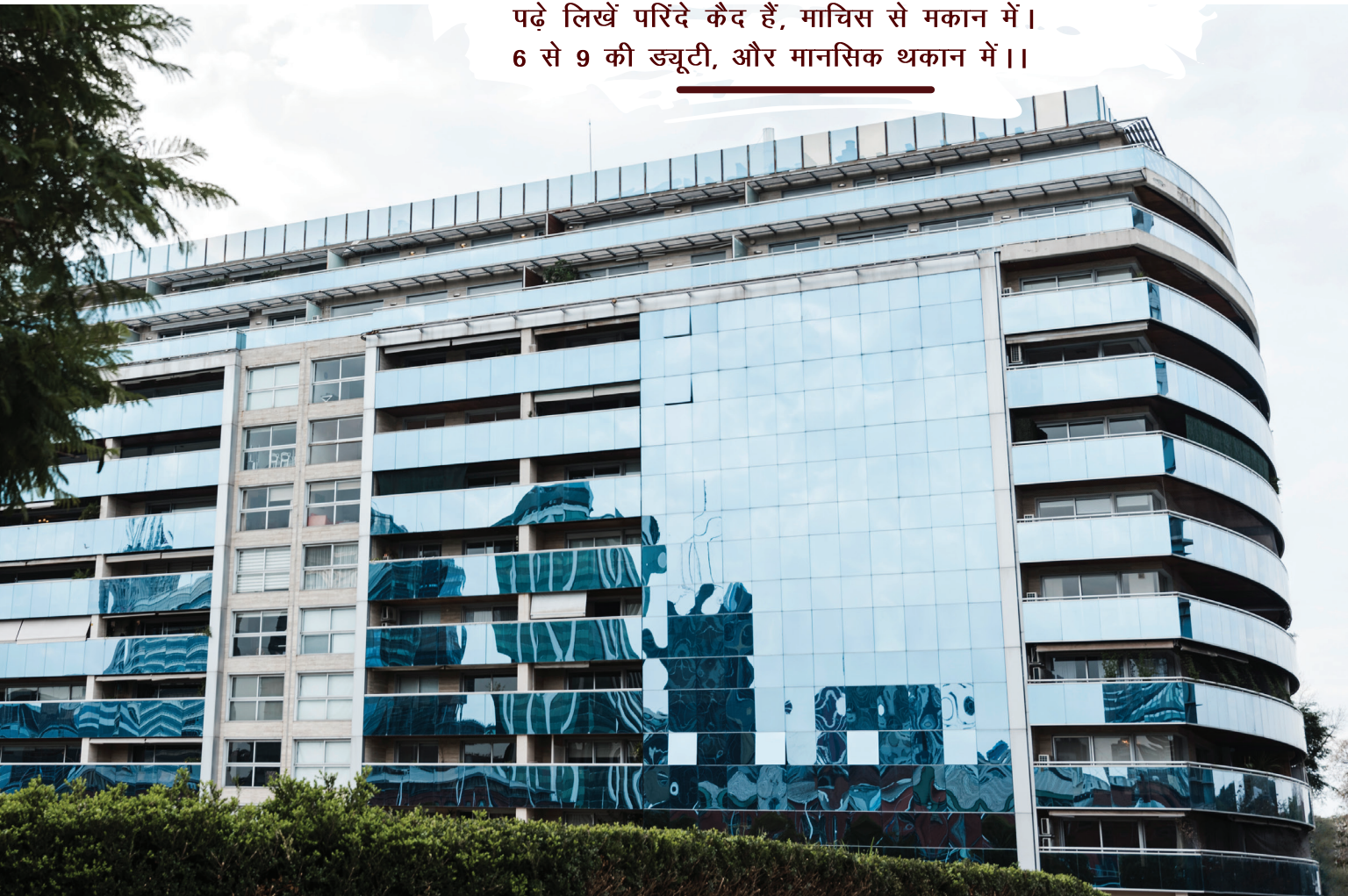
शुरुवाती; मजा बहुत है, एकाकी; स्वप्न; संसार में।
मुसीबत हमेशा हारी है, संगठिक संयुक्त परिवार में॥

मात, पिता न आने को राजी, गांव में नौकरी है कहां जी।
जिनके पास दोनों है बंधुओं, उनका जीवन है शान में

पढ़े लिखें परिंदे कैद हैं, माचिस से मकान में।
6 से 9 की ड्यूटी, और मानसिक थकान में॥

दिगांत चन्द्रा

इलेक्ट्रिकल इंजीनियर, भारतीय
रिजर्व बैंक, लखनऊ



GRIHA Site Visits



LIC Hailakandi Branch Office Building, Assam



Parivesh Bhavan, CPCB, Bhopal



Sales Training Centre, LIC building, Bareilly



Zonal training centre, LIC building, Gurgaon



LIC Western Zonal Training Centre, Akurdi, Pune

From Pollutant to Pillar: can rice straw bricks curb *parali* burning and build sustainable construction?

The practice of burning rice straw, referred to as *parali* or *puaal* significantly contributes to air pollution in India, particularly affecting Delhi, Haryana, and Uttar Pradesh. This article by **Indra Chaurasia**, investigates the potential of using rice straw in cementitious bricks as a sustainable construction material. The study demonstrates that these bricks are cost-effective and can mitigate air pollution. By reducing the chopped rice straw content to 40 kg per 1000 bricks, compressive strength improves when combined with consistent quantities of cement and fine aggregate. The addition of visco additives further enhances the strength, resulting in economical, lightweight, and thermally insulating bricks that support sustainable development.

Indra Chaurasia



Indra Chaurasia, currently working as Architect in Uttar Pradesh Rajkiya Nirman Nigam Limited Lucknow, has a rich and diverse experience of 37 years. She has designed notable structures such as PGI Lucknow, Lok Bandhu Hospital on government degree and inter colleges, the Collectorate, and several auditoriums. Currently, she is working on Critical Care Hospital projects for the Medical and Health Department of the Government of Uttar Pradesh. She could be corresponded via <chaurasiaindra@gmail.com>.

Introduction

Agriculture is the cornerstone of India's economy, accounting for 18% of the gross domestic product (GDP), employing over half of the workforce. Post-harvest practices involve burning rice straw to clear fields quickly which results in severe air pollution. The burning of rice straw causes serious air pollution, health issues, and soil degradation. Despite legislation against this practice, enforcement remains weak. Annually, over 500 million tonnes of crop residues are burned, releasing significant pollutants. This study explored the use of rice straw into cementitious bricks to produce sustainable building materials. Various proportions of rice straw were tested to determine the optimal mix for compressive strength. The use of visco additives significantly improved the strength of these bricks, making them suitable for sustainable



construction. Thus it aimed to find an alternative use for rice straw by incorporating it into cement bricks, thus reducing pollution and contributing to sustainable development.

Objectives

The research discussed in this article evaluates the impact of different percentages of chopped rice straw on cementitious brick mixes, focusing on compressive strength, economic feasibility, thermal insulation, and sustainability compared to commercial cement bricks.

Materials to be used

- Ordinary Portland cement (OPC)
- Fine aggregate siliceous sand
- Coarse aggregate
- Chopped rice straw

- Viscoelastic admixture (Sika Viscocrete)
- Natural fresh water

Literature Review

Several studies have highlighted the potential of rice straw bricks. Allam, *et al.* (2011) found that R-bricks cost 25% less than standard cement bricks while providing economic and thermal benefits. G. Garas, *et al.* (2015) noted that reducing rice straw content to 40 kg per 1000 bricks maximized compressive strength. Bahari, *et al.* (2019) observed significant improvements in compressive strength with viscoelastic admixtures. Raut, *et al.* (2011) reviewed the use of various waste materials in bricks, highlighting their enhanced performance. Chiang, *et al.* (2009) and Lertsatitthanakorn,

et al. (2009) demonstrated the potential for sustainable construction using lightweight bricks and rice husk ash-based blocks, respectively.

Proportion Defining of Materials for Bricks

The study involved mixing rice straw with cement and aggregates in various proportions to find the optimal mix for brick production. The materials were mixed, molded, and cured to produce bricks with different rice straw contents. Viscocrete was added at 1.5% by weight of cement for improved workability.

Sample Casting

Bricks were manufactured using a mobile semi-mechanized egg-

laying machine. The chopped rice straw was added to the mix, which was then molded, vibrated, and cured. Mix C was excluded due to poor consistency (Table 1).

Testing: as observed from various papers

Compressive strength test

The highest compressive strength observed was 3.0852 megapascal (MPa), meeting the requirements for non-structural lightweight concrete.

Specific gravity

Specific gravity decreased with increased straw content, as straw has a lower density than sand and cement. The specific gravity ranged from 1446.705 kg/m³ to 1762.375 kg/m³, classifying it as lightweight concrete.

Water absorption test

Water absorption increased with higher straw content, ranging from 8.1123% to 13.9828%. These values were within acceptable limits.

Fire resistance test

Instrumentation and test setup

The furnace reached up to 1200°C, following the ASTM

119-00a standard fire test curve. Tests were conducted at various temperatures for both cement and rice straw bricks.

Fire tests results and discussion

Rice straw bricks lost up to 70% of their strength at 800°C after one hour, while cement bricks lost 25%. After two hours, rice straw bricks lost 80% of their strength at 700°C.

Economical study

Rice straw bricks cost 25% less than standard cement bricks, providing economic and environmental benefits (Table 2).

Table 2: Cost comparison

Brick type	Cost (₹/1000 bricks)
Commercial standard	8000
Rice straw cement	6000

Conclusion

- Excessive rice straw (90 kg/ 1000 bricks) weakens the bricks.
- Optimal strength is achieved with 40 kg rice straw per 1000 bricks.
- Rice straw bricks are cost-effective, with 25% savings compared to standard bricks.
- Higher straw content lowers specific gravity.

- Visco additives significantly enhance brick strength.
- Rice straw bricks have lower fire resistance compared to cement bricks.
- Suitable for non-load bearing walls if fire exposure is below 400°C.

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Reserve Bank of India, Lucknow

The Reserve Bank of India's office building in Lucknow has proudly secured a 5-star GRIHA rating in the existing buildings category. The journey to this prestigious recognition was a positive and smooth experience, thanks to the cooperative GRIHA officials who guided the team through each step. Remarkably, this accomplishment was achieved without a consultant, despite the challenges of acquiring rating in an already constructed building.

To secure the GRIHA rating, several strategies were implemented to minimize environmental impact. A total of 774 trees were planted and preserved on the site which significantly enhanced biodiversity. Over 50% of hard-paved areas were treated with solar reflective index (SRI) materials to reduce heat absorption. The site was designed to recharge 100% of rainwater, ensuring sustainable water management, while urban farming was introduced to blend agriculture into the urban environment.

Significant efforts in architectural design and energy use reduced the building's energy consumption by 17.92%, with renewable energy sources accounting for 11.21% of total energy use. This was supported by the installation of 75 kWp on-grid and 40 kWp off-grid solar power systems, ensuring a steady supply of clean energy.

Water and waste management were also critical to the sustainability strategy. The building's water consumption was reduced by 71.76% through efficient fixtures and water-saving techniques. A 15-kilolitres per day (KLD) sewage treatment plant (STP) and drip and sprinkler systems contributed to a 73.17% reduction in landscape water use. An organic waste converter (OWC) was installed to process and recycle organic waste on-site.

Sustainability was prioritized in materials used, with eco-friendly products for housekeeping and organic manure for soil health. A vermicompost pit is utilized to reduce waste and produce

Shri Pankaj Kumar
Regional Director, RBI, Lucknow



natural fertilizers. Additionally, lifestyle enhancements included electric vehicle (EV) chargers, dedicated parking spaces, cultural heritage preservation, and maintaining good air quality. Environmental awareness campaigns were conducted to engage stakeholders, embedding sustainability into the building's operation and the broader community.

This achievement highlights the potential of sustainable practices to enhance existing infrastructures, setting a new standard for environmentally conscious operations across the industry.

Testimonial



Lucknow

1st Regional Conclave

20 June 2024



Felicitation of the Jawahar Navodaya Vidyalaya (JNV) schools from the state of Uttar Pradesh that achieved rating under GRIHA Existing Schools during the GRIHA Regional Conclave



Welcome address by Shri Sanjay Seth, Vice President & Chief Executive Officer, GRIHA Council & Senior Director, Sustainable Infrastructure Programme, TERI



Lighting of the lamp by Shri Amrit Abhijat, Principal Secretary, Urban Development Department, Govt of UP; Ms. Dipa Bagai, Country Head, NRDC India; Mr. Anurag Bajpai, Director, GreenTree Global; Mr. Sanjay Seth, VP & CEO, GRIHA Council and Senior Director, Sustainable Infrastructure Programme, TERI; and Ms Shabnam Bassi, Deputy CEO & Secretary, GRIHA Council & Director, Sustainable Buildings Division, TERI



Keynote address by Shri Amrit Abhijat, Principal Secretary, Urban Development Department, Govt of UP during the Inaugural session.



Shri Ashish Tiwari, Department of Environment, Forest and Climate Change, Government of Uttar Pradesh setting the theme of the Plenary Session titled Challenges in Decarbonizing of Construction Industries



Special remarks by Shri B.K. Sinha, Deputy Commissioner, Navodaya Vidyalaya Samiti RO, Ministry of Education, Government of India, Department of School Education and Literacy at the Valedictory Session



Special address by Smt. Sabeena Narula Singh, Chief Architect, Uttar Pradesh Public Works Department at the Valedictory Session



Participants at the Valedictory Session

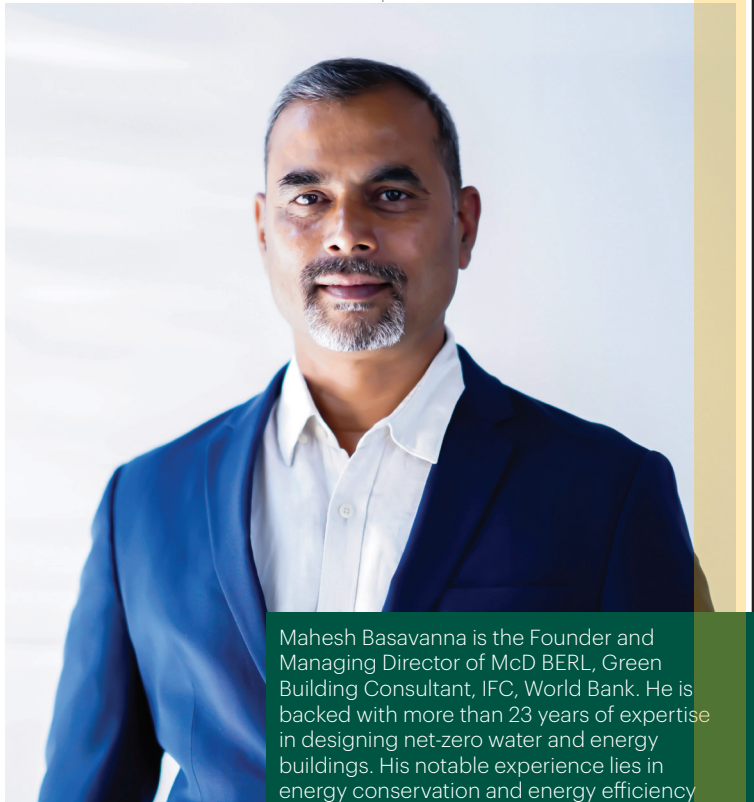


Team GRIHA at the closing ceremony of the 1st Regional Conclave

Accelerating Climate Action by Curbing Building Sector Emissions

The present article is dedicated towards constructive discussion on the building sector and the role it has in the global carbon dioxide (CO₂) emissions. **Mahesh Basavanna** gives us his insights on how addressing the CO₂ emissions from the building sector is not only a necessity but also an opportunity to build a resilient future. We can pave the way for a future when buildings serve as more than just shelter, they can serve as beacons of sustainability. In essence, the effort to lower CO₂ emissions in the construction industry is an effort to create a better, greener, and more just world.

Mahesh Basavanna



Mahesh Basavanna is the Founder and Managing Director of McD BERL, Green Building Consultant, IFC, World Bank. He is backed with more than 23 years of expertise in designing net-zero water and energy buildings. His notable experience lies in energy conservation and energy efficiency work across various projects, including residential and commercial buildings, as well as public facilities. He could be connected via <maresh@mcdberl.com>.

The building sector is a significant contributor to the global carbon dioxide (CO₂) emissions, rapidly depleting our carbon budget and accelerating climate change. Climate actions and the adoption of net-zero solutions are shifting the trend by curbing emissions. By implementing sustainable practices the rate of carbon budget depletion is slowing, showcasing the potential of the built environment to lead in climate action. Of the total worldwide emissions, 37% stems from the building sector (Figure 1). This encompasses both operational emissions (27%) and embodied emissions (10%), which account for the entire lifecycle of a building.

Carbon Budget

The 'carbon budget' refers to the maximum allowable greenhouse gas (GHG) emissions to keep global temperature increase within safe limits, as outlined by international agreements like

the Paris Agreement. According to the Intergovernmental Panel on Climate Change (IPCC), the remaining carbon budgets for limiting warming to 1.5°C and 2°C are critical metrics. Given that the building sector accounts for approximately 37% of total the emissions (IEA 2022), it is allocated a carbon budget of 148 gigatonnes of carbon dioxide (GtCO₂) and 425 GtCO₂ to limit the temperature rise to 1.5°C and 2°C, respectively (Figure 2).

Prospective Analysis

As countries have set the net-zero targets by 2050, over the next three decades the building sector is poised to undergo significant transformations across various key dimensions.

Projection of the Built-up area

Over the next three decades, the landscape of urban development is poised to undergo a transformative expansion (CO₂ Emissions 2050 Forecast). The relentless pace of global construction is set to continue, with an estimated 2.5 billion people expected to move into urban areas by 2050 (Roadmaps for Buildings and Construction | Globalabc 2023, Figure 3). This surge will result in a 52.33% increase in new construction spaces, effectively doubling the global building floor area (CO₂ Emissions 2050 Forecast, *n.d.*).

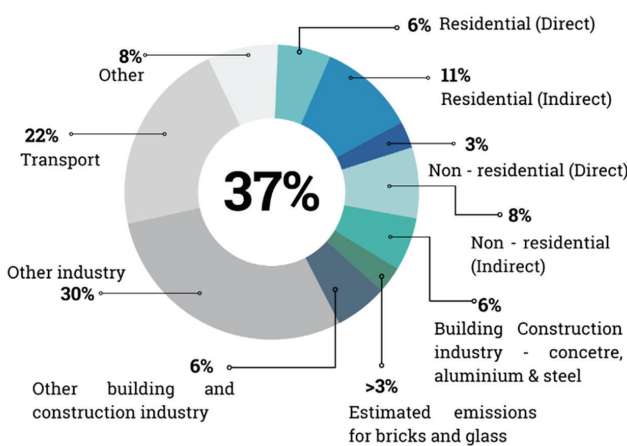


Figure 1: Carbon emissions from building sector

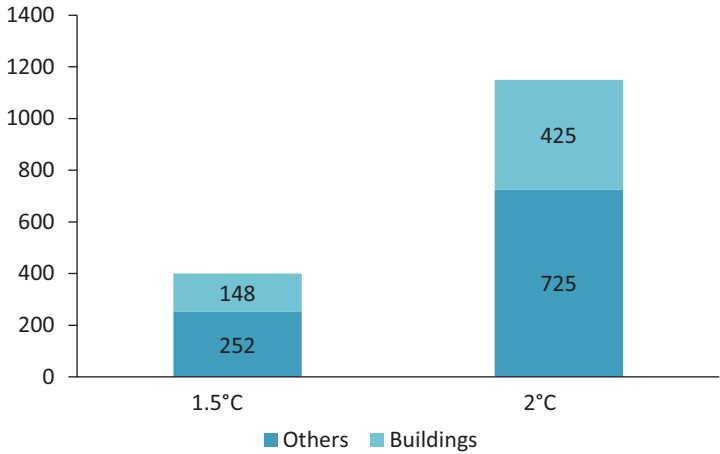


Figure 2: Carbon budget scenarios

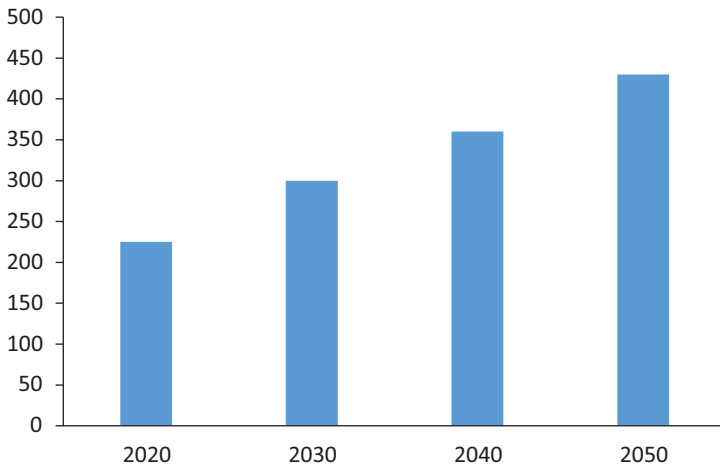


Figure 3: Projection of the built-up area

Comparison of Fossil Fuel and Renewable Energy Production

There is a crossroad between renewable energy and fossil fuel production. From the present day until 2050, there is an anticipated reduction exceeding 49.5% in fossil fuel production (U.S. Energy Information Administration - EIA - Independent Statistics and Analysis, *n.d.*). This trajectory (Figure 4) places the future of fossil fuels at a pivotal juncture, signalling a potential shift in the energy paradigm. The projected data paints an optimistic picture for renewable energy, with production forecasted to surge from 7 trillion kilowatt hour (kWh) to an impressive 22 trillion kWh (Renewable Energy Market Size, Growth, Analysis 2023 - 2030, *n.d.*).

EPI Projection and Building Energy Consumption Analytics

Building energy is measured in terms of energy performance index or EPI (kWh/m²/year). Site EPI is considered in this study. The drive towards EPI values (Figure 5) reflects a commitment to minimizing energy consumption and maximizing performance through innovative technologies, improved

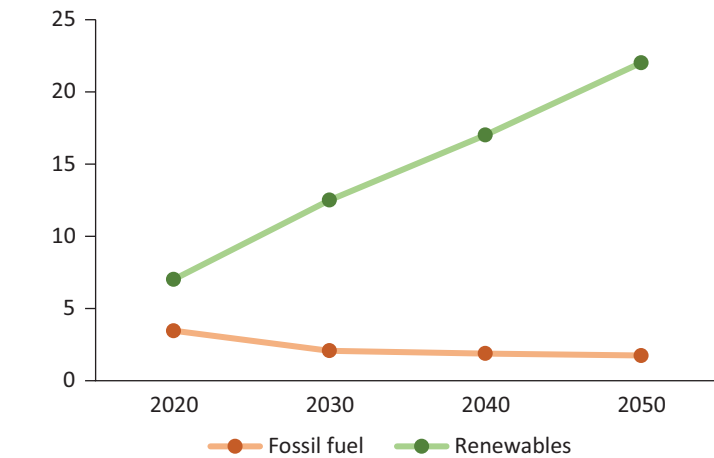


Figure 4: Comparison of fossil fuel and renewable energy production

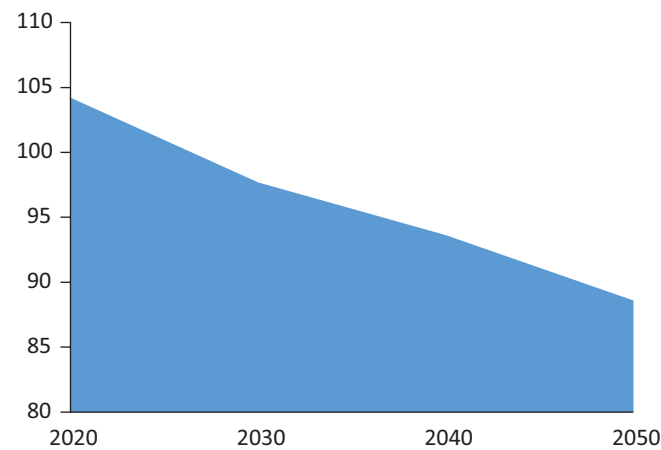


Figure 5: Site EPI projections

insulation, and renewable energy integration.

To align with the net-zero goals as well as India's national missions' optimal energy consumption is crucial. As per the study, global building energy consumption projection graph (Figure 6) shows that there will be 62.75% increase in energy consumption over the next three decades with 52.33% increase in new construction spaces.

Operational Carbon Dioxide Emission from the Building Sector

The building sector is responsible for a major portion of global energy consumption which leads to a significant amount of GHG emission, particularly carbon dioxide. The building sector is responsible for 42% of which 27.3% is due to operational

activity (CO₂ Emissions 2050 Forecast, *n.d.*). Operational CO₂ emissions prediction plunges more than 90% in the next three decades (Figures 7 and 8).

By addressing operational emissions, we can make substantial strides towards achieving sustainability goals, mitigating climate change, and creating more environmentally responsible and energy-efficient systems.

Embodied Carbon Dioxide Emission from the Building Sector

The emission from the embodied category is calculated by comparing the embodied intensity projections with respect to the increasing built-up area due years. Embodied emissions account for 14.7% of the overall emission from the construction sector. More than 20% decrease is seen in the reduction of embodied carbon dioxide emission (2030 Climate Challenge, *n.d.*). This is due to the widespread adoption of low-carbon and carbon-neutral materials, integration of circular economy principles, reuse and recycling of construction materials, etc.

Total Operational + Embodied Carbon Emission from Buildings

The building sector is poised to witness a concerning escalation

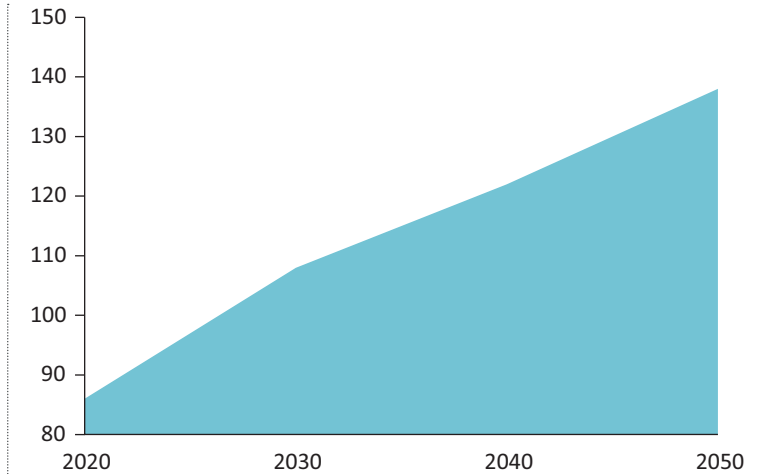


Figure 6: Building energy consumption analytics

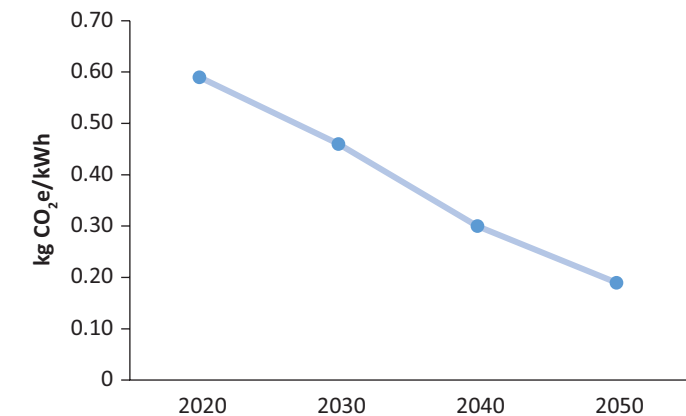


Figure 7: Operational CO₂ intensity projection

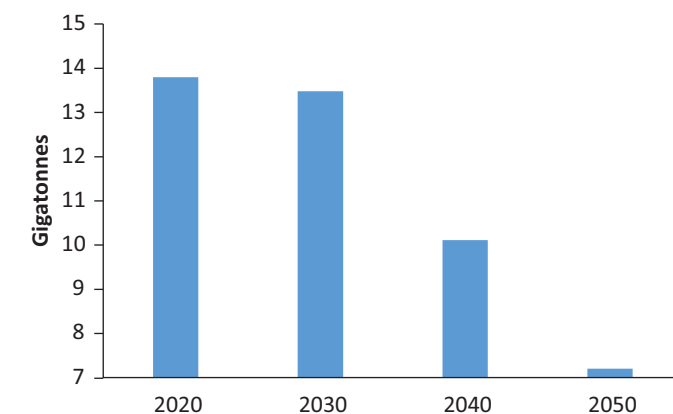


Figure 8: Operational CO₂ emission in Gt

in CO₂ emissions in the coming years. This worrying pattern can be mainly attributed to the paced urbanization and population growth, which are leading to a need for new construction and infrastructure (Figures 9 and 10).

Conclusion

The global CO₂ emissions from the building sector are rising together with the steadily growing built-up area. Figure 11 explains the intense growth of emissions with the business-as-usual scenario and the reduced emission scenario through the next 50 years.

Even with high reduction in the emission after the transition to renewable sources and efficient designs of buildings, the carbon budget from the building sector depletes the remaining 148 GtCO₂ (Figure 12) by 2059 leaving the next 41 years under question. BAU scenario predicts that the remaining carbon budget gets depleted by 2038 leaving the next 62 years under threat.

Addressing the CO₂ emissions from the building sector is not only a necessity but also an opportunity to build a resilient future. We can pave the way for a future when buildings serve as more than just shelter, they can serve as beacons of sustainability. In essence, the effort to lower CO₂ emissions in the construction industry is an effort to create a better, greener, and more just world.

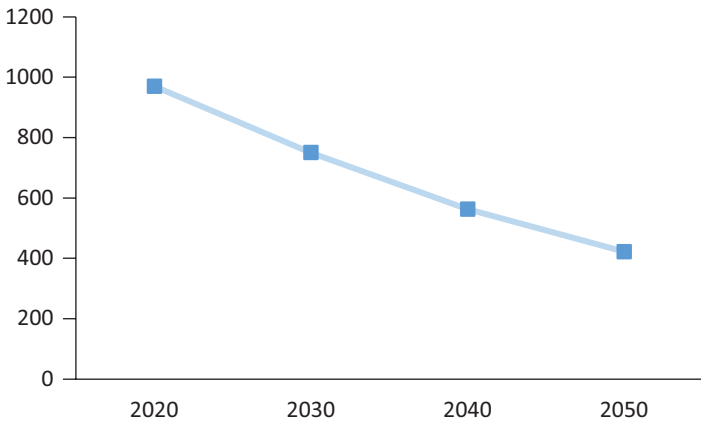


Figure 9: Embodied CO₂ intensity projection

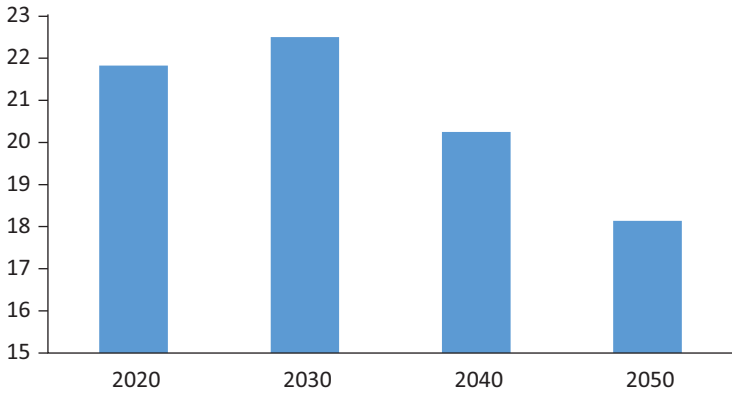


Figure 10: Embodied CO₂ emission in Gt projection

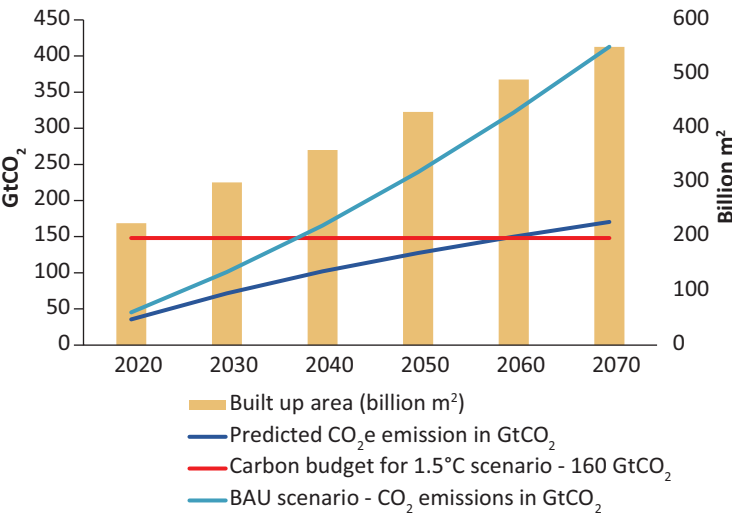


Figure 11: CO₂ emissions' prospective analysis

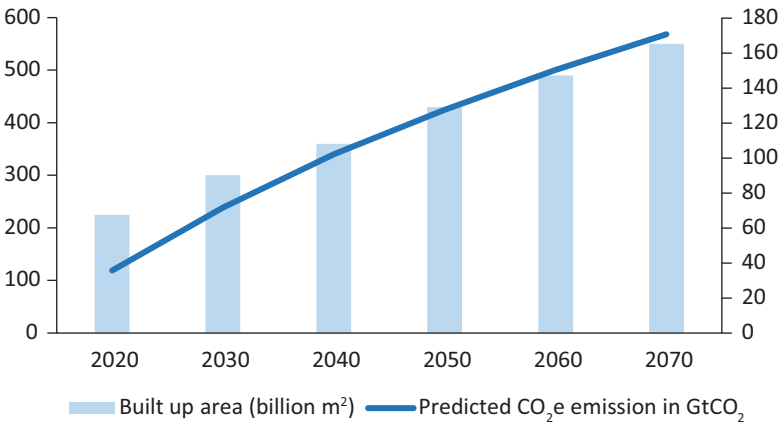


Figure 12: Predicted CO₂ emissions in Gt

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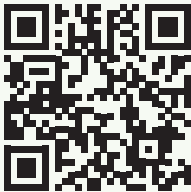
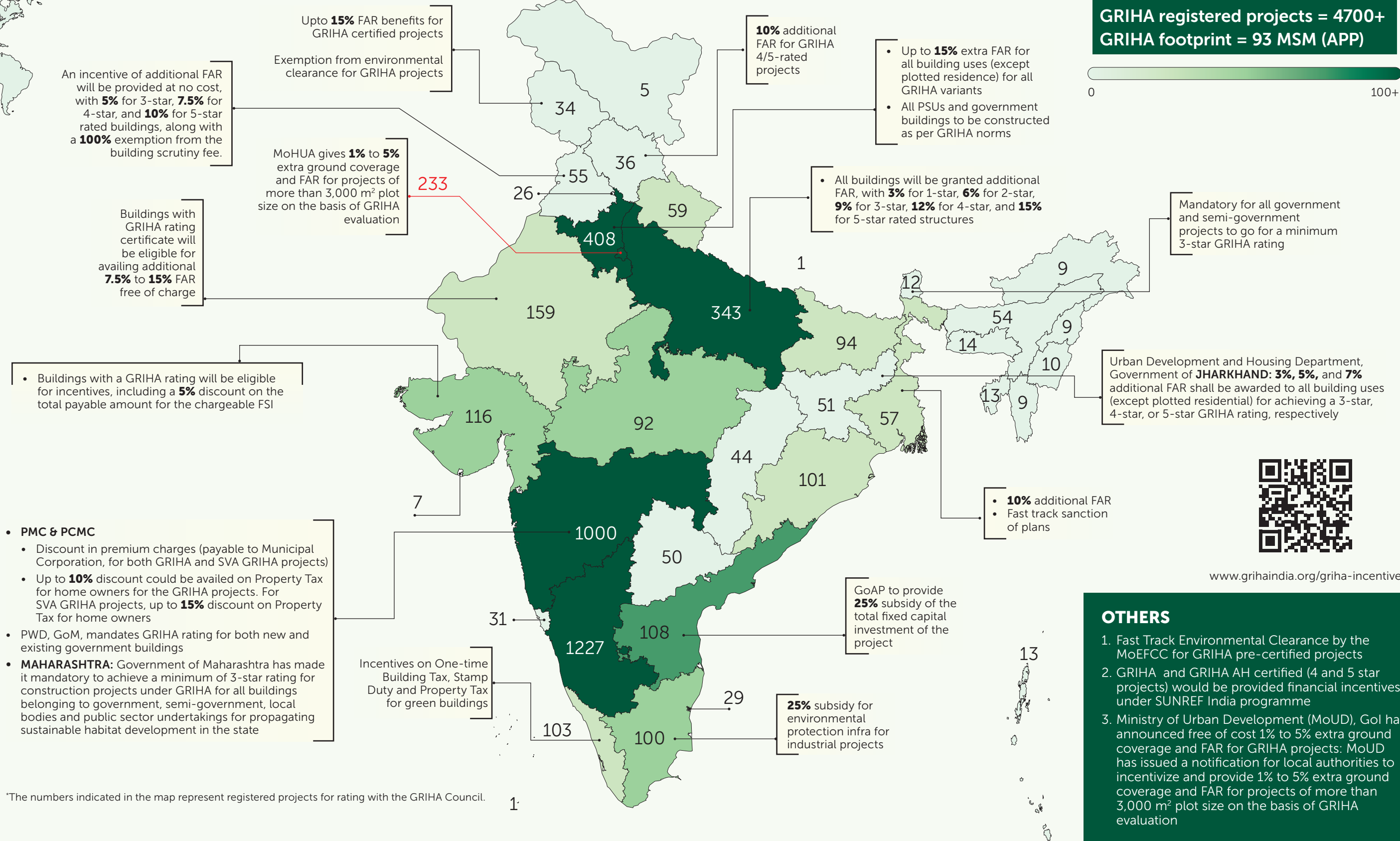
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GRIHA PROJECTS' FOOTPRINT & LINKED INCENTIVES

GRIHA registered projects = 4700+
GRIHA footprint = 93 MSM (APP)



www.grihaindia.org/griha-incentive

OTHERS

1. Fast Track Environmental Clearance by the MoEFCC for GRIHA pre-certified projects
2. GRIHA and GRIHA AH certified (4 and 5 star projects) would be provided financial incentives under SUNREF India programme
3. Ministry of Urban Development (MoUD), GoI has announced free of cost 1% to 5% extra ground coverage and FAR for GRIHA projects: MoUD has issued a notification for local authorities to incentivize and provide 1% to 5% extra ground coverage and FAR for projects of more than 3,000 m² plot size on the basis of GRIHA evaluation

*The numbers indicated in the map represent registered projects for rating with the GRIHA Council.

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Be the Change we need

A simple poem for Shashwat is the ask, Oh! Not a big task,
A few words to write about Sustainability and Climate change,
A few swords to brandish in all the super-heated verbal exchange(s),
Truly, I mock not thee, as this is the need of the hour
There for all to see, with every untimely rain shower,
With ice caps melting and temperatures soaring,
A serious action -map we need to plod ahead full speed and roaring,

We may be from any country or region,
Let's pledge to belong to this legion,
The one that doesn't want a change,
But the one that will be the change.

If in the future we don't want to be filled with more regrets and sorrow,
We need to some or all the sustainable strategies follow,
Be it one that's just a drop in the ocean,
that too is good to set things in motion,
So, plant a tree, say no to plastic,
say yes to recycled, nothing too drastic,
or else try a strategy with large scale impact,
based on concepts of GWP or LCA that were a little abstract,
Till we decided to be the change,
It matters not, whether for reasons sane or strange.
So, whether you're the mom of a kid breathing in poor air,
Or a professional wanting to adhere to practices fair,
become the change we need.

We need to learn before we can implement,
Concepts of optimization, conservation and management,
Rather than our responsibilities abdicate,
We must first learn and then educate,
Spread awareness and stimulate,
We must become a sustainability advocate,
We must **"Be the change we need"**

Suhasini Sharma
Principal Architect,
Sukriti Design Studio



Role of Co-working Spaces: accelerating climate action in the built environment

The article composed by **Vaibhav Sharma** sheds light on the concept of co-working model that has significantly evolved, becoming vital in the modern work landscape. As the industry grows, emphasizing sustainability has become much more crucial for addressing environmental challenges and meeting the expectations of a conscientious market. By adopting sustainable practices, co-working spaces can reduce their environmental footprint and enhance their economic and social value, contributing to a more sustainable future.

Vaibhav Sharma



Vaibhav Sharma is Senior Associate in the Sustainable Design Department at LEAD Consultancy. An architect by profession with a master's degree in Sustainable Architecture, Vaibhav brings four years of experience in the construction industry. He is a dedicated advocate for sustainable building practices. His professional certifications, including GRIHA CP, IGBC AP, and LEED GA, underscore his expertise in facilitating green building certifications. He could be approached at <sharmavaibhav.222@gmail.com>.

The climate crisis is becoming a daily reality, bringing an urgent need to minimize our environmental impact. This includes reimagining our workplaces to be more sustainable and carbon-neutral. Co-working spaces, with their sharing-oriented nature, have significant potential to support environmental sustainability by optimizing their resource consumption, reducing wastefulness through shared resources and spaces at last are more dependent on renewable energy sources.

Co-working spaces are communal work environments where individuals from various companies and backgrounds collaborate. These spaces typically offer high-speed internet, meeting rooms, and communal areas, fostering a collaborative and flexible atmosphere. They cater to freelancers, startups, small and medium enterprises, and increasingly, large corporations seeking flexible



office solutions. This diversity has made the co-working model resilient and adaptable.

The co-working movement began in 2005 when Brad Neuberg established the first official co-working space in San Francisco (Neuberg 2005). The global co-working market has since seen an exponential growth, with over 35,000 co-working spaces worldwide (Deskmag 2023). North America and Europe dominate the market, but the Asia-Pacific region, especially countries like India, China, and Indonesia, is emerging as a significant player. In India, the count of co-working spaces has grown from around 350 in 2018 to over 1,000 in 2023,

with major cities like Bengaluru, Mumbai, and Delhi-NCR leading the trend (JLL India 2023). There is also a growing movement towards tier-2 and tier-3 cities, which offer cost advantages and attract new entrepreneurs and remote workers (Cushman and Wakefield 2023).

Sustainable Co-working Spaces

Sustainable co-working spaces integrate environmental, social, and economic considerations into their design and operations, aiming to minimize their ecological footprint while promoting well-being and productivity. They contribute to

environmental conservation in various ways such as:

1. Resource optimization: Using energy-efficient lighting, heating, ventilation, and air-conditioning (HVAC) systems, plumbing systems, and appliances significantly reduces energy and water consumption.
2. Waste reduction: Sharing-oriented nature and waste management practices, including recycling and composting, help minimize landfill waste.
3. Reducing carbon emissions: Strategically located near public transport, walking paths, and bike lanes, co-working spaces reduce

- reliance on personal vehicles, lowering CO₂ emissions from work-related travel by at least 10%.
- Environmental impact: Optimized resource use, reduced waste generation, and lower CO₂ emissions support environmental conservation.
 - Economic advantages: Sustainable co-working spaces, which are energy efficient and generate less waste, lead to operational cost savings, create a competitive market, and attract tenants prioritizing sustainability.
 - Social benefits and community building: These spaces offer a sense of belonging, combatting isolation in remote work setups, and engage members in sustainability initiatives, fostering community and shared purpose.
 - Enhanced well-being: Better occupant comfort through improved indoor air quality, thermal comfort, acoustic comfort, natural light, active design, and biophilic design enhances health, well-being, and productivity.

Key Drivers and Challenges

The push towards sustainable co-working spaces is driven by increasing environmental regulations, market demand for sustainable workspaces, and advancements in green

technologies and smart building systems. However, challenges include the initial costs of sustainable design and technologies, a lack of awareness and education about sustainability practices, and the complexity and resource intensity of implementing sustainability measures across multiple locations.

Case Studies

- WeWork:** As a leading co-working operator, WeWork has implemented various sustainability initiatives, including energy-efficient designs and waste reduction programs (WeWork 2023).
- The Office Group (TOG):** TOG retrofits existing buildings with eco-friendly materials and systems, achieving multiple green building certifications (The Office Group 2023).
- Impact Hub:** A global network focused on sustainable impact, many Impact Hub locations are designed with sustainability in mind and host events on environmental issues.

Strategies for Enhancing Sustainability in Co-working Spaces

- Design and construction
 - Green architecture: Minimize environmental impact through technological innovations.

- Efficient space utilization: Maximize natural light and optimize space layouts.
- Energy efficiency
 - LED lighting: Replace incandescent bulbs with LEDs.
 - Smart thermostats: Optimize heating and cooling.
 - Energy-efficient appliances: Use Energy Star-rated equipment.
 - Natural lighting: Reduce artificial lighting needs.
 - Water conservation
 - Low-flow fixtures: Install water-saving faucets, toilets, and showerheads.
 - Rainwater harvesting: Use collected rainwater for non-potable purposes.
 - Water-efficient landscaping: Employ native plants and xeriscaping.
 - Waste reduction
 - Recycling programmes: Implement recycling for various materials.
 - Composting: Provide options for organic waste.
 - Digitalization: Reduce paper use through digital documentation.
 - Sustainable materials
 - Furniture and fixtures: Use recycled, reclaimed, or sustainably sourced materials.
 - Eco-friendly building materials: Choose non-

- toxic, low-volatile organic compounds (VOC) products.
- Indoor air quality
 - Ventilation: Maintain good air quality.
 - Air purifiers: Reduce pollutants and allergens.
 - Plants: Improve air quality with indoor plants.
 - Sustainable transportation
 - Bicycle facilities: Provide bike racks and showers.
 - Public transport access: Choose locations with good transport links.
 - Carpool programmes: Promote carpooling.
 - Renewable energy
 - Solar panels: Install for on-site energy.
 - Green power purchasing: Buy renewable energy.
 - Community engagement
 - Sustainability workshops: Host events on sustainable practices.
 - Member involvement: Encourage participation in green initiatives.
 - Technology integration
 - Smart energy management: Monitor and optimize energy usage.
 - Smart building systems: Use internet of things

- (IoT) and artificial intelligence (AI) for energy management.
- Remote collaboration tools: Reduce travel with virtual meetings.
- Policy and governance
 - Sustainability policies: Implement guidelines.
 - Continuous improvement: Regularly review and improve practices.
 - Green building certifications: Pursue certifications to demonstrate commitment to sustainability.

Conclusion

The co-working model has significantly evolved, becoming vital in the modern work landscape. As the industry grows, emphasizing sustainability is crucial for addressing environmental challenges and meeting the expectations of a conscientious market. By adopting sustainable practices, co-working spaces can reduce their environmental footprint and enhance their economic and social value, contributing to a more sustainable future.

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Jeevan Vidya

Zonal Training Centre, Kolkata

Life Insurance Corporation of India, 4/2 C Ho Chi Minh Sarani, Kolkata - 700061

The Zonal Training Centre, Kolkata, started its operation from 1993 onwards. The institution comprises two blocks—one Administrative Block with training halls and one Hostel Block. The total built up area is 5163 m². The Training Centre from its inception has been an epicentre for sustainable practice. The environment has almost more than 52 old and new native trees and plenty of native shrubs, this makes the campus serene and environment friendly. The Training Centre has achieved 4 star GRIHA rating under existing buildings category in 2023. The Administrative Block of the Centre has 80 kWp rooftop on grid solar plant. The solar energy generated is almost 42% of the total grid power. The Hostel Block is equipped with a 4 × 500 lpd solar hot water system. The campus has a sustainable waste management policy in force. Biodegradable kitchen waste is processed through



Sri N Nalage CE(EZO)

Sri D Das AEE(EZO)

onsite organic compost bin. The compost is used for gardening purpose. Drip irrigation is used for gardening. To reduce urban heat island effect, high SRI paint (SRI index>100%) is applied on terrace of the Hostel and Administrative Blocks, including car parking sheds. Eco-friendly cleaning chemicals for housekeeping are used to reduce adverse environmental impact. The electricity requirement has been minimized using all minimum BEE 3 star-rated ACs and 100% LED lighting in the entire built environment. Water-efficient plumbing fixtures have been introduced to optimize water

consumption. Further roof rainwater harvesting has been done for all building blocks through rechargeable pits. As per the Government of India's Harmonised Guidelines and Universal Accessibilities, ramp with adequate width, slope, and handrail have been provided at the building entrance of the Training Centre. Dedicated parking space and toilets for differently abled person have been provided. To provide sustainable environment, energy audit, comfort audit, water audit, and IAQ audit have been carried out in the buildings with BEE-accredited third-party audit team. The built environment has been made compliant with National Air Quality Standards and meets standard comfort conditions as per the NBC guidelines.

GRIHA has provided responsible guidance in our endeavour to make this building environment friendly, in line with our corporate the ESG policy.

Retreat 2024



**Kasauli,
Himachal Pradesh**



Urban Flooding and Road Infrastructure: a civil engineer's perspective

Urban flooding is a recurring issue in many Indian cities, revealing significant gaps in infrastructure and planning. From waterlogged streets in Mumbai to submerged roads in Chennai, these problems underscore the need for a critical assessment of our road and drainage systems. However, India's ancient architectural marvels, including temples that have managed rainwater effectively for centuries, offer valuable lessons for modern urban planning. The present article, contributed by **Anmol Chitransh**, explores the causes of urban flooding in India, draws comparisons with international practices, and delves into the wisdom of ancient water management systems that could inspire contemporary solutions.

Anmol Chitransh



Anmol Chitransh has over five years of experience in sustainable construction management practices, environmental compliance, and capacity-building initiatives. Passionate about protecting the planet, Anmol believes every action counts in building a sustainable future for all. He could be written at <anmol.chitransh@grihaindia.org>.

The Persistent Problem of Urban Flooding in India

India's rapid urbanization has led to the expansion of cities, often at the expense of natural landscapes. This growth, coupled with outdated and insufficient drainage systems, has increased vulnerability to flooding. Many cities still rely on drainage systems designed decades ago, which are inadequate to handle the current population and rainfall patterns. These systems often become clogged with solid waste, leading to waterlogging and urban flooding.

Concretization of urban areas is another contributing factor. The replacement of natural landscapes with impermeable surfaces has drastically reduced the ground's ability to absorb rainwater, resulting in increased

surface runoff and subsequent flooding.

To address these challenges, we can look back at the traditional practices that effectively managed water resources.

Ancient Temples and Rainwater Management

India's ancient temples provide remarkable examples of sustainable water management practices that have withstood the test of time. These structures were designed not only for spiritual and cultural purposes but also incorporated advanced engineering techniques to manage rainwater effectively.

The Brihadeeswarar Temple in Thanjavur, Tamil Nadu, is a testament to ancient engineering. Built over 1,000 years ago, this UNESCO World Heritage site has an intricate system of underground channels and tanks designed to collect and store rainwater. The temple complex features a sophisticated drainage system that directs rainwater to large tanks, ensuring the surrounding area remains flood-free even during heavy rains.

The Rani Ki Vav stepwell in Patan, Gujarat, another UNESCO World Heritage site, exemplifies how ancient Indian architecture integrated water management into its design. Built in the 11th century, this stepwell was not just a source of water but also a mechanism to manage rainwater and groundwater recharge.

The stepwell's design allowed it to capture and store rainwater efficiently, providing a reliable water source even during dry periods.

The temples of Hampi in Karnataka, are known for their hydraulic engineering, utilized a network of aqueducts, canals, and water tanks to manage water resources. These systems not only supplied water to the city but also controlled flooding by directing excess rainwater into reservoirs. The city's layout and water management systems were so advanced that they ensured a sustainable water supply and flood control for centuries.

Learning from Global Examples

While India's ancient structures offer insights into sustainable water management, modern cities can also learn from international examples of effective flood management.

Singapore has implemented an advanced drainage system that includes stormwater management ponds and underground tunnels to handle heavy rainfall. Despite its tropical climate, Singapore rarely experiences flooding, thanks to its efficient water management infrastructure.

Tokyo, Japan, with its extensive underground flood control systems, including reservoirs and tunnels, is another city that effectively manages urban flooding. These infrastructures

prevent flooding by redirecting and storing excess rainwater, ensuring that the city remains functional even during heavy rains.

Amsterdam, Netherlands, with its canals and water management practices, shows how urban planning can integrate flood control measures to prevent inundation in low-lying areas. The city's approach to managing water has been a model for flood-prone regions around the world.

Addressing Urban Flooding in India: key considerations

To mitigate urban flooding and enhance the resilience of the Indian cities, several key factors must be considered, drawing from both ancient wisdom and modern engineering practices:

- 1. Upgrading and expanding drainage systems:** The Indian cities need to invest in modernizing their drainage infrastructure, expanding capacity, and ensuring regular maintenance. Integrating real-time monitoring systems can help manage and mitigate potential flooding risks.
- 2. Incorporating sustainable urban drainage systems (SUDS):** Techniques like permeable pavements, rainwater harvesting systems, and green roofs can reduce surface runoff and help recharge groundwater, alleviating pressure on urban drainage systems.

3. Reviving and preserving traditional water management systems:

Ancient water tanks, stepwells, and canals, many of which are neglected or encroached upon, should be restored and integrated into modern urban planning. These systems have proven effective for centuries and can play a crucial role in contemporary flood management.

4. Urban planning and zoning regulations:

Integrating flood risk management into urban planning is essential. This includes restricting construction in flood-prone areas, creating floodplains, and designing roads that can channel water away from residential and commercial areas during heavy rainfall.

5. Community awareness and involvement:

Engaging communities in water management efforts, such as maintaining local water bodies and practising sustainable waste disposal, can significantly reduce urban flooding risks.

Conclusion

Urban flooding in India is a complex problem that demands a multifaceted approach. By combining the wisdom of ancient water management systems with modern engineering solutions and learning from global

examples, the Indian cities can develop resilient infrastructure capable of withstanding heavy rainfall. Civil engineers and urban planners must work together to create sustainable, flood-resistant urban environments that honour the past while preparing for the future.

The way forward lies in embracing both tradition and innovation. By doing so, we can build cities that are not only resilient to flooding but also sustainable, preserving the rich heritage of India's architectural and engineering marvels for future generations.

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Lighting of the lamp by our dignitaries Smt. Shabnam Bassi, Shri Radhakrishna Reddy, Shri Duddilla Sridhar Babu, Shri Sanjay Seth, & Smt. Samhita M at the GRIHA Regional Summit



Felicitation of rated projects at the regional summit



Cultural night at the closing ceremony of 2nd regional summit



The signing of Memorandum of Understanding between GRIHA Council and Bangalore Metro Rail Corporation Limited (BMRCL)



Mr. Sanjay Seth; Shri Ravindra Babu KS; Smt. Samhita M; and Dr. Anirban Ghosh at the session on "Blueprint to Legislation - Policies Shaping Climate Action"



Smt. Neetu Jain, Managing Director, Panache Greentech Solutions Pvt Ltd; Shri. Tarun Jami, Founder & Chief Executive Officer, GreenJams; Shri. Mohit Agarwal, Founder, Vinayak Industries; and Smt. Shabnam Bassi, Deputy Chief Executive Officer & Secretary, GRIHA Council & Director, Sustainable Buildings Division, TERI at the GRIHA Regional Conclave



Dr. Rajkiran Bilolikar, Professor, Centre for Energy Studies at Administrative Staff College of India (ASCI); Shri Ramesh Samala, Regional Lead-IBMS, Digital Energy BU, Digital Buildings, Schneider Electric; Dr. Nina Lazar, Professor, V-SPARC, Vellore Institute of Technology (VIT); Ar. Vijayadurga Koppiseti, Founder & Chief Executive Officer, Architude BiM Services; and Shri Akash Deep, Deputy General Manager & Treasurer, GRIHA Council at the GRIHA Regional Conclave



GRIHA team representing the Regional Conclave in Hyderabad

Green Banking in India: paving the way to a sustainable future

Banking, as one of the financial institutions, contributes to a country's economic growth through its range of functions with the customers. The term 'green banking' is gaining immense prominence today. Originator of this article, **Pratiksha Baruah**, explicates how green banks, also known as environmental banking in broad perception, are mission-driven institutions, designed to enhance overall betterment of 'people, planet and profit'.

Pratiksha Baruah



Pratiksha Baruah, is a management consultant working as Environmental Policy and Planning Expert, currently affiliated with Grant Thornton Bharat LLP's Public Sector Advisory team in Kolkata, West Bengal.

Ms Baruah has authored over 14 publications, including peer-reviewed journal articles, conference papers, feature articles in periodicals and newspaper editorials. She can be reached at <pratikshabaruah@yahoo.com>.

Overview

Climate change stands as a paramount issue of the era that needs continued and supplementary efforts to address it. Since the dawn of the Industrial Revolution, anthropogenic activities have played a major role in contributing significantly to the global warming. In the face of future climate projections, the rate of urbanization worldwide has intensified climate risks, resulting into drastic deterioration of natural ecosystems and wellbeing of human societies driven by natural and human hazards, socio-economic vulnerability and institutional and infrastructural coping capacity. As a response to the prevailing environmental issues, the concept of 'green banking' has evolved, stemming as a subset of 'sustainable banking'. Historically, it began as a socially

responsible and ethical banking by building non-profit principles into business operations. Triodos Bank, headquartered in the Netherlands and established in 1980, was the first to integrate sustainability into its operations with the mission to make money work for positive social, environmental, and cultural change. Later, 'green banking' followed, which took climate change into account. Global initiatives such as the United Nations Environmental Programme Financial Initiative (UNEP FI), the Global Reporting Initiative Financial Sector Supplement, the Equator Principles (EP) and the Principles for Responsible Investment (PRI) are key milestones in integrating sustainability into the financial sector.

Understanding the Concept

According to the Harvard Business School, the triple bottom line concept, emphasizing 'planet, people, and profit,' has been gradually integrated into green banking, as banks transition from a sole focus on profit to a more sustainable model. Green banking is defined as an umbrella term referring to practices and guidelines that make banks sustainable in economic, environmental, and social dimensions. Green banking involves formulation of policy and regulatory instruments as well as the promotion of sustainable

infrastructure within the banking ecosystem. Following a country-driven approach to global climate action, implementation of the Paris Agreement is essential for the achievement of the Sustainable Development Goals (SDGs) and provides a roadmap that will reduce emissions' footprint and build climate resilience through the Nationally Determined Contributions (NDCs).

India's Scenario

Green banking in India is gradually gaining momentum as financial institutions increasingly recognize the importance of sustainable practices. The Reserve Bank of India (RBI) has been instrumental in promoting green finance, encouraging banks to adopt eco-friendly

technologies and practices. To date, over 27 banks, including all public-sector banks, 40% of private-sector banks, and 14% of regional rural banks, have adopted sustainable banking, green banking, or a combination of both, according to their respective websites.

However, in a developing country like India with an average literacy rate of 70% according to the National Statistical Commission and 80% of adults having bank accounts, green banking is still in its early stage and there is still a substantial journey ahead to transform all Indian banks into green banks. As depicted in Figure 2, these hurdles pose significant barriers to realizing a greener financial sector across associated people, infrastructure, and operations.



Figure 1: List of banks implementing green/ sustainable initiatives based on bank typology



Figure 2: List of barriers of green banking in India

Way Forward

Following a two-tier guidance with reference to RBI’s publications, the banking functions are categorized into banking ecosystem: (i) processes and services, (ii) products; (iii) infrastructure; (iv) additional activities; (v) policies and regulations. Integrating these avenues into the different stages of the banking cycle can yield optimal benefits for green banks. Stages include: (i) customer acquisition and onboarding, (ii) account management and operations, (iii) credit assessment and loan processing, (iv) investment and

financing activities, (v) monitoring and reporting, (vi) customer relationship management (CRM), and (vii) risk management and compliance. Green banking not only transforms the traditional banking model into a sustainable banking ecosystem but benefits its customers and the environment. Banking processes refer to the various activities and procedures that banks use to manage customer accounts and facilitate transactions. Banking services are various financial services provided to their customers by offering various tools and support. Financial instruments offered to customers to facilitate

financial needs are called banking products. Through range of green banking co-benefits across various dimensions, these combined efforts contribute to triple bottom line, thereby to the country’s economic growth. All while fulfilling financial objectives and meeting customers’ needs, green banks emphasize on preserving natural resources, supporting people, livelihoods and ecosystems resilience as well as limiting greenhouse gas (GHG) emissions. Not only that, it contributes to climate adaptation and mitigation, but also aligns with all the SDGs.



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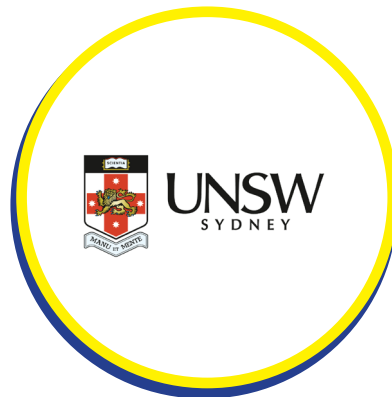
Navodaya Vidyalaya Samiti (NVS)



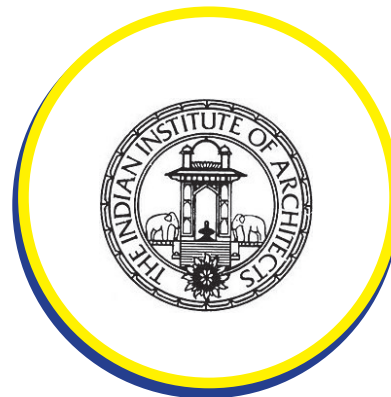
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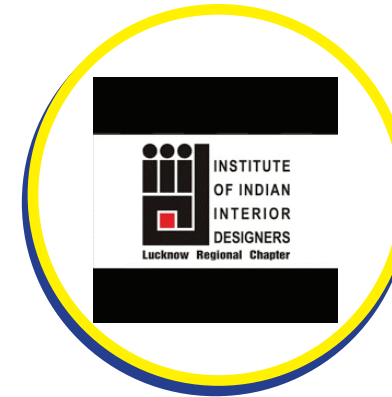
Bharati Vidyapeeth Deemed University (BVDU) College of Architecture, Pune



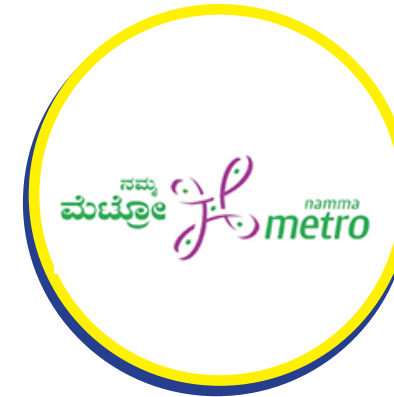
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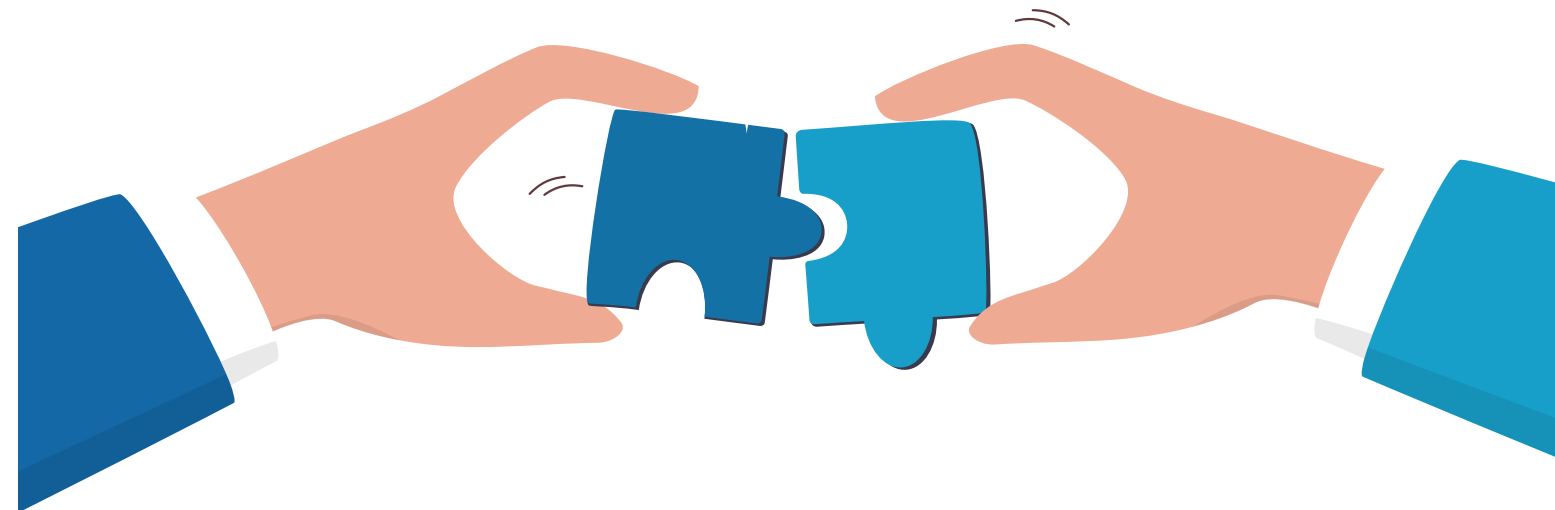
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An Overview of Dichotomous Approaches to Address C&D Waste Management

Construction and demolition (C&D) management is one of the major environmental challenges, notably in the developing countries. The contributing factors include economic constraints, inadequate infrastructure, and lack of awareness, and incentives. This article contributed by **Ar. Priy Ranjan Kumar** and **Ar. Titan Bullet Das** explores the barriers to the effective C&D waste management in the developing nations and highlights the opportunities to overcome these challenges.

Ar. Priy Ranjan Kumar



Ar. Priy Ranjan Kumar, Senior Project Officer at GRIHA Council, is a sustainability professional with over 6 years of experience in sustainable architecture and energy efficiency. His expertise includes energy-efficient design and green building certifications. He has played a key role in developing GRIHA v2019 and conducted extensive building audits on sustainable practices. He can be reached at <priy.ranjankumar@grihaindia.org>.

Ar. Titan Bullet Das



Ar. Titan Bullet Das is an NIT-Tiruchy alumni, completed his master's in the field of energy efficient and sustainable architecture. He has been for 7+ years in the industry and worked on a variety of sustainable material palette. In his current role, he has brought a pioneering change in modern bamboo construction in North East India. Communication with him could be established via <titan@onecampus.info>.

Introduction

Construction and demolition (C&D) waste are the most crucial contributors to environmental degradation, loss of quality resources, and liveability in our cities today. A wide range of C&D waste materials, such as concrete, asphalt, shuttering waste, steel, bricks, and plastics are bulky and undecomposed products that often end up in landfills. Effective and responsible waste management, as a solution to this problem, is being looked at and practised to establish a circular approach for sustainable development by the global north. "Developed countries collectively generate more waste than developing countries" (Das, et al. 2019). "They, however, struggle with waste recycling despite having a robust waste management infrastructure and conducive policies for

waste management" (Haas, et al. 2015; Pires and Martinho 2019). Managing this waste is a challenge due to various factors in developing countries, including economic constraints, inadequate infrastructure, and lack of awareness and incentives. This article explores the barriers to effective C&D waste management in developing nations and highlights the opportunities to overcome these challenges.

Scope and Challenges

Global perspective

A recent United Nations report highlights the construction sector's contribution to global environmental issues, revealing that it accounts for 37% of all energy-related carbon dioxide emissions (UNEP, 2022). Figure 1



Image 1: Demolition of a structure

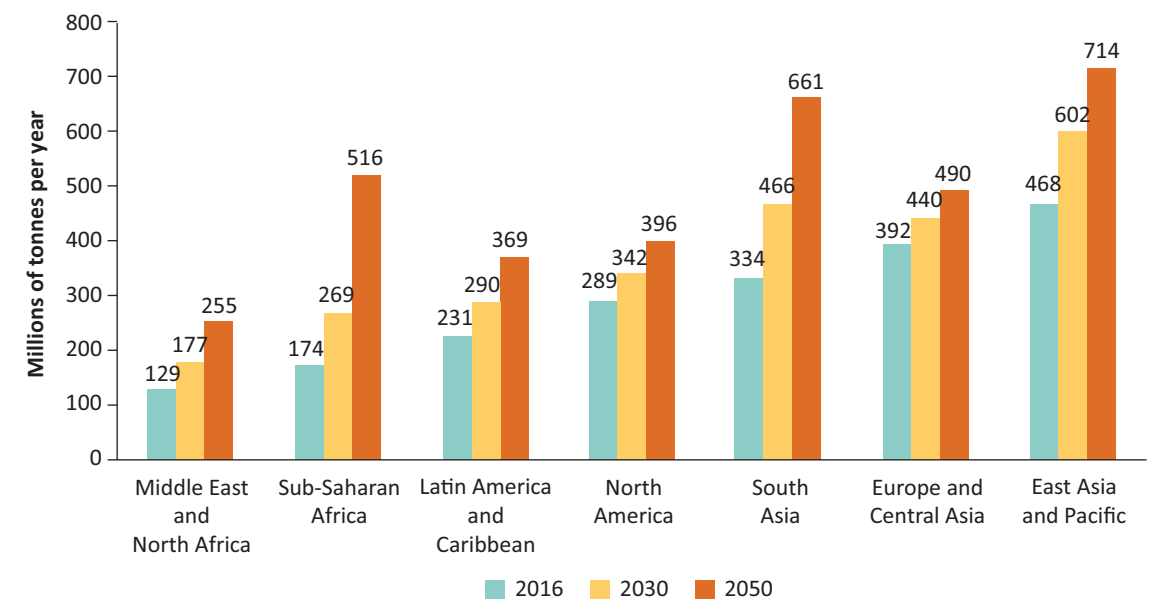


Figure 1: Projected waste generation, by regions (millions of tonnes/year)
Source: Kaza, S. et al. (2018)

gives projected waste generation by various regions.

Environmental impact

The C&D waste constitutes about 35–40% of the annual global waste generation, significantly contributing to environmental degradation and increased carbon emissions. For example, due to the nature of its production process, cement alone contributes to 7% of the world’s CO₂ emissions. If not managed properly, C&D waste can negatively impact air quality, biodiversity, water, and soil contamination, and lead to health hazards.

The Indian perspective

A report by the Centre for Science and Environment (CSE) in 2020 indicated that India has a C&D waste recycling rate of just 1%, pointing to systemic issues such as inadequate infrastructure, lack of enforcement, and low awareness among stakeholders. The Interim Budget for 2024/25 has allocated 11.1 trillion INR for capital investment in infrastructure, which is an 11% increase over the previous year's budget, indicating both the growing need and opportunity to enhance waste management practices.

Reusability and recycling potential

Approximately 80% of the C&D waste has the potential

to be reused (Muhammad Shahzad Aslam 2020), with major components like concrete and steel offering substantial opportunities for recycling and resource recovery. The C&D waste management which starts with segregating the waste at source, can be done by reducing, salvaging, recycling, and reusing existing materials.

Challenges in Waste Management

Barriers to effective C&D waste management include a lack of knowledge among contractors, inadequate client interest in waste reduction, limited market competition, insufficient training and education, a shortage of skilled labour, and minimal awareness of policies and incentives. The developed countries generate substantial amounts of C&D waste due to extensive urbanization and industrialization. However, they have implemented robust waste



Image 2: Waste segregation

management policies and infrastructure that significantly mitigate environmental impacts.

Differences in Policy and Regulatory Frameworks

The developed nations have comprehensive laws and regulations that mandate waste management. For instance, in Australia, the enforcement of landfill disposal levies, which involve higher landfill taxes compared to recycling costs, has made C&D waste recycling a more viable and preferred option (Tam 2018). In the United States, the Resource Conservation and Recovery Act (RCRA) provides a framework for managing hazardous and non-hazardous waste, including C&D waste. Their legislation mandates tracking and reporting, ensuring accountability and compliance across the industry.

Infrastructure and Technology

Although waste generation in developed nations like the USA, Australia generate more C&D waste every year compared to the developing counterparts, due to the availability of advanced infrastructure and technology these countries recycle more than 70% of their C&D waste. The Netherlands, for example, is renowned for its innovative approach to waste management, which is indicated by its heavy investments in R&D to develop new recycling technologies and sustainable construction materials. Table 1 lists ratio of waste generation and waste recycled of some of the countries.

Economic Incentives

Many developing nations grapple with financial constraints due to unfavourable economic policies, widespread poverty, and inadequate infrastructure, hindering the development of Construction and Demolition Waste Management systems (Correia, et al. 2021). For example, key among the several successful strategies employed in the USA for managing C&D waste effectively is the availability of satisfactory commercial opportunities for C&D waste products, which provides an economic incentive for waste recycling. Stakeholders often perceive Construction and Demolition Waste Management

Table 1: Ratio of waste generation and waste recycled (select countries)

Country	Year	Quantity of waste generation	Quantity of waste recycled
USA	2018	600 million tonnes	455 million tonnes= 75.83%
Australia	2018	27 million tonnes	20.5 million tonnes= 75.93%
China	2020	2.6 billion tonnes	312 million tonnes= 12%
UK	2020	60 million tonnes	92.6%
India	2020	150 million tonnes	1%
Malaysia	2018	3.75 to 5.5 million tonnes	10–15%



Image 3: Recycling of C&D waste

system as needing more cost-effectiveness and efficiency, reducing their motivation for waste reduction.

Stakeholder and Public Awareness

Contractors perceive Construction Waste Management credits as involving high capital investment and difficult to achieve compared to other sustainability credits. Existing waste management systems in India are characterized by low collection rates, minimal recycling, and increased open

dumping. Training programmes for contractors, builders, and waste management professionals focus on best practices in waste reduction, recycling, and sustainable construction (Shooshtarian and Maqsood 2019). The government and non-profit organizations conduct extensive public awareness campaigns to educate stakeholders about the benefits of C&D waste recycling and he importance of sustainable construction practices (Aslam 2020).



Image 4: Landfill through waste

Final Word

From decades of economic growth and supply to ever-increasing consumer needs, unmanaged or improperly managed waste affects every person in the world and requires urgent action at all levels of society across all regions. Reviewing the years of available data and extensive literature on CDWM, governments, whether developed or developing, can realistically allocate resources, assess relevant technologies, overlook stringent execution and consider strategic partners for service provision to address the challenges and bottlenecks identified.

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25 October 2024



Lighting of the lamp by our dignitaries Dr Ajay Kumar; Mr. Sanjay Seth; Mr. Ashu Gupta; Ms. Shabnam Bassi; Shri Nishant Jain; and Shri Alok at the inaugural of GRIHA Regional Conclave in Jaipur



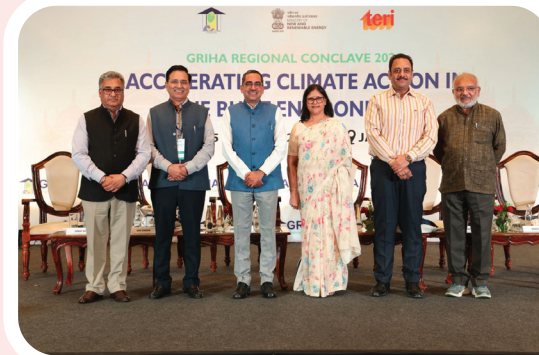
The signing of Memorandum of Understanding between GRIHA Council ASHRAE Rajasthan Chapter



Our esteemed panellists Ms. Shabnam Bassi; Mr. Subhas Arya; Mr. Vijai N; Mr. Anand Mishra; Ar. Gagan Sharma; and Mr. Roopesh Gupta at the session on “Advancing Low-Carbon Materials in the Construction Industry”



Our esteemed panelists Mr. Akash Deep; Mr. Abinav Banthia; Mr. Sudhir Mathur; Ms. Dhvani Patel; and Mr. Kushagra Juneja at the session on “Sustainable, Resilient and Innovative Solutions to Water and Energy”



Our esteemed panelists Mr. Sanjay Seth; Mr. Amit Kakkar; Prof. Jyotirmay Mathur; Ms. Sunita Mantri; Mr. Gaurav Agrawal; and Prof. Neeraj Gupta at the closing session on “Navigating the Path to Sustainability: Implementing Rajasthan’s New Regulations into Action”



Welcome address by Mr. Sanjay Seth, Vice President & Chief Executive Officer, GRIHA Council & Senior Director, Sustainable Infrastructure Programme, TERI



Ms. Shabnam Bassi, Deputy Chief Executive Officer & Secretary, GRIHA Council & Director, Sustainable Buildings Division, TERI at the session ‘Advancing Low-Carbon Materials in the Construction Industry’



During the Felicitation Ceremony at GRIHA Regional Summit, the project team received awards for their GRIHA Existing School ratings



Participants at the valedictory session

Bioplastic: for the Indian die-cast community?

Article by **Astitva Rai** and **Dr Ruchi Agrawal** is experiential in nature and discusses how it is our responsibility to minimize children's dependence on plastic for toys. The authors made us understand the concept via die-cast toys and how we can make toy manufacturing sustainable by switching to bioplastic, at the same time, elaborating limitations of bioplastic use.

Astitva Rai



Astitva Rai is a graduate from Netaji Subhas University of Technology, Delhi (erstwhile NSIT) with a B. Tech in Biotechnology, and currently gaining experience as Healthcare Analyst, at EXL Service, Noida. He is a passionate writer who raises the issues that impede environmental justice while maintaining a balance by writing about football. He can be reached at bhattastitva@gmail.com.

Dr Ruchi Agrawal



Dr Ruchi Agrawal is a Fulbright- Kalam Climate Fellow for Professional and Academic Excellence and Fellow, TERI. She has expertise in developing process schemes for 'Decarbonization and Nature-based Solutions'. She has been honoured with prestigious Governor Award in 2016 and received DST-INSPIRE Fellowship in 2010. Dr Agrawal was Visiting Fellow at University of Tennessee, USA. Communication with her could be established via <ruchi.agrawal@teri.res.in> and <dr.ruchiagrawal010@gmail.com>.

It was shortly before 2020 when the Indian consumer market was hit by an agonizing blow. I, a hopeful Astitva, walked jovially to my local store after ages to enquire about the global die-cast sensation, Mattel's Hot Wheels. The world stood still when the words, "They are banned until further notice," fell on my otherwise comfortably deaf ears. The pandemic ensued and the reason for such a grave predicament took time to surface.

Fast-forward to 2024, and all is seemingly back to normal. My collection is flourishing but the space to accommodate it is definitely not. However, what happened? Why did a nation with great dependence on toy import, banish the second-largest toy maker from its shores? Why are we writing about this? Your parched minds will be quenched of their thirst in short order.

Choking on Plastic

What a revelation it must have been once bakelite came to production in 1907 (Chalmin



Image 1: Astitva's Hot Wheels Led Zeppelin Hiway Hauler

2019). And what a fall from grace! We look at the world around ourselves and see such great dependence on plastics at every level of society. It forms a key part of the country's construction and packaging industries, recording 23% and 35% consumption, respectively of the overall plastics produced (Banerjee and Srivastava 2012). Moreover, it has given many people a career by researching its erasure.

The wide-ranging detriments of its production, usage, and post-consumer waste generation are well documented. It is anthropogenic and carcinogenic in great proportions. The year 1950 was the breakthrough for plastics. Since then, their use has grown 180 times. Currently, 400 million plastic tonnes are manufactured annually; by 2050, that number is expected to reach 1600 million tonnes (World Economic Forum 2016). In terms of waste generation that followed, the Central Pollution Control

Board (CPCB) reported 9.46 million tonnes of plastic waste in its 2018-19 annual report, focusing solely on India (Mohanty 2017).

Breathing Through Bioplastic

The Oil Crisis of 1973 due to an embargo by Arab oil-producing nations in response to US support for Israel prompted researchers to look back as far as 1926 for petroleum alternatives (Hayes 2023). It was in 1926 that bioplastic, polyhydroxybutyrate (PHB), was discovered by French researcher, Maurice Lemoigne, from his work with the bacterium *Bacillus megaterium* (Fridovich-Keil 2024). Today the yearning to look for alternatives is not because of conflicts but because we stare at imminent doom.

Bioplastics, however, aren't a straightforward solution. Firstly, the nation at present is not in possession of 100%



Image 2: Garbage pickers searching valuables at Ghazipur Landfill site



Image 3: During the cleanliness fair organized by the South MCD, manufacturers are showcasing biodegradable and compostable plastic free bottles

biodegradable plastic and research is still underway on this across the world. A material can only be deemed biodegradable when after 90% of degradation, there is no adverse impact on the environment (Dash 2023). Secondly, increased use and subsequent production of bioplastics without proper phasing out of conventional plastic will result in intense competition amongst various resources (land and water), thus causing more damage than repair Rafey and Siddiqui 2021).

The infrastructure and opportunity, however, to produce bioplastics are closer to

its epitome than ever before in India. The agricultural feedstock for a large-scale production of bioplastic continues to grow, so does a favourable policy framework to ground the industrial roots of the process. The BioE3 policy—Biotechnology for Economy, Environment, and Employment—is being pursued with a new-found vigour by the Department of Biotechnology (DBT). Ease of Doing Business ranking of India jumped from 142nd in 2015 to 63rd in 2022.

India's economic reforms are propelling growth, as evidenced by the record foreign inflow of US\$ 83.6 billion in FY 2022 and

an estimated US\$ 100 billion in FY 2023 (Shete 2024).

So what is the way forward, you ask? Toys. Bear with me.

Collecting Still!

The Bureau of Indian Standards (BIS), back in 2020, issued a resounding and impartial ban on import of toys without a BIS certification. It was done to effectively cut down on any kind of sub-standard or hazardous toys and in lieu of those, inject a catalyst to produce toys on home turf as part of Make in India (Bhaskar and Tandon 2020).

As a result, an import of toys that stood at INR2,960 crore in 2018–19, fell by 70% to INR870 crore in 2021–22 and the export stood at INR2,601 crore (PTI 2023). In 2023, the toys market in India was valued at US\$1.7 billion. The market is expected to reach US\$ 4.4 billion by 2032, according to IMARC Group, with a compound annual growth rate (CAGR) of 10.6% from 2024 to 2032 (IMARC Group 2023).

A sizable market but how much of it is being produced responsibly? The toy industry globally uses 40 tonnes of plastic for every \$1 million in revenues and is the most plastic-intensive industry in the world.

Nine out of ten of the toys on the market are made of plastic (The World Counts 2024). If India aspires to become a hub for toys and collectors' items, its priorities for the material used must be as clear as the path it has taken.

A shift has to come about - keeping aside all the love for the traditional die-cast cars. When global leaders in the toy market have begun a cleaner process of manufacturing, India must have a responsible stance on the process. Mattel announced a reduction of 25% in its plastic packaging per product by 2030 (Mattel Inc. 2022) and LEGO plans on completely abandoning

plastic by the same year (The World Counts 2024).

In an attempt to drive Indian bioplastic production, Balrampur Chini Mills, Kolkata, one of the largest sugar manufacturers of the country, is spearheading the nation's first industrial bioplastic manufacturing facility. With a capacity of about 75,000 tonnes per year in Uttar Pradesh, other more plastic-intensive sectors of the economy look to benefit greatly from it (Santos 2024). But once past those, do we look at the little big cars?

The die-cast community is brimming with loyalists, as any hobby is. Keeping that in mind, dare we say, the first die-cast



Image 4: Spoon and straw made with biodegradable corn starch granules shown during the cleanliness fair by South MCD



Image 5: A die-cast collectors’ meet

car made from bioplastic will be warmly welcomed.

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Zonal Training Centre, LIC Gurugram

The Zonal Training Centre in Gurugram is a testament to sustainable design and environmental responsibility. Registered under the GRIHA Existing Buildings rating, the campus is lush green, featuring two distinct building blocks: the academic block and the hostel block. The buildings were designed with courtyard planning to ensure natural ventilation and efficient daylight, creating a comfortable and healthy indoor environment.

The standout feature of the Zonal Training Centre is its 110 kWp solar energy system, which significantly reduces its dependence on conventional energy sources. The campus also has a solar water-heating system to meet its energy needs, and a 30 kLD sewage treatment plant (STP) utilizing MBBR technology, which recycles treated water for landscaping and flushing purposes. Additionally, composting pits on-site manage organic waste effectively, while a rainwater harvesting system contributes to water conservation efforts.

The interior of the buildings is equipped with smart

lighting solutions and BEE star-rated appliances, enhancing energy efficiency throughout the campus. Furthermore, the installation of low-flow fixtures helps to minimize water usage, demonstrating the project’s commitment to water conservation. The project is also designed to be barrier-free, making it accessible to all by providing ramps, dedicated rooms, toilets, dedicated parking spaces for differently abled ensuring inclusivity and ease of access.

The journey with GRIHA Council during the evaluation process was enriching, with a well-structured, multi-step rating system based on various criteria. The supportive and collaborative atmosphere fostered by the GRIHA team and Life Insurance Corporation of India (LIC) staff created a strong sense of community, making the entire rating experience positive and impactful.

As the Zonal Training Centre building moves towards its final rating, the project has successfully implemented sustainable features such as energy efficiency, waste management, renewable energy usage, and water conservation. The supportive and collaborative atmosphere fostered by the

GRIHA and LIC created a strong sense of community, making the entire rating experience positive and impactful.

The LIC is dedicated to advancing sustainability and environmental stewardship, not only through its insurance products but also through its proactive corporate social responsibility (CSR) initiatives. LIC is committed to enhancing its collaboration with GRIHA by focusing on various sustainability efforts, such as organizing tree plantation drives, integrating renewable energy solutions into LIC projects, and implementing effective waste management and recycling programmes. By strengthening its association with GRIHA, LIC aims to promote sustainable living practices and foster a greater sense of environmental responsibility within the community.

Through this partnership, LIC seeks to achieve higher sustainability standards across its operations, aligning with the broader vision of creating a more sustainable and environmentally responsible future. GRIHA’s support will be instrumental in guiding LIC towards these goals, ensuring that both organizations make a meaningful impact on social and environmental development.

Testimonial





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Leveraging Sustainable Solid Waste Management for Accelerating Climate Action

In the light of climate change, it can be stated with certainty; how we manage our trash can have a significant effect on the world in which we live. This article penned by **Ar. Gaurav Gupta** explores the creative thinking and environmentally friendly methods that turn trash management from a menial task into an effective instrument for environmental advancement. By implementing environmentally responsible waste management practices, we not only lessen our carbon footprints but also move closer to reaching challenging climate targets.

Gaurav Gupta



Gaurav Gupta commenced his career as a sustainable architect and has served the industry of green building for 11+ years. He is the Founder and Managing Partner at I-NAT Studio LLP. As part of his professional career, he has audited 400+ green building projects, designed 120+ architectural projects, conducted 400+ training/ awareness programmes on green building and sustainability.

Underlying Climatic Impacts of Solid Waste

In the battle against climate change, solid waste management is essential. The main way that improperly managed trash contributes to greenhouse gas (GHG) emissions is through the release of methane from landfills. With a potential of 28-36 times more global warming than carbon dioxide over 100 years. Figure 1 details the composition of solid waste as per the USEPA 2016.

The other issues faced globally are:

- Mismanagement of solid waste (e-waste, agricultural waste, construction waste, industrial waste): These wastes if not managed properly release toxins and GHGs into the environment.
- Depletion of resources

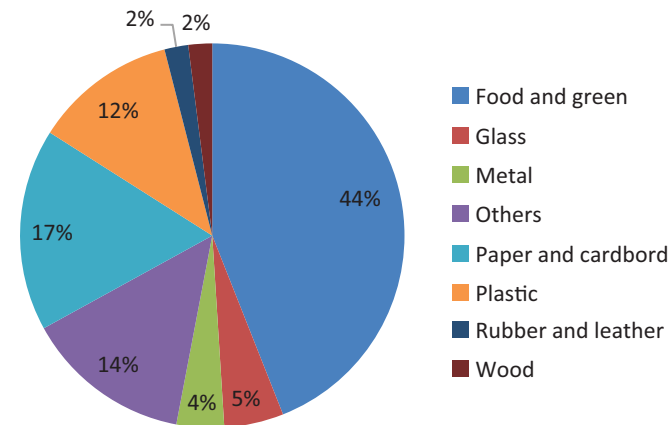


Figure 1: Composition of solid waste as per the USEPA 2016

India's Current Climate Change Policy

India's climate change initiatives have strategically focused on aligning developmental objectives with climate action. With the implementation of the Solid Waste Management Rules, the country is set to drive upcoming advancements in waste management for both commercial and residential sectors. These developments aim to enhance waste segregation, recycling, and sustainable disposal practices, ensuring that future urban growth integrates eco-friendly waste management solutions for more efficient and sustainable communities.

Solutions

- **Prevention and reduction of waste:** Avoiding the generation of trash in the first place is the most efficient approach to waste management

- **Implementing extended producer responsibility (EPR) programmes:** Encouraging the use of reusable products, and promoting sustainable consumption patterns are some effective waste reduction initiatives. Manufacturers are encouraged to design for durability, repairability, and recyclability by EPR programmes, which mandate that they assume responsibility



Image 1: Dumping grounds: construction waste crisis

for the full lifecycle of their products.

- **Improved composting and recycling:** By keeping garbage out of landfills and minimizing the need to extract virgin materials, recycling and composting help to cut GHG emissions. Modern recycling techniques, like improved mechanical and chemical recycling, can raise the effectiveness and calibre of recycled materials. In addition to lowering methane emissions from landfills, composting organic waste creates valuable material that can enhance soil health and absorb carbon.
- **Solutions for waste-to-energy (WtE):** The WtE systems transform non-recyclable materials into fuel, heat, or electricity. Contemporary WtE facilities have sophisticated energy-recovery rates and emissions control technologies to reduce

their negative environmental effects. The WtE offers a sustainable substitute for landfilling garbage that cannot be otherwise diverted, even though it does not replace recycling.

- **Models of the circular economy:** To make the shift to a circular economy, systems must be redesigned to maximize the value that can be extracted from resources throughout their useful lives, recover, and repurpose products and materials at the end of their useful lives, and so on. In line with climate goals, this strategy not only minimizes waste but also reduces environmental impacts associated with production and consumption.
- **Innovative technologies:** Innovations in technology are essential to the advancement of environmentally friendly waste management techniques. Important



Waste sensors



Waste app for citizens



Smart waste collection

Figure 2: Smart waste management system

inventions consist of smart waste management systems optimize waste collection routes, cut fuel costs, and increase recycling rates by leveraging internet of things (IoT) sensors and data analytics.

- **Advanced sorting technologies:** Using robotics and artificial intelligence (AI) to improve the efficiency and accuracy of sorting recyclable materials, lower contamination, and improve the quality of recycled goods.

Now let's explore how AI is ruling the world of waste management in different countries.

- Every year, India generates 62 million tonnes of garbage, of which only 70% is collected, 12 million is processed, and 31 million is disposed of in landfills. Owing to shifting consumption habits and quick economic expansion, 165

million tonnes of municipal solid garbage is anticipated to be generated by 2030. So, if we talk about India, with 43 underground trash systems constructed around the city, Surat in Gujarat can accommodate 1.5 tonnes of waste per bin. When these bins fill up to 70%, sensors in the bins notify the control rooms. And that helps them to work efficiently and unnecessary littering of waste.

- New 3D scanning technologies have been introduced, enabling the scanning of illegally disposed of municipal solid garbage on the roadside. It specifies the kind of garbage that is included in it as well as its volume.
- The Polish business created a smart bin that uses AI to detect the type of object and automatically sort it into the appropriate bin to reduce incorrect sorting at the source.

- Countries like the US, Japan, Canada, the European Union, Australia, and China utilize smart waste collection and sorting techniques.
- Japan has automated recycling facilities to sort and process garbage more effectively, recycling facilities use automated systems and robots powered by AI. Such technologies are being developed by companies such as Fujitsu.
- Utilizing AI and machine learning, nations can enhance their solid waste management procedures, resulting in waste management systems that are more sustainable and effective.

What Are India’s Climate Change Challenges?

India’s challenges in addressing climate change through solid waste management have significant global impacts, as

the country is one of the largest waste producers in the world. As outlined earlier, India generates around 62 million tonnes of solid waste annually, of which only 43 million tonnes is collected, and about 12 million tonne is treated. The remaining waste, about 31 million tonnes, is dumped in landfill sites. By 2030, this figure is projected to nearly triple, further exacerbating the problem. According to the 2022 figures, only around 25% of India’s solid waste is scientifically processed, including composting, recycling, and WtE conversion. This leaves a large portion of waste untreated, contributing to emissions and environmental degradation.

Conclusion

Sustainable solid waste management is a complex task that calls for a range of approaches, tools, and regulations in order to advance climate goals. We can greatly lessen the impact of waste on the environment by

emphasizing waste reduction, improving recycling and composting, putting WtE solutions into practice, and adopting the concepts of the circular economy. It can become a key component of the worldwide climate action, opening the door for a more resilient and sustainable future, with coordinated efforts by governments, businesses, and individuals.

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Weblinks

- <https://www.ispp.org.in/>
- datatopics.worldbank.org

Learn with GRIHA Training Calender

Date	Days	Training Topic	Number of Days	Online/Location
Completed	Friday	GRIHA for Existing Buildings (GRIHA EB)	1	Online
Completed	Thursday - Saturday	GRIHA V.2019	3	Bengaluru
Completed	Friday	GRIHA V.2019	1	Online
Completed	2 Consecutive Saturdays	GRIHA V.2019 Documentation	2	Online
Completed	Friday	GRIHA for Existing Buildings (GRIHA EB)	1	Online
12-14 December 2024	Thursday - Saturday	GRIHA V.2019	3	New Delhi
6-8 February 2025	Thursday - Saturday	GRIHA V.2019	3	Online
8 March 2025	Friday	SVAGRIHA V.3	1	Online
20-22 March 2025	Thursday - Saturday	GRIHA V.2019	3	Mumbai / Pune





Accelerating Climate Action in the Built Environment

PART 1: REALIZE WHAT YOU HAD AND LOST Years gone by, Oh Humans !

and I still think of those surreal days
No matter what, we did Co-Exist,
I for you and you for me.
As much I received, the sunlight and the rain,
I shared the fresh air, food
and shelter for you to nestle.
While allowing myself to surround you,
I felt cozy with your embrace.
I once got so much in return for all that I provided.
You cared, nurtured and revered me too,
I felt so guarded and protected by you.
Every child of your's that played around me
basking in the sun , getting wet in the rain
and the joy they flaunted, a feeling so mutual
like those colourful butterflies ,
flying over my flowery beds and what a sight !
ever so fragrant and bright.
The very thought of being wanted
and included was a blessing in disguise.
But Alas ! Today, when I rise
I see a world of darkness and the night

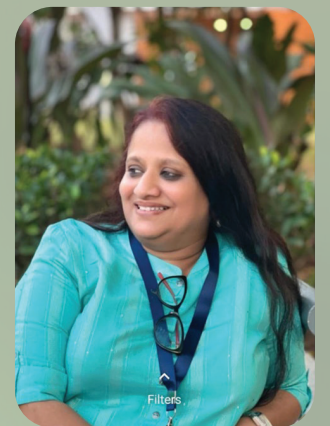
I just feel not all that right.
The air so heavy, with the smog settled so grey
and all that green gone away,
I feel so dull and rundown anyway.
Hardly finding myself clean, feel gloomy all the day.
Time and again I am being looted and uprooted ,
that, I have no birds to sing around the spring
All the thunders and the lightening announced
the arrival
of the monsoon rain that beat
the beads of sweat of the dry summer heat
making me all calm, was nature at its best .
With all those things laid to rest,
I kind of feel consumed and warm
And every child of your's born, I feel insecure
with the thought, that I could be assaulted
Certainly ! not a Boon anymore but, a Bane
In all its natural indulging self.

PART 2 : PAUSE !...TO INTROSPECT AND PLAN TO CORRECT

When did the equations change? For you to forget
and take this conscious materialistic dive
Certainly ! A Regressive selfish thrive.
Overused and so meddled that I am,

the climate has so changed, that the primates have grown
all over me, reminding me that I am the lowest in the
pyramid and in surplus too,
while you are the highest and the mightiest .
Little do you realize, Oh Humans! that with all your
dominance, still I remain "The Foundation"
for you to survive.
Why don't you understand, Oh! Creatures of mankind
You shake me, you shake yourself
I stay, only then you are for sure to stay.
I Gather and Harness the Natural Resources
The forces of power that strengthens me and you
The Sun with its Light and Heat ,
The Air with the Oxygen to breathe
The Winds that bring in Rain,
Oh ! The streams-of-nectar
for all of us to drink, let alone as sources of energy
even to just survive, to reproduce and whatever more
These very driving forces, are our lives,
Should we then sacrifice? rest assured, we are for sure
are at the brink of ending our own dear lives.
PART 3: REALIZE IT THROUGH RIGHT ACTION
The Need, To Want, To Greed
gone so very far, that you have me almost Archived
Now is the time or never will it be
the simple life with frugal wants
Wake-up to the new dawn
Live green and plant more green ,
For it will protect you in all its means/
Give and Give it Back, only to receive back
Once you lived gadget free and felt carefree
living a life of gay abandon, yet connected
Now when you are all so wired
yet ! on either side the relationships
are almost up and dried.
AI and the tools you have created for yourself ,
still listen to you to operate
but ,do you hear the voices of nature that created you?

It is high time you did, live and let live
To pause, think and act,
lest you might lose it all in a blink.
Oh ! Humans, the social beings that you are ,
to stay connected you move place to place
and so should you to be-friend and meet face to face
But, stationed in a place we are
yet ,our branches reach out to the sky
and our roots go so deep into earth,
for us to grow and thrive
Are'nt we stable and able taking everybody in our stride?
While we include and feel secure
Challenging nature, you exclude
to find yourself forever insecure.
Be conscious of the living environment you create
that which contributes more than one receives
Frugality is living in restraint and being pure
not flaunting the excessive impure.
Should we stabilize, one needs to
make informed lifestyle changes to Optimize
To what one has , to how much is needed
and how much to be used and left behind,
for the generations next to breath and not die.
Clean air, pure water, lush and green environ
are just not a sight to behold ,
but, to experience them as one's Birth Right.



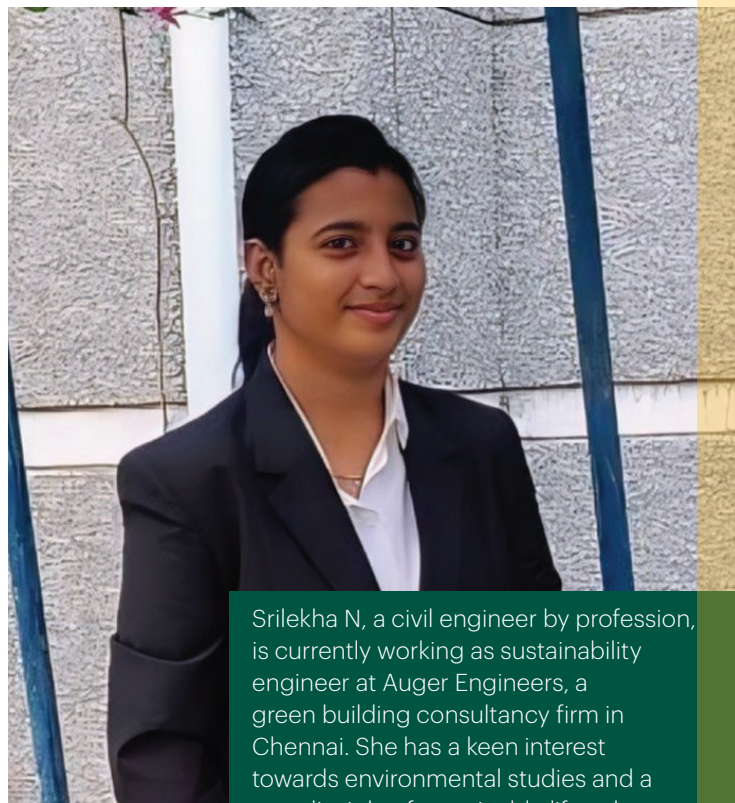
Architect Geetha V.G

Principal Architect
Flora-Arcade Consultancy

Antispot: a sustainable co-working space

This piece of writing, contributed by **Srilekha N**, accentuates the relevance of sustainable co-working space. The author first puts forward her views on the concept and then delves into the sustainable aspects of the platform. The text is supplemented by the discussion on a sustainable building—Antispot—lending practicality to the concept.

Srilekha N



Srilekha N, a civil engineer by profession, is currently working as sustainability engineer at Auger Engineers, a green building consultancy firm in Chennai. She has a keen interest towards environmental studies and a true disciple of sustainable lifestyle. She could be written at <srilekha@augerengineers.com>.

Co-working space in general is a shared office space concept where different types of companies work under one roof. It is affordable and economical as compared to a conventional office setup, as it allows the users to avail common infrastructure features such as unlimited Wi-Fi, furnished air-conditioned sitting space with good ambience, conference/meeting rooms, cafeteria, break-out space, recreation hall, housekeeping and maintenance, receptionist front desk, common utilities, parking space, and registered business address. Today it is the preferred choice for many small businesses, start-ups, solopreneurs, freelancers, consultants, and established companies. In addition, co-working helps avoid the social isolation that a person may experience while working remotely and eliminates distractions.



Image 1: Exterior view of the building Antispot, Anna Nagar, Chennai



Image 2: Solar panel which acts as a roof for dining and break-out space

The concept of co-working space has boomed in India in recent years. Earlier limited to metro cities, it is now mushrooming in Tier 2 and Tier 3 cities. However, regarding sustainability, how the building is designed and operates is a significant matter. A building needs to be developed in such a way that creates a positive impact on the environment and the building occupants, in order to be called a sustainable building.

One such building is Antispot, which is a coworking space located in Anna Nagar, Chennai owned by Mr Tanay Bokaria. It serves as a shared workspace for individuals from different companies, freelancers, and remote workers to work together in a communal setting. The facility has a built-up area of 930 m² with two floors and a shaded terrace by the elevated solar photovoltaic (PV) structure. A sustainable co-

working environment is important for several factors, encompassing environmental, economic, and social benefits.

This co-working space is built by taking many initiatives to make the workspace more sustainable. It is designed with features such as natural ventilation, daylighting, open terraces, 100% light-emitting diode (LED) lighting, high-performing glazing, adequate circulation space, ergonomic furniture design, use of engineered tile, better outdoor view, amongst others. The building meets 40% of the annual energy demand of 95,500 kilowatt hour (kWh) through a 40-kW on-grid monocrystalline solar PV system. This significant investment in solar technology underscores a dedication to reducing carbon emissions and promoting energy independence. The building has also achieved an energy performance index (EPI) of 102.68 kWh/m², 30% less than the Energy Conservation Building Code (ECBC) norms.

Moreover, the building incorporates sustainable practices, by use of variable refrigerant volume (VRV)-based air conditioners with the use of eco-friendly refrigerants (R410A), which reduce environmental impact while enhancing cooling efficiency. Rainwater harvesting is practised by collecting water in a storage sump to promote water conservation. Solar panels installed on the terrace also act as a roof, providing shelter for the open dining space for the members of the co-working space.

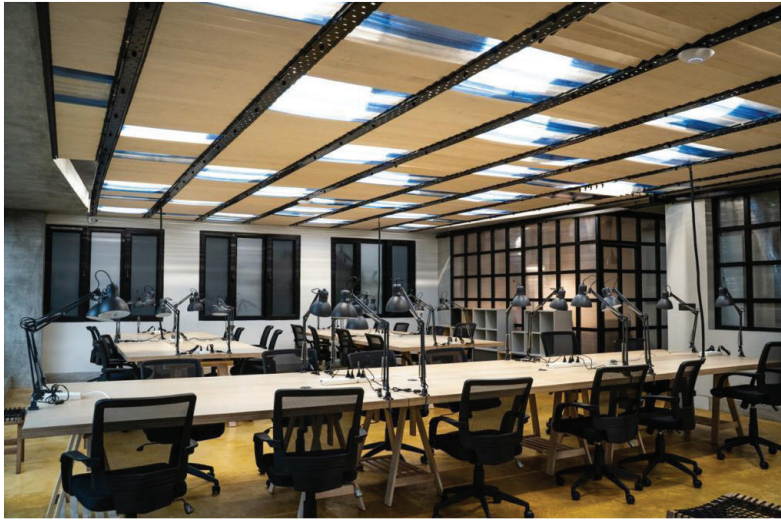


Image 3: Interior view of the building with adequate daylighting, circulation space, and ergonomic furniture with better outdoor view



Image 4: VRV-based air conditioner with R410A eco-friendly refrigerant



Image 5: Open dining space and a break-out space

The building's surrounding is also embraced by dense native shade-giving trees, this not only enhances air quality but also improves thermal comfort by reducing the heat island effect. Some parts of the building walls have been left unpainted and un-plastered to maintain the natural essence of the building. Automatic sensor-based sliding doors are placed in the reception area of the building for enables easy access to the people entering the working space. The facility also practises organic composting of food waste generated by the members of the co-working space. This way the manure generated out of the composting is utilized for gardening purposes in the building.

Hence, such sustainable practices make it a green co-working space which is preferred by many because of its already-stated multifold tangible and intangible benefits.

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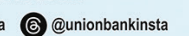
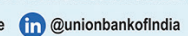
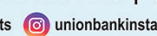
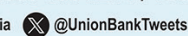
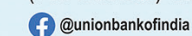
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Green certifications offer an exemplary framework for addressing climate change through innovative building designs and sustainable construction materials. Over the past two decades, the Indian built environment has made remarkable strides and is leading globally in many respects. Projects rated by GRIHA and the use of certified materials stand as a testament to this progress and represent an exceptional achievement.



Akshay Kumar Gupta
Director, Passive Design Consultants

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The built environment is our canvas. Let's paint a sustainable future with every stroke!! Climate action is both a necessity and responsibility. By embracing GRIHA's principles, we can design and operate resilient, energy-efficient spaces that harmonize with nature and ensure a greener tomorrow.



Ashu Gupta
Managing Partner, Design2Occupancy LLP

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At GreenTree Global, we excel in green building consulting, delivering evaluations aligned with GRIHA norms for sustainability. With over 15 years of expertise in energy efficiency and green practices, we value GRIHA's unique blend of accessibility, deep knowledge, and practical solutions. This synergy aligns perfectly with our core values, making our collaboration both productive and inspiring. We look forward to continuing this partnership and reaching new milestones in sustainable development



Anurag Bajpai
Director, GreenTree Global

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Building low-cost and energy efficient habitats will be the key to adaptation for millions of people at risk of climate change impacts such as heat stress and floods.

Integrating a low-energy thermal comfort system in building design and creating an energy efficient building envelope can be a game-changer for India in the challenge for climate resilience.



Dr. Roshni Udyavar Yehuda
Chief Executive Officer, RUA Ecospaces LLP, Mumbai

”

Climate action in the built environment isn't just about green buildings, it's more about the holistic approach towards the climate, the people and the environment. Surmount advocates for a comprehensive climate strategy in construction, adhering to GRIHA's sustainable practices. This commitment has supported projects that minimize environmental impact and emissions. With the increasing adoption of eco-friendly design, we're positive for a cleaner, resource-efficient future, harmonizing built spaces with nature.”



JP Rout (Mr. Jyotti Prakash Rout)
Vice President- Sustainable Services Surmount Energy Solutions Pvt. Ltd.,

”

Sustainable buildings are not just mere structures; they are a commitment to the future. Using Sustainability frameworks like GRIHA, we can integrate various eco-friendly strategies and create spaces that not only serve us today but also protect the planet for generations to come.”



Sumesh Nair LEED AP
Dy. General Manager, Green Consultancy & Energy Management

Paving the Way to Disaster: Bengaluru's urbanization and climate extremes

Article inked by **Prajna Aigal** draws our focus on the truth, how development because of concretization is contributing towards eradication of green and blue patches of the cities. This gives rise to occurrence of extreme events like flooding and heatwaves. The author makes us understand via a case study—Bengaluru city—once well known for its pleasant weather, has recently faced episodes of severe heatwave and intense water scarcity. The question now arises—how do we combat this? The simple answer is by reducing the sprawling concretization and providing more green and blue spaces within developments, irrespective of being old or new.

Prajna Aigal



Prajna Aigal is presently associated with The Energy and Resources Institute (TERI) as an Associate Fellow in the Sustainable Buildings Division. She is an Architect specialized in energy efficient and sustainable architecture. Her experience spans research and consultancy in regard to sustainable built environment. She could be approached via <prajna.aigal@teri.res.in>.

Bengaluru, called the 'garden city' and the 'lake city', known for its pleasant weather, earlier never crossed 25°C, recently faced a severe heatwave and intense water scarcity. With temperatures soaring to an unprecedented 40°C, the city was in serious disarray. With the onset of rains, the city has cooled down, and the water scarcity has subsided, but fears of flooding loom over the residents. These issues can be directly associated with the rapid urbanization and significant increase in concretization of the city.

What does 'concretization' mean? This term refers to the addition of hard-paved surfaces in the city, such as asphalt or concrete roads, footpath pavements, and other impermeable surfaces. Since these surfaces do not allow water to pass through them, any rainwater falling on these surfaces gets washed away and is considered as run-off water.

This run-off water then gets collected in low-lying areas and causes flooding. Additionally, these hard-paved surfaces have a high potential to absorb and re-emit the sun's heat, creating pockets of hot areas in the city, also known as 'heat islands'.

An example of a locality, Bellandur, in Bengaluru would strengthen comprehension of this phenomenon. This area faced severe flooding during the Bengaluru floods of 2022 and hence would be a relevant case study. First, let us examine how the area has developed over the last 10 years (Figures 1 and 2).

It is obvious that development and concretization have increased in the area. Another thing that can be noticed is that this area has quite a few lakes around it, four of which are adjoining the marked area (Figure 3).

During the rains, water will flow towards these lakes based on the land's slope. These existing water flow patterns have been recorded in the revenue maps of the ward (Figures 4, 5, 6, and 7).



Figure 1: Development in the Bellandur area in 2013

Source: Google Earth



Figure 2: Development in the Bellandur area in 2023; showing increase in number of buildings and hard-paved areas

Source: Google Earth

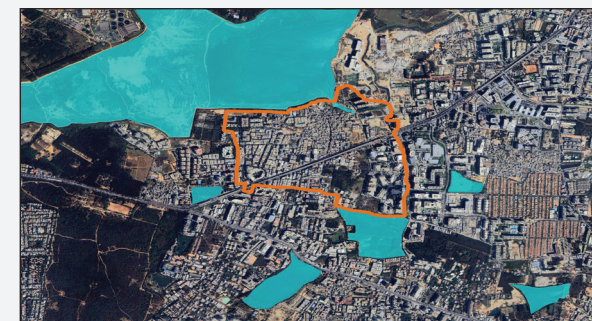


Figure 3: Lakes around Bellandur

Source: Google Earth (www.rajakaluve.org)



Figure 4: Existing water flow pattern (as per the Revenue Maps) overlapped on the development in the Bellandur area in 2013; showing certain water flow paths are still in unpaved and open areas

Source: Google Earth (www.rajakaluve.org)



Figure 5: Existing water flow pattern (as per the Revenue Maps) overlapped on the development in the Bellandur area in 2023; showing the developed water flow paths

Source: Google Earth (www.rajakaluve.org)

We can clearly see that, in certain areas, the existing water flow paths have been built over, either by buildings or roads and pathways. Blocking these water flows will, of course, leads to flooding in the area.

Now, let us understand the heat island effect in this area. Ideally, the presence of four lakes should keep the area quite cool and pleasant. However, comparison of the land surface temperatures over the last decade has shown an increasing trend (Figures 8 and 9).

It can be seen that the land surface temperatures are quite high in the area. A noticeable



Figure 6: Existing water flow pattern (as per the Revenue Maps) overlapped on the development in the Bellandur area in 2013; showing certain water flow paths are still in unpaved and open areas

Source: Google Earth (www.rajakaluve.org)



Figure 7: Existing water flow pattern (as per the Revenue Maps) overlapped on the development in the Bellandur area in 2023

Source: Google Earth (www.rajakaluve.org)

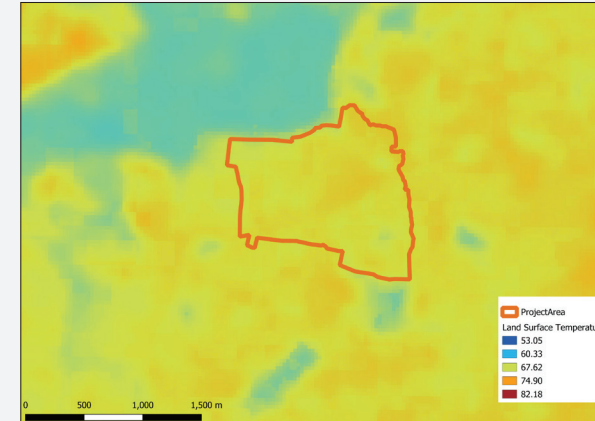
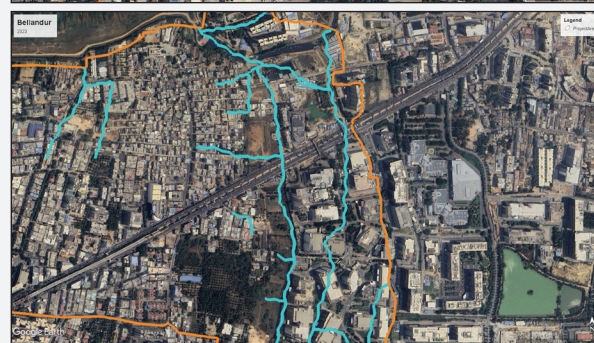


Figure 8: Land surface temperature of Bellandur in 2013; certain pockets of the Bellandur area still have relatively cooler land surface temperatures, especially those near the lakes

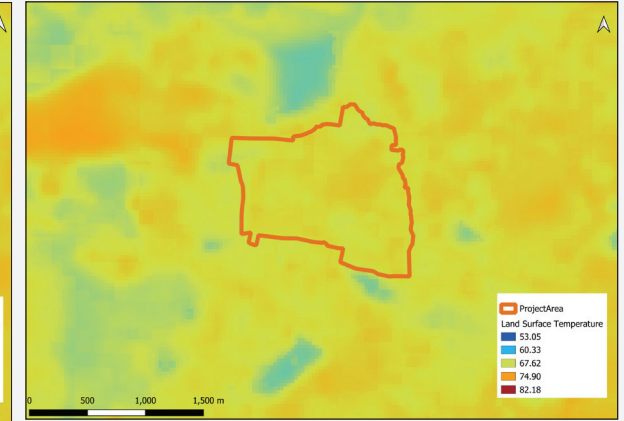


Figure 9: Land surface temperature of Bellandur in 2023; showing slight increases in land surface temperature within the Bellandur area boundary and large changes in land surface temperature outside the boundary, especially in the lake areas

increase, averaging more than 1°C, is seen from 2013 to 2023. Comparing Bellandur to a central green space of Bengaluru, Cubbon Park, shows how much higher the temperatures are felt in this area due to the increase in hard-paved surfaces and buildings (Figures 10 and 11).

So, how do we combat this? The simple answer is to reduce the

sprawling concretization and provide more green and blue spaces within developments, whether they are old or new. In this context, 'green' means adding more vegetation like trees (which will shade the paved surfaces and reduce heat absorption) and grass or small shrubs which will cover the ground (slowing down run-

off and allowing water to be absorbed by the ground). 'Blue' refers to managing the existing waterways by providing natural water drainage and retention systems (which will allow for more water percolation through the ground). Strategies for natural drainage and retention systems include swales (which are water channels with plants

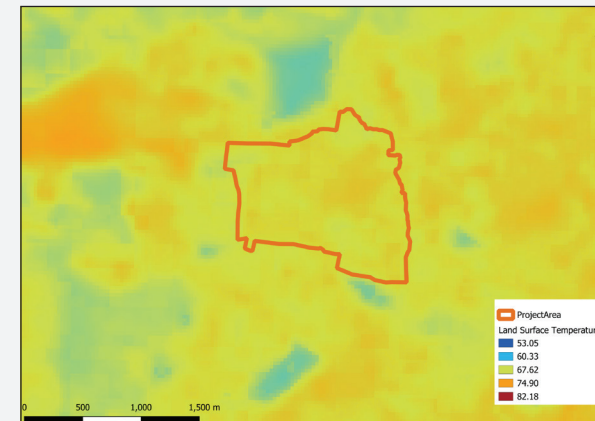


Figure 10: Land surface temperature of Bellandur area; showing relatively higher land surface temperatures

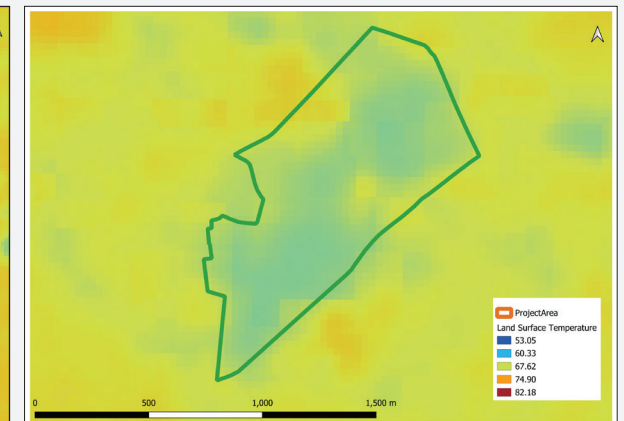


Figure 11: Land surface temperature of Cubbon Park; showing comparatively lower land surface temperatures

and natural porous materials like broken rocks or sand), retention ponds (which retains collected water and allow for percolation into the ground), rain gardens (which is a depressed area in the landscaping that collects water and allows it to soak into

the ground) and more. These drainage and retention systems can be connected to rainwater pits, tanks, wells, ponds and lakes, which will help in reducing flooding events and will keep water scarcity at bay Image 1.

Another possible strategy is to provide lesser paving all together or to use open-paving blocks, which use grass as fillers. This allows water to seep into the ground, reducing the amount of hard paving as well Image 2.



Image 1: Green and blue spaces



Image 2: Open pavers or grass pavers

Providing lighter-coloured surfaces can also help in reducing heat absorption, as light surfaces absorb lesser heat. These lighter surfaces can also be used on rooftops to reduce the amount of heat entering a building from the roof. These types of roofs are called 'cool roofs', as they significantly reduce the amount of heat entering the building (Image 3).

In conclusion, we need to rethink the way we plan our spaces, be innovative in how we pave our open areas, and bring in more 'green' and 'blue' elements into our developments. Not only will these help in reducing the flood risks and heat island effects, it will also create a better environment for human, plant, and animal well-being. Encouraging green

and blue elements in your renovation plans and upcoming developments will undoubtedly have positive impacts!

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Image 3: Cool roof

Paryavaran Rakshak Programme 3.0 GREEN CARNIVAL

On the occasion of Children's Day, a prelude to the 16th GRIHA Summit was organized by GRIHA Council with the aim of creating awareness and preparing the future climate warriors—the school children.

Prelude to the 16th GRIHA Summit

PLOGGING

GRIHA Council conducted an awareness drive on 12th November 2024 at the Lajpat Nagar Central Market, New Delhi, on the importance on waste segregation and responsible disposal





Redefining Luxury Real Estate in India

For over a decade, Elan Group has stood as a revolutionary force in the Indian Real Estate Sector, emerging as the Largest and Most Iconic Developer in Gurugram. Since its inception in 2013, Elan has shattered industry benchmarks with groundbreaking developments that epitomize luxury, innovation, and sophistication.

With an unparalleled portfolio of nine iconic projects in Gurugram – Elan Mercado, Elan Town Centre, Elan Miracle, Elan Epic, Elan Paradise, Elan Empire, Elan The Presidential, Elan The Mark and Elan Imperial, Elan Group has transformed the very essence of luxury living and sophisticated lifestyle.

The first four projects are already fully operational, delivering the apex of luxury high-street retail, world-class dining and immersive entertainment experiences that set new standards in excellence. The remaining five projects, grandly launched and currently under construction, promise to elevate the benchmarks of urban sophistication. Furthermore, two visionary developments are in the pipeline, poised for an extraordinary launch, cementing Elan's reputation as a trailblazer in India's luxury real estate sector.

Every Elan project is a masterpiece, meticulously designed to cater to the aspirations of the most discerning clientele. With each launch, the Group surpasses expectations, reinforcing its reputation as a leader in luxury real estate. From cutting-edge architecture to uncompromising quality, Elan's developments are a testament to modern-day opulence and innovation.

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Elan's vision of "Building the Future" drives its relentless pursuit of excellence. By integrating advanced technologies and sustainable practices, the Group creates developments that are not only luxurious but also at the forefront of modern architecture and urban design.

In a world where expectations constantly evolve, Elan Group leads the charge, transforming Gurugram's skyline and shaping the future of ultra-luxury living. With an unparalleled track record and a mission to continuously innovate, Elan Group stands as a leader in India's luxury real estate landscape, crafting destinations that set new benchmarks for excellence.

Burnt Clay Hollow Blocks: a modern material for low-carbon buildings

The article authored by **Dr Sameer Maithel** dedicates itself to the low-carbon buildings. In this attempt of sustainable construction, burnt clay hollow blocks have emerged as an excellent walling material. This is also accompanied by reducing both embodied and operational carbon in buildings and faster and enhanced quality of construction. On this basis, it could be one of the ideal materials for constructing new housing.

Sameer Maithel



Dr Sameer Maithel, PhD from the Indian Institute of Technology (IIT) Bombay has more than 30 years of experience in field testing and dissemination of low-carbon solutions in industries and buildings. He is an independent expert based in Bengaluru and has made noteworthy contributions to the development of Eco-Niwas Samhita and in reducing carbon emissions and air pollution from brick industry. He could be written at <sameermaithel@gmail.com>.

Introduction

India is expected to construct around 100 million new homes during next 10 years (Swaminathan 2024). During the life cycle of a building, the largest carbon emissions are: (a) cradle to gate embodied carbon emissions, occurring during the product stage, that is, in mining, transportation of raw material and manufacturing of construction materials like steel, cement, brick, glass, and so on, (b) operational carbon emissions, occurring during the operation (heating, cooling, lighting, and so on) of the building. It is critically important that the new housing being constructed has low embodied and low operational carbon emissions.

A significant percentage of the new housing construction is expected to be RCC frame structure with masonry infill walls made from bricks. In



such constructions, the walls can contribute up to 25% of the cradle to gate embodied carbon emissions (Chetia, Mital, Phogat, *et al.* 2024). The thermal properties of bricks impact the heat transfer across the building envelope and the energy used for cooling and heating of the building. One of the ways to reduce life cycle carbon emissions of new housing is to choose bricks that have low embodied carbon, this also helps in reducing operational carbon emissions. Burnt clay hollow block is one such promising material available in the Indian market.

Burnt Clay Hollow Blocks

In South Asia, burnt clay bricks have been widely used since the Indus Valley civilization. Even today, burnt clay solid bricks have the largest market share among masonry materials in India. The popularity of burnt clay bricks is attributed to good strength, durability, dimensional stability,

resistance to fire, breathability, amongst others (Bender and Handle 1982). Burnt clay bricks are also free from toxic materials, easy to reuse and recycle.

The Bureau of Indian Standards (BIS) defines a burnt clay hollow block as a block in which holes pass through the block exceed 25% of its volume and thus are not small (IS 2248:1992). The hollows may be at right angle or parallel to the bearing surface. Burnt clay hollow blocks have been widely used for decades in Europe, South America, and the Middle East. In India, burnt clay hollow blocks were manufactured in small quantities in roofing clay tile factories in Kerala for decades, it is only after the starting of the operation of Wienerberger India factory located near Bangalore in 2009, their availability increased in South India, and being used in large residential building projects. In recent years, some of the brick manufacturers located in North India, like Prayag Clay Products Limited (PCPL), Varanasi and Jindal Ceramica, Jhajjar

have modernized their brick-manufacturing plants and started manufacturing hollow blocks, thus improving their availability nationally.

Types and specifications of hollow blocks

Today, several types of burnt clay hollow blocks are available in the Indian market. They can be broadly categorized as:



Image 1: Horizontally cored hollow blocks

- a) horizontally perforated clay blocks (Image 1), which have compressive strength ≥ 3.5 N/mm², and are suitable for non-load bearing construction and b) vertically perforated clay blocks (Image 2), which have compressive strength ≥ 7 N/mm², and are suitable for load-bearing construction. The density



Image 2: Vertically cored hollow block



Image 3: Interlocking vertically cored hollow block

and water absorption of these blocks typically range from 700–950 kg/m³ and 10–20%, respectively. The blocks are available in several sizes (Table 1). Some innovative products like interlocking blocks (Image 3) which due to its interlocking feature reduces the amount of mortar requirement and insulation filled hollow blocks (Image 4) which provide higher thermal insulation are also available. Some of the hollow blocks also carry GRIHA certification. While the conventional cement-sand mortar can be used for laying these blocks, dry mortar or super glue, which does not require any curing is also available. Training programmes to train masons for using these blocks are

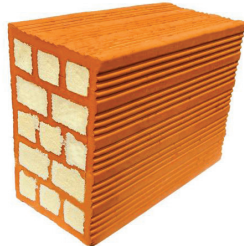


Image 4: Insulation-filled hollow block

Table 1: Size and application of some types of hollow blocks available in the Indian market

Product	Length × width × height (mm)	Application
Horizontally cored clay block	400 × 200 × 200	Non-load-bearing wall
	400 × 150 × 200	
	400 × 100 × 200	
Vertically cored clay block	400 × 200 × 200	Load-bearing wall
	400 × 150 × 200	
	280 × 205 × 130	
	280 × 135 × 130	
	280 × 70 × 130	



Image 5: House construction with hollow blocks

also being offered by the manufacturers.

Reduction in Operational Carbon

The U-value (thermal transmittance) of the walls made from burnt clay hollow blocks is significantly lower compared to the wall made from solid burnt bricks or concrete walls. The U-value of walls constructed using burnt clay hollow blocks with wall thickness, ranging from 100 mm to 200 mm, varies from 1.0 to 1.7 W/m²K (Wienerberger

n.d.). A report based on lab testing of hollow blocks at CEPT, University at Ahmedabad, reports U-value ranging from 1.69 to 1.83 W/m²K for walls made from 200 mm thick hollow block and 0.75 W/m²K for a composite wall of 200 mm thick hollow block with XPS insulation (Rawal, Shukla, Shah, *et al.* 2022). The same study reports the U-value of a 250-mm thick wall made from solid burnt clay brick as 2.41 W/m²K and that of a 100-mm thick RCC wall as 3.59 W/m²K. The lower U-value of walls made from burnt clay hollow blocks helps in improved indoor thermal comfort and in

reducing operational energy required for air conditioning.

Reductions in Embodied Carbon

The cradle to gate embodied carbon analysis depends heavily on the technology for manufacturing bricks and fuel used. The results of a study on cradle to gate embodied carbon emissions of solid and hollow products manufactured at a plant located in Varanasi (Maithel, 2023) show huge reductions in carbon emissions:

- A 31% reduction in cradle to gate embodied carbon emissions for a type of vertically cored hollow block (137.3 kgCO₂/m³), compared to burnt clay solid brick (198.9 kgCO₂/m³).
- A 55% reduction in carbon emissions (kgCO₂/m² of wall) for a 150 mm thick wall made of hollow block compared to a 230 mm thick wall of solid brick.

Material Savings and Faster Construction

In addition to the reductions in carbon emissions, the hollow blocks also result in huge material savings. For the study quoted above for embodied carbon,

there is a saving of 58% in soil requirement for manufacturing, around 60% savings in cement and sand consumption in mortar (per m² of wall area) as well as a reduction in the quantity of steel and concrete due to lower weight of the hollow blocks (Maithel 2023). Owing to large format size, construction is faster with hollow blocks.

Conclusion

Burnt clay hollow blocks are an excellent walling material which helps in reducing both embodied and operational carbon in buildings as well as faster and enhanced quality of construction. They can be one of the ideal materials for constructing new housing (Figures 5 and 6). Government agencies like the BMTPC and green building rating agencies like GRIHA can play an important role in increasing the demand for the burnt clay hollow blocks. On the supply side, if the government can initiate actions to indigenize modern technology for extrusion, drying and firing and facilitate finance to brick industries, it will help in modernizing the brick industry and in rapidly increasing the supply and bringing down the cost of burnt clay hollow blocks.

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मैना (चिड़िया)

शहर के किसी कोने में एक कस्बा है,
कस्बे के किसी एक कोने में मेरा घर
घर की पहली मंजिल पर एक कमरा है।
कमरे में सन्नाटा है,
जिसमे मैना रहती है।

मैना के मन में एक बात दबी है,
बात में गहरी सोच छुपी है।
सोच में एक बड़ा सा सदमा है,
सदमे से खामोशी फैली है।
जिसमे मैना रहती है।

यूं न था, मैना ऐसी सी थी,
ना शांत शांत सा रहती थी।
बस अपने मन की चलाती थी,
खुशियों का महल बनाती थी।
उसमें मैना रहती थी।

एक रोज क्या हुआ,
समाज को ये सब खटक गया,
मैना का महल चटक गया।
घनघोर काला बादल छाया,
एक व्यापारी घर में आया।
पहले खाया फिर सुस्ताया,
तब जाके मुददे पर आया।

बोला,

पढ़ेगी ज्यादा तो बिगड़ जाएगी,
ऐसा पापा को समझाया।

इस मसले का हल लाया हूँ,
मै सोने का पिंजरा लाया हूँ।
दिला दोगे तो मान बढ़ेगा,
हाँ पर इसका दाम लगेगा।
सोचा, थोड़ा और हिचकिचाए,
पापा दबाव में खुद को रोक न पाए।

हमने मैना को समझाया,
पंख तो झूठे किरसे हैं,
आसमान गिद्धों के हिस्से हैं।
ज्यादा तुम उड़ना पाओगी,
पिंजरे में सुरक्षित रह पाओगी।

मैना ज्यादा सोच न पाई,
और हमने की सोने की भरपाई।
बेच दिया सब कुछ अपना,
घर, जमीन, और सपना।

अंत में बेचा खुद को हमने
मन ही मन मुस्काए
और जाके मैना को उसके
पिंजरे में रख आए।

पहले नदिया सी बहती थी वो
चट्टानों से टकराती
इस बांध से रोकी ना जाती
तो झरना बन जाती।

या यूं होता गुलशन में रहती
अपना घर बनाती

श्री. नवनीत शर्मा
ग्रीनट्री ग्लोबल में वरिष्ठ ऊर्जा विश्लेषक

टूटे तिनकों पर सोती
जब चाहती उड़, तो पाती।

पर गलती, ये की मैना ने
पिंजरे मे उड़ना चाहा
समाज तो क्या वो पिंजरा भी
इसको सह ना पाया।

पंख कुतर कर मैना को छोड़ दिया
चमन में
बिना पंख-बिना खुआब के मेरे
घर के आंगन में।

एक आंगन जिसमे झूला है,
पहले खुशियां थी, अब सूना है।
तुलसी सूख चुकी है,
बैल टूट चुकी है।
अब जिसमें मैना रहती है।

हम सबने पूरा जोर लगाया
फिर मैना का गुलशन फिर बस न पाया,

अब उठाते उठाते मैना के सपने,
खुद इतना गिर गया हूं मै।
मैना का गुलशन ढूँढ ना पाया,
किसी बुलबुल का पिंजरा बन गया हूँ मै।

uBreathe

uBreathe's story is a compelling example of how personal challenges can ignite groundbreaking innovation. uBreathe was founded to address the urgent issue of indoor air pollution, which is significantly more harmful than outdoor air. According to WHO, indoor air is up to five times more polluted,



highlighting the need for effective solutions.

uBreathe was founded by **Sanjay Maurya** and **Akhil Gupta**. Sanjay, a tech entrepreneur with a background from IIT Kanpur and FMS Delhi, and Akhil, who brings over 16 years of international experience in impact investing and engineering, came together to create a solution for cleaner air. With their complementary skills and a shared vision, they set out to revolutionize air purification.

The idea was born when two of the co-founders experienced asthma because of poor air quality. This personal experience drove them to seek a better solution. With a strong background in technology and entrepreneurship, the team embarked on creating an advanced air purification system that goes beyond conventional methods.

Started in 2018 with the launch of the world's first natural air purifier, this innovative product

marked the start of uBreathe's commitment to integrating green solutions into air purification. In 2021, uBreathe continued to push boundaries with the introduction of the uBreathe Life Classic, a sophisticated plant-based purifier designed to enhance indoor air quality.

The momentum continued in 2022 with the launch of two new products: the uBreathe Rain and uBreathe Mini Classic. The uBreathe Rain, a modular and wall-mounted purifier, addressed the needs of semi-open spaces with high population influx, while the uBreathe Mini Classic offered an accessible solution for smaller spaces.

Building on their success, uBreathe unveiled the uBreathe Mini Lite and uBreathe Solutions in 2023. The Mini Lite was designed to provide an efficient air purification option, while uBreathe Solutions expanded their offerings to include comprehensive air quality management services.

uBreathe's core innovation lies in their 'Breathing Roots'



technology, which has now been officially granted a patent by the Government of India. This technology enhances the natural air-purifying capabilities of plants by improving soil breathability, allowing them to filter out pollutants more effectively. Unlike traditional mechanical purifiers, which are often limited and environmentally taxing, uBreathe's approach offers a sustainable and efficient alternative.

The company's product range includes the uBreathe Mini Lite, Mini Classic, and Life Classic, designed to bring cleaner air

to homes and offices. With over 8,500 users across India, uBreathe is making a tangible difference in indoor air quality. Their comprehensive air quality solutions also include auditing, purification, and monitoring services. Collaborations with notable organizations, such as the UN House in Delhi and the Government of Maharashtra, underscore their impact on creating healthier indoor environments.

uBreathe has earned recognition through several prestigious awards, including the Innovation



Challenge by MQDC and the UNDP India Accelerator Labs programme. The recent patent achievement further validates the uniqueness and effectiveness of their technology.

Supported by leading institutions like IIT Ropar, CIIE, CO IIM Ahmedabad, and the Biotechnology Industry Research Assistance Council (BIRAC), uBreathe is at the forefront of revolutionizing air purification. Their journey reflects a commitment to combining technology, nature, and design to improve indoor air quality, paving the way for a cleaner, greener future.

uBreathe's story is a powerful example of how combining innovative technology with a commitment to sustainability can drive meaningful change. Their work not only addresses the urgent issue of indoor air pollution but also sets a precedent for a greener, more sustainable approach to air purification.



Harnessing Bioclimatic Air Conditioning for Climate Action

This article, an ideation of **Faris Ahmed**, details the concept of bioclimatic architecture. The author is of the opinion: as the humanity stands on the brink of a climate crisis, the adoption of bioclimatic architecture is the need of the hour. Collaboration among architects, engineers, policymakers, and the broader community is essential to drive innovation and set new standards. By bounding these principles, India has the potential to pioneer sustainable development and serve as a global model.

Faris Ahmed



Faris Ahmed, National Doctoral Fellow, SSN College of Engineering, is an industry-academic researcher. He has dedicated more than 7+ years of his professional life to the areas pertaining to HVAC, indoor air quality, thermal comfort research, nature-based, technological solutions for sustainability, and climate change mitigation. He could be reached via <farisahmed@ssn.edu.in>.

Urgency of Climate Action in Architecture

As nations worldwide grapple with the urgent need to combat climate change, the built environment emerges as a critical frontier in this battle that accounts for a staggering 40% of the country's total energy consumption, with over half dedicated to heating, cooling, and ventilation. This makes it vital to rethink how we design, construct, and operate them. By 2050, with a projected temperature increase of 2–3°C, air-conditioning usage in India could quadruple. One promising approach is bioclimatic air conditioning, which leverages the natural characteristics of the local climate to regulate indoor temperatures, reducing the reliance on energy-intensive mechanical systems and minimizing environmental impact.

Bioclimatic Air-conditioning Techniques

Bioclimatic air conditioning utilizes passive cooling methods to maintain adaptable indoor temperatures with significantly less energy. The Figure 1 illustrates various passive cooling methods that can be employed in buildings.

Moreover, bioclimatic buildings can perpetuate more stable and comfortable indoor temperatures throughout the day, even as outdoor temperatures fluctuate significantly. Figure 2 shows the temperature regulation of outdoor and indoor over a 24-hour period, in conventional and bioclimatic buildings applicable to Bengaluru and Pune locations with moderate climate settings.

Geothermal Cooling and Heating: a game changer

Geothermal technology harnesses the relatively stable temperatures below the earth's surface to provide efficient heating and cooling. A fluid circulates through underground pipes, absorbing heat from the ground in winter and releasing heat into the ground in summer. As shown in Figure 3, ground temperatures at certain depths stay close to the average annual air temperature, making this method highly efficient and reducing energy use by up to 50% compared to traditional systems. As of 2024, geothermal

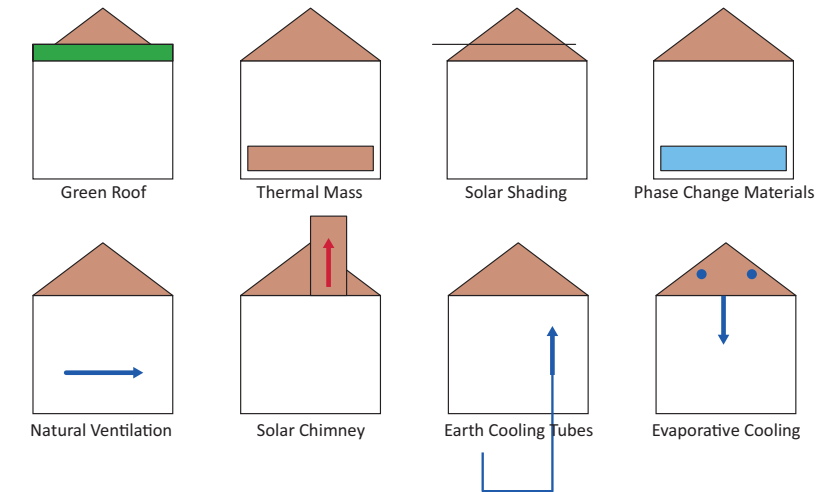


Figure 1: Illustration of bioclimatic air-conditioning techniques

Source: Adapted from Passive Building Design: a handbook of natural climatic control by Bansal, et al. 1994

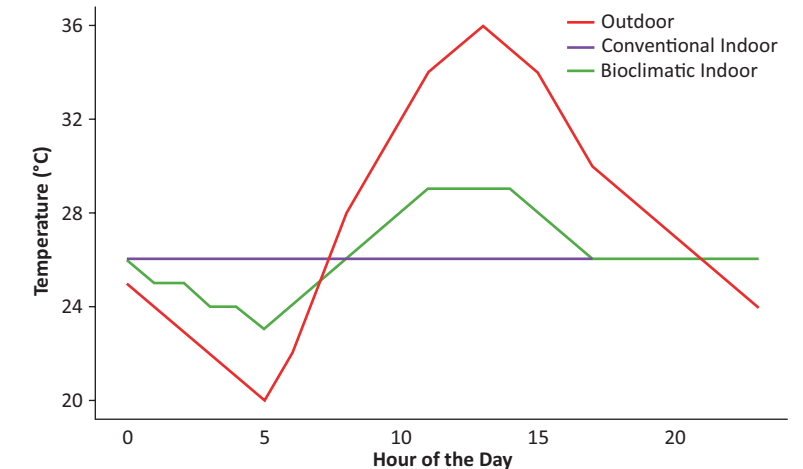


Figure 2: 24-hour temperature regulation: outdoor versus indoor

Source: Data simulated based on typical weather patterns and building performance

cooling systems in India are primarily used in commercial and institutional buildings, with notable examples like the TERI Retreat in Gurugram, which employs an earth air heat exchanger as part of its sustainable practices. While adoption is currently limited to pilot projects, these serve

as valuable case studies for understanding the feasibility and benefits of geothermal cooling. India has significant geothermal potential, estimated at 10,600 megawatt (MW) as per a Ministry of New and Renewable Energy (MNRE) report, 2016. Regions like the Indo-Gangetic plains, Cambay basin, and parts of

central India offer promising opportunities. In Ladakh, a pilot project is exploring geothermal energy for heating and cooling, while Gujarat is investigating its use in the Cambay basin. Research in the Konkan region is also exploring applications in buildings. Despite its potential, large-scale adoption faces challenges, including high initial installation costs. However, these are balanced by lower operational and maintenance expenses. Advances in drilling and heat exchange technologies are making geothermal cooling increasingly accessible for a wider range of buildings.

Energy-saving Potential of Bioclimatic Techniques

The estimated energy-saving potential of various bioclimatic

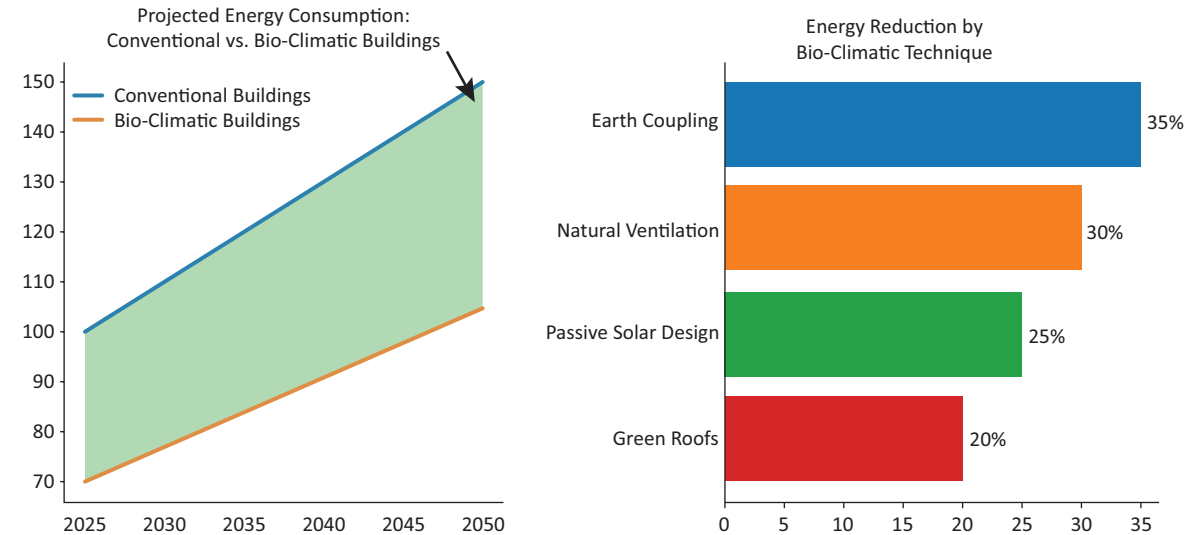


Figure 4: Comparison of energy projection versus estimated energy requirement
Source: Adapted from IGBC Rating Systems and UNEP Report

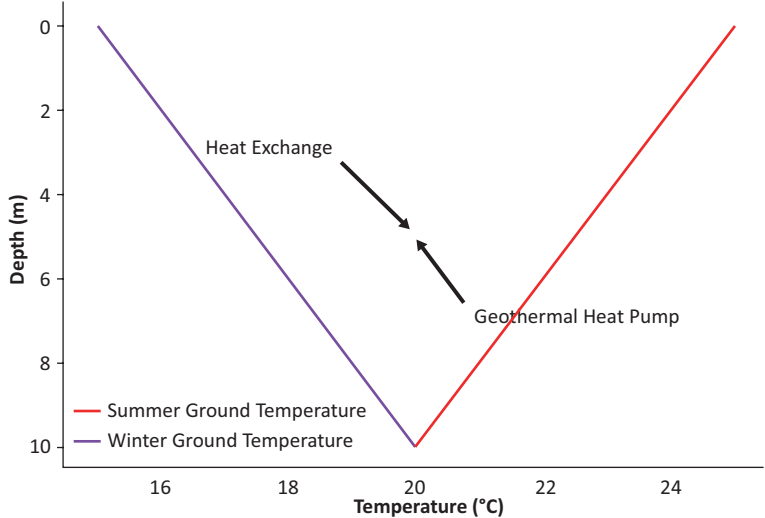


Figure 3: Ground temperature profile for geothermal cooling and heating
Source: Adapted from Direct Utilization of Geothermal Energy 2010 Worldwide Review by Lund, et al. 2010

techniques if implemented thoughtfully could consume 25–30% less energy by 2050 than their conventional counterparts as presented in Figure 4. Specific tools and models, such as the India Model for Adaptive Comfort (IMAC) and bioclimatic analysis

tools, have been developed to assess the energy-saving potential. The adaptive time-tested designs which respond to seasonal variations prove that comfort and efficiency can coexist without heavy reliance on mechanical cooling.

Adaptive Design and Architecture: building for the future

Accelerating climate action in the Indian built environment requires a paradigm shift towards adaptive design. This involves creating buildings that can respond to seasonal variations and long-term climate changes, ensuring comfort and energy efficiency over their lifespan. Bioclimatic architecture is already being practised across various regions in India. Worth-quoting examples from different climate zones are highlighted here and shown in Image 1.

- **Hot and dry climate:** The Pearl Academy building uses a combination of traditional and modern techniques to achieve thermal comfort. Features such



Image 1: A few bioclimatic designed buildings in India
Source: Compiled from respective building websites and architectural publications

as courtyards, water bodies, and shaded walkways help in passive cooling, while the use of locally sourced materials like sandstone enhances thermal efficiency.

- **Moderate climate:** The Infosys Campus in Pune incorporates extensive green spaces, natural ventilation, and daylighting to reduce energy consumption. The use of fly ash bricks and other sustainable materials further enhances the building's energy efficiency.
- **Warm and humid climate:** IIM in Kozhikode campus is designed to maximize natural ventilation and minimize heat gain. The use of terracotta tiles and bamboo for construction helps in maintaining a comfortable indoor environment.
- **Composite climate:** The TERI Retreat in Gurugram uses geothermal cooling, solar energy, and rainwater harvesting to achieve sustainability. The use of high-performance glass and insulation materials ensures minimal energy loss.

Sustainable Pathway

As we stand on the brink of a climate crisis, the adoption of bioclimatic architecture is the need of the hour. Collaboration among architects, engineers, policymakers, and the broader community is essential to

drive innovation and set new standards. By bounding these principles, India has the potential to pioneer sustainable development and serve as a global model.

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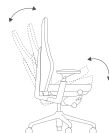
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BUILDINGS

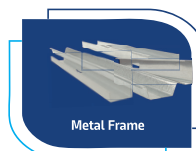
WORLD'S NO. 1 COMPANY IN
DRYWALL & CEILING SOLUTIONS



Gypsum Plasterboard



Aquapanel



Metal Frame



Joint Compound

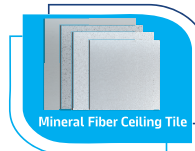


Gypsum Plaster



Gypsum Ceiling Tile

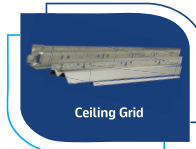
PRODUCT CATEGORIES



Mineral Fiber Ceiling Tile



Insulation



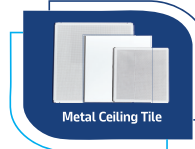
Ceiling Grid



Access Panel



Accessories



Metal Ceiling Tile

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