Shashwat

Volume 10 I Issue 10 I November 2023

Let Nature Be

"Empowering Sustainable and Resilient Communities"



A GRIHA Council Publication

COVER STORY

- Sulabh's Individual Household Toilet Programme: A Tool of Socio-Economic Change
- Blue Coastal Economy

FACE-TO-FACE

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- Aarvy Healthcare Pvt. Ltd

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प्रधान मंत्री
Prime Minister

MESSAGE

I am happy to learn about the organisation of the '15th GRIHA Summit' by GRIHA Council. The theme of the Summit, 'Empowering sustainable and resilient communities' is highly relevant. The initiative to release the 10th edition of the annual magazine – 'Shashwat – Let nature be' is timely.

India, a nation blessed with a diversity of natural resources, has a long-standing tradition of living in harmony with nature. Building upon our traditions, every aspect of life, including culture, daily practices and festivals, reiterates our strong connection with nature.

As a strong advocate of the principle of climate justice, we have embraced sustainable, innovative, and eco-friendly practices. Given that India is a megadiverse country, it is our responsibility to safeguard the environment. For centuries, the mantra of Reduce, Reuse, and Recycle has been deeply ingrained in our cultural ethos and daily routine.

India's growth story is characterised by its achievement of becoming the fastest growing economy while also being perhaps the only country that is on track in achieving the goals set in the Paris Accord. Further, through Mission LiFE, a mass movement has been initiated, shifting focus towards conscious and purposeful utilisation to fulfil the dreams and aspirations of its people, rather than unchecked and harmful consumption.

The period leading up to 2047, when India celebrates 100 years of independence, presents a unique opportunity to establish a strong, sustainable and self-sufficient nation. In this regard, adopting environment-friendly practices is crucial for achieving this vision through both individual and collective efforts.

May the Summit lead to productive discussions. I am sure that the magazine will capture and reflect the spirit and essence of the occasion.

Best wishes for success of the 15th GRIHA Summit.

(Narendra Modi)

New Delhi
कार्तिक 26, शक संवत् 1945
17th November, 2023

GRIHA TIMELINE

2000-2012

2012

- ❍ SVA GRIHA rating, GRIHA Product Catalogue
- ❖ SIDBI announces concessional rate of interest for GRIHA projects

2011

- ■ CREDAI
- ❖ PCMC announces discounts on premium charges to developers and property tax rebate for buyers for GRIHA-rated projects

2010

- ❍ Evaluators' and Trainers' Programme

2009

- ■ Committee of secretaries: 3-star GRIHA rating mandatory for all government buildings
- ■ CPWD embraces GRIHA
- ◆ Acknowledged as an innovative region-specific green building assessment tool by the UN

2008

- ❍ National Mission on Sustainable Habitat

2007

- ■ MNRE adopts GRIHA as a National Rating System for Green Buildings

2005

- ❍ TERI GRIHA released as an indigenous green building rating in India

2014

- ❍ GRIHA for Existing Day Schools rating
- ✸ GRIHA projects in MoUD, Delhi Division, Government of India
- ✸ Sikkim mandates GRIHA

2013

- ❍ GRIHA LD rating
- ❍ GRIHA app
- ❖ PCMC announces premium discounts to developers and property tax rebate for buyers for SVA GRIHA rated projects

2015

- ✸ GRIHA projects in Rajasthan, Pune, AUDA, and UP
- ✸ GRIHA projects in the Government of West Bengal, Department of Municipal Affairs
- ✸ A 25% subsidy on FSI for GRIHA-rated industrial projects in Andhra Pradesh
- ❍ GRIHA v.2015 rating and GRIHA LD rating

2017

- ❍ GRIHA for EB rating, GRIHA for AH rating
- ❍ Revamped evaluators module and exam
- ■ MPPH & IDC, PMC, BESTECH, IREO, Vatika, CONSCIENT, ADANI Realty, Vilas Javdekar Developers and Godrej Properties
- ■ EESL, NHB, ISHRAE
- ■ Extended with NASA, India
- ❖ Circular issued to all the State Police Housing Corporations for the incorporation of GRIHA in the ongoing and future projects by the BPRD
- ❍ SPARSH installed at the UN office on UN Day 2017

2018

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

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

- ❍ Launch
- ■ Memorandum of Understanding (MoU)
- ✸ Floor Area Ratio (FAR) incentive
- ❖ Green Building Incentive
- ★ Projects
- ◆ Awards and Recognitions

2016

- ❍ GRIHA Help Centre, ACE membership, CATALYST Programme
- ✸ GRIHA projects in Haryana
- ■ MPPH & IDC, IICCI
- ❖ PMC announces discount in premium charges for GRIHA/SVA GRIHA projects

2019

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

2020

- ❍ GRIHA Product Catalogue Brochure
- ■ First Construction Council, EMC, CIMSME, KIIFB and IIA, Northern Chapter
- ✸ GRIHA projects in Himachal Pradesh
- ❖ Govt. of Gujarat (Industries Commissionerate) offers assistance of up to 50% of consulting charges or INR 2.5 lakh, whichever is less, for industrial buildings of more than 2,000 sq.m built up area which obtain green rating from GRIHA Council
- ❖ GRIHA, and GRIHA AH-certified (4-and 5-star projects) was provided financial incentives under SUNREF India program
- ❍ GRIHA v. 2019 (User Manual)
- ❍ Release of policy brief on Sustain the Sustainable change
- ❍ 30 stories Beyond Buildings
- ❖ Extra FAR for GRIHA projects in Rajasthan

2021

- ■ IIFL HFL and Council of Architecture (Renewal)
- ❖ Upto 15% FAR benefits in J & K for GRIHA certified projects
- ❖ Exemption from EC for GRIHA projects in J & K

Government of Maharashtra makes it mandatory to achieve a minimum of 3 star rating for construction projects under GRIHA for all buildings belonging to Government, Semi-Government, local bodies and public sector undertakings for propagating sustainable habitat development in the state.

2022

- ❍ NHB manual, SVA GRIHA V.3, JAN GRIHA, Decarbonizing Habitat Program, GRIHA Water Positive certification
- ❖ Kerala government incentives on one time building tax, stamp duties and property taxes for green building in the state
- ■ 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 and Life Insurance Corporation of India (LIC)
- ❖ Govt. of Uttar Pradesh would reimburse 50% of the certification fee paid, up to Rs 10 lakh to hotel/wellness resort obtaining Green Building Certification under GRIHA Council

2023

- ■ Navodaya Vidyalaya Samiti (NVS) and NASA India
- ❍ Fast-track process for GRIHA Product Catalogue
- ✸ First GRIHA Registered International Airport Project - Hanimaadhoo International Airport, Maldives
- ◆ GRIHA Council was awarded the "Best National Brand of the Year" under the Solutions Category at the 6th edition of the Global Smart Build Summit and Award
- ❖ Bank of Maharashtra shall provide concession of 0.1% in applicable ROI in regular Maha Super Housing Loan Scheme
- ❖ Pondicherry Green Budget 2023-24 shall adopt a policy of constructing only GRIHA certified new buildings
- ◆ GRIHA Council became network member of UNCTCN

MESSAGE FROM THE PRESIDENT, GRIHA COUNCIL



As the world is undergoing a transformative phase and continues to grapple with social, economic and environmental challenges, the notion of sustainability has evolved from being a mere expression to an imperative.

Globally, the concept of development is being redefined across various sectors and industries. As we find ourselves halfway through the UN 2030 Agenda, the *Global Sustainable Development Report 2023* states unequivocally that 'the world is far off track on achieving the Sustainable Development Goals'. This serves as a 'call to action' and reminder for all of us—nations, societies and individuals to take collective and collaborative steps aiming at creating healthier, productive, and resilient societies whilst safeguarding and protecting our natural resources and ecosystems.

As nations worldwide persist in their efforts to attain individual climate objectives in consonance with global commitments, the imminent COP28 in Dubai emerges as a pivotal platform for global leaders. The forum will further provide an opportunity to streamline the paradigm shifts with respect to accelerating energy transitions, strengthening climate finance, encouraging the blend of innovation and technology in sustainability endeavours, fostering inclusivity in climate and sustainability decision-making on global platforms and integrating nature, people, and livelihoods in climate action.

India, as a nation is making significant strides in promoting sustainable development and building resilient communities.

Based on a collective and collaborative approach, Mission LiFE (Lifestyle for Environment), an initiative launched by the Government of India has gained prominence on the global platform. Recently, a landmark event unfolded in India—the G20 Summit. India's G20 Presidency was a testament to our nation's commitment to fostering collaborative global efforts in sustainable transformation and inclusive development.

On this occasion, I am pleased to share that the theme of this year's GRIHA Council's Shashwat Magazine is—Empowering Sustainable and Resilient Communities which is in tandem with the spirit of Mission LiFE and UN SDGs 'Leaving No One Behind'. It serves as a platform to delve into the multifaceted dimensions of sustainability and resilience.

GRIHA means – Abode in Sanskrit. The vision of GRIHA Council aims to create spaces and habitats that promote human well-being and minimize detrimental impact of the built environment on the health of the natural ecosystem. It firmly stands for its goals of achieving sustainable development in the built environment and plays a crucial role in empowering communities to embrace sustainability and advance resource efficiency.

I congratulate the leadership at GRIHA Council for their instrumental role in steering the organization towards continuous progress and the advancement of the vision to create sustainable habitats. I extend by sincere gratitude to the various ministries and departments of the Government of India for their trust and confidence in the brand GRIHA for accelerating the sustainable habitat movement nationwide.

I humbly acknowledge the unwavering support and contributions of our valued partners, collaborators, and well-wishers for the faith they have shown in GRIHA Council. I am certain that GRIHA Council will remain a frontrunner in promoting sustainability and resilience, even beyond the construction industry.

Wishing everyone the very best for the upcoming year, 2024!



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

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Minister of External Affairs
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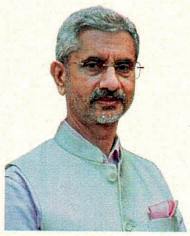

MESSAGE

I am delighted to be informed about the upcoming release of GRIHA Council's annual magazine "Shashwat," which is centered around the theme "Empowering Sustainable and Resilient Communities". I would like to congratulate GRIHA Council for hosting their upcoming annual "15th GRIHA Summit" on 23rd November and 24th November 2023 at New Delhi, India.

India is committed to fostering partnerships that contribute towards the sustainable development goals, while empowering communities worldwide. With rapid globalization and ecological imbalance resulting due to anthropogenic activities, the resilience of our communities stand as the cornerstone of our shared future. The profound interconnectedness of our world and the integral role that empowered communities play in shaping our future are of utmost importance. It is only holistic and mindful sustainable development that can ensure that we overcome the challenges the world faces currently.

I extend my best wishes to the entire GRIHA Council team for a successful "15th GRIHA Summit & launch of the annual Shashwat Magazine".

(S. Jaishankar)

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Enclosure(s) | Case/ID No. | Department | Date
2 November 2023

Ambassador, Royal Danish Embassy

I am delighted to extend my sincere congratulations to the GRIHA Council on the launch of this year's edition of their annual magazine and looking forward to the 15th annual GRIHA Summit based on the theme "Empowering Resilient and Sustainable Communities". Your commitment to driving sustainable practices and fostering resilience within communities is truly inspiring and aligns seamlessly with Denmark's own values and initiatives.

In the spirit of collaboration, I would like to share some highlights of Denmark's endeavours towards similar goals. Denmark's strong focus on renewable energy has led to a significant reduction in carbon emissions and our investments in sustainable urban planning and green transportation have transformed our cities into models of efficiency and sustainability. Our commitment to circular economy principles has driven innovation and reduced waste across industries.

The summit serves as a shining example of your dedication to positive change and your efforts to advance environmental conservation & community well-being. By assembling experts, thought leaders and stakeholders, you have created an invaluable platform for exchanging insights and experiences that will undoubtedly contribute to shaping a more sustainable future.

As we collectively address the challenges posed by climate change and other global issues, it is heartening to witness organizations like the GRIHA Council spearheading the change and driving sustainability to create lasting positive impacts. Your work resonates deeply with Denmark's dedication to sustainability and we commend your leadership in this realm. My best wishes for a successful event.

Freddy Svane
Ambassador

ROYAL NORWEGIAN EMBASSY

Ambassador



On behalf of the Royal Norwegian Embassy in New Delhi, India, I extend my warmest wishes to GRIHA Council on the occasion of the "15th GRIHA Summit" and on the launch of the 10th edition of their annual magazine "Shashwat – Let Nature Be".

This year's theme 'Empowering Sustainable and Resilient Communities' shares common synergies and is inclusive with the national climate action targets set by both our countries.

Norway's commitment to renewable energy has led to a significant reduction in carbon emissions. Our investments in sustainable transportation and infrastructure continue to pave the way for a greener future. Our focus on ocean conservation and sustainable fisheries management is a symbol of our dedication to preserving vital ecosystems for generations to come.

The Norwegian Climate Investment Fund has committed equity and guarantees to a number of green energy projects in India as a part of Norway's effort to fulfil the Climate Finance promises and contribute to Green Transition & Energy Security in India.

Norway and India have consistently worked towards strengthening the economic and technical partnership and have made thriving progress in this regard. It is a remarkable testament to the commitments of both countries towards sustainable practices and environmental stewardship.

As we collectively navigate the challenges posed by climate change and other global issues, it is heartening to witness organizations like the GRIHA Council spearheading initiatives that create lasting positive impacts. Your efforts truly resonate with Norway's commitment to sustainability and we commend your leadership in this area.

May-Elin Stener

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Rajesh Kumar Kaushal
Director General

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Government of India

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MESSAGE

It gives me immense pleasure to learn that GRIHA Council is bringing out its annual magazine '**Shashwat-Let Nature Be**' during its annual flagship event in New Delhi on 23rd and 24th November 2023.

Considering the wide geography of our country with various disasters affecting man and infrastructure each year in different parts of the country, this year's theme of "Empowering Sustainable and Resilient Communities" is an apt one for creating a forum for discussion on development with environment friendly practices.

CPWD being a principal engineering organisation of Government of India, envisages itself in a leading role in the execution, maintenance and standardization of the built environment in India. CPWD has adopted green construction practices in all its projects. Technical publications of CPWD issued from time to time are aligned with the National Building Code, Energy Conservation Building Code and GRIHA norms.

I would like to convey my deep appreciation to GRIHA Council and the strides it has taken towards mainstreaming sustainable construction practices with focus indigenous material and technologies. CPWD has a vision in line with GRIHA and we are both working towards making built environment more resilient and self-reliant and at the same time spreading the idea of sustainability to a grass root level.

I compliment GRIHA council and extend my best wishes for their continued success.

(Rajesh Kumar Kaushal)

AJAY MATHUR, Ph.D
Director General



Message

I am pleased to note that GRIHA Council is organizing the 15th edition of its annual GRIHA Summit, with the central theme of **"Empowering Sustainable and Resilient Communities".**

The International Solar Alliance (ISA) was conceptualized as a collaborative undertaking between India and France, aimed at stimulating collective action against climate change through the widespread adoption of solar energy solutions. Currently, the ISA Framework Agreement boasts participation from 116 nations, with 94 countries having fulfilled the prerequisites for becoming full-fledged members. ISA has a clear aim of increasing the utilization of solar energy across the world in an effective and efficient manner. Identifying and understanding the existing challenges & anticipating future advancements in the energy sector is of utmost importance.

GRIHA Council is playing a significant role in achieving the ambitious objectives outlined by India to attain net-zero carbon emissions by the year 2070. India is steadily transitioning its energy demand to solar energy. This holds the promise of reducing carbon emissions and advancing the cause of sustainable development.

An alliance between the initiatives of ISA and the interventions spearheaded by GRIHA Council is discernible. I am hopeful that convergence of our collective strengths and expertise will facilitate the effective and efficient realization of the energy transition objectives across our Member Countries.

I extend my commendations to the members of the GRIHA Council for their relentless endeavors and extend my best wishes for the forthcoming summit and their upcoming undertakings.

(Ajay Mathur)

New Delhi
25 October 2023

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अभय बाकरे, आईआरएसईई
महानिदेशक
ABHAY BAKRE, IRSEE
Director General

सत्यमेव जयते

ऊर्जा दक्षता ब्यूरो
(विद्युत मंत्रालय, भारत सरकार)
BUREAU OF ENERGY EFFICIENCY
(Ministry of Power, Government of India)

MESSAGE

I would like to congratulate GRIHA Council for hosting their upcoming annual 15th GRIHA Summit from 23rd November to 24th November 2023 at New Delhi, India.

The theme holds significant relevance considering the prevailing global circumstances, where the essential contribution of communities to climate action has gained increasing recognition. The theme is significant to foster a sustainable future by equipping communities with the means to enhance their resilience and adopt sustainable practices, thereby effectively addressing the hurdles posed by the rapid pace of climate change.

According to the Energy Conservation amendment Act, 2022, the Energy Conservation Building Code (ECBC) of 2017 is under revision to Energy Conservation and sustainable Building Code (ECSBC) for further inclusion of sustainability features. This change enhances sustainability in built environment (Building sector) by incorporating energy efficiency, renewable energy, passive design, Sustainable site planning, water and waste management and material efficiency. The EC Act amendment also expands the code's scope to include residential buildings and confers regulatory authority to state government to ensure effective implementation. The measures are implemented to support COP26 climate goals, by creating a carbon registry and carbon trading mechanism that shall contribute to achieving India's COP26 climate mitigation commitments.

It is heartening to learn that GRIHA ratings have consistently incorporated the Energy Conservation Building Code (ECBC) (or as amended Energy Conservation and Sustainable Building Code (ECSBC), as a mandatory prerequisite for obtaining the rating. This complementary relationship ensures that ECBC serves as the foundation for assessing energy and material-related parameters within the GRIHA rating system.

I extend my best wishes to the GRIHA Council team for a successful "15th GRIHA Summit & Launch of the annual Shashwat Magazine".

Abhay Bakre

(Abhay Bakre)

Date: 31.10.2023

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I would like to express my greetings to the entire GRIHA Council team for their tireless efforts and passion in driving sustainable development initiatives in the built environment and conducting this year's **15th GRIHA Summit** on the theme of 'Empowering Sustainable and Resilient Communities'. This annual congregation not only brings together diverse stakeholders on a common platform, but also presents itself as a means to exchange global ideas and synergies being carried out in different parts of the world to achieve the pursuit of sustainability.

Let us embrace this moment with enthusiasm and optimism, knowing that our collective actions today will pave the way for a brighter and more sustainable tomorrow. The vision of Smart City of Indore is "*Imagining Indore to Inherit, Innovate, Include, Incubate and Invest*" for "An ideal world-class smart commercial metropolis that thrives on investment opportunities, incubating business and ideas, rich inheritance and inclusive development".

Undoubtedly, only the combined endeavours of the national strategies and local involvement in implementing these strategies will enable this goal to be realised. Indore has been named the 1st cleanest city in India, because of its well-planned waste segregation, conversion and disposal methods. This could not have been possible with the support we received from the citizens and this is a portrayal of how the community as a whole can make a difference. Together, we will continue to make strides in creating a city that is not only smart but also deeply committed to preserving the environment for generations to come.

Congratulations once again and I eagerly look forward to witnessing the roaring success of this event.

(Divyank Singh, *IAS*)
Chief Executive Officer
Indore Smart City Development Limited

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)

October 21, 2023

The Kerala Infrastructure Investment Fund Board (KIIFB) is the nodal agency of the Government of Kerala for funding major infrastructure projects including PPP projects. KIIFB finances projects primarily in healthcare, education, transportation, water supply, energy, social & commercial infrastructure, IT and telecommunication sectors through SPVs. KIIFB has always endeavoured to inculcate sustainability in its initiatives.

The lion's share of the upcoming major public building projects in the state of Kerala in coming years would be funded by KIIFB. It is in this background that KIIFB joined hands with the GRIHA Council by signing of the Memorandum of Understanding (MoU) in 2021 to ensure that all KIIFB funded buildings above 2500 Sq.m of Built-Up Area shall strive for a minimum of GRIHA 3-star rating. Since the signing of the MoU, both the organizations have been collectively working to develop the future built forms in a sustainable way. I am proud to note that our collaboration led to the registration of 43 KIIFB funded building projects for green certification from GRIHA council during 2022-23. This is reported to be the highest number registered through a single entity in the country.

It gives me immense pleasure to learn that GRIHA Council is organizing the annual "15th GRIHA Summit" in New Delhi in the month of November 2023, based on the theme "Empowering Sustainable and Resilient Communities". This theme is of high relevance in the context of climate change. Resilient infrastructure is essential to pave the way for resilient communities. KIIFB, taking cognizance of this, has recently rolled out a climate resilience policy which is a pioneering initiative in the country.

We are proud to be associated with GRIHA Council that is dedicated for the development of the building stock of the nation, in a sustainable way.

Best wishes for the Summit and future endeavours.

Dr. K M Abraham

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TATA TRUSTS

SIDDHARTH SHARMA
CHIEF EXECUTIVE OFFICER

MESSAGE

I am pleased to learn that the GRIHA Council is hosting its 15th annual GRIHA Summit on the theme 'Empowering Sustainable and Resilient Communities' on 23rd and 24th November 2023. The theme aptly recognizes the need for sustainable transformation at global, national, regional, community and individual levels.

2. Amidst the myriad social, environmental and economic challenges, the role of resilient communities cannot be overstated. For more than a century now, the Trusts have been committed to the welfare of the communities - that has been a foundational value for us. We firmly believe that the strength of a nation lies in the well-being of its people and is inextricably connected to the viability and resilience of its local communities. Through diverse initiatives in sustainable agriculture practices, renewable energy projects, healthcare interventions, education & skill development programs and water & sanitation projects, the Trusts constantly endeavour to promote environmental & social stewardship and empower, enable and transform communities across the nation.

3. I would like to record my appreciation of the GRIHA Council for their unwavering commitment, contribution and leadership in promoting sustainability in the built environment and catalyzing transformative change for the development of sustainable habitats.

I congratulate GRIHA Council on their 15th annual GRIHA Summit and convey my best wishes for its success and future endeavours.

(Siddharth Sharma)

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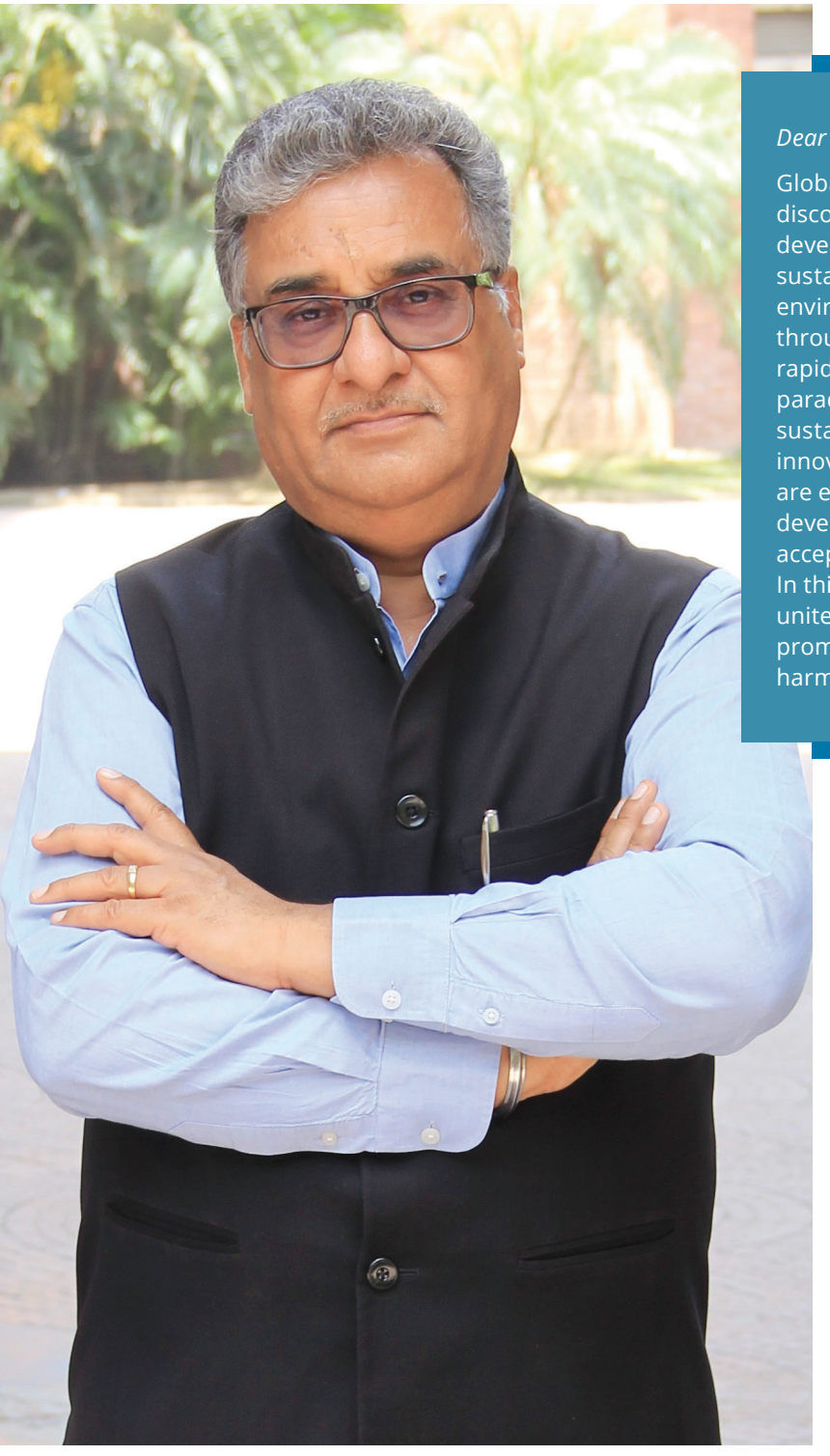


Dear Friends & Colleagues,

Globally, it is recognized that the current discourse on climate change and sustainable development are underpinned by the sustainable transformation of human–environment relationship. As we traverse through these unprecedented times, the rapidly evolving human–environment paradigm demands implementation of sustainable practices and cutting-edge innovative solutions. These measures are essential to facilitate climate-resilient development characterized by increased acceptability and adaptability to solutions. In this context, the global community must unite to implement transformative policies, promote green technologies, and encourage harmonious cohabitation with nature.

Time and again on several global and national forums, India has articulated its commitment to catalyzing sustainable global transformation based on a collaborative and participatory approach. Recently, India concluded its notable historic feat—India's G20 Presidency which was centred around the spirit of Mission LiFE. Through this Presidency, India emphasized the interdependent nature of global environmental, social, and economic challenges and advocated for collaborative solutions. The New Delhi Leaders' Declaration emphasized on a 'whole of society' approach and promoted sustainable and inclusive development which entails balancing social and economic growth with environmental sustainability by engaging sub-national and local governments, civil society organizations, local communities, and individuals.

In consonance with the current global shift to sustainable and inclusive development, I am pleased to announce the theme of annual 15th GRIHA Summit and this year's GRIHA Council's Shashwat Magazine — 'Empowering Sustainable and Resilient Communities'. Aligned with the concept of Mission LiFE — 'Lifestyle for Environment' introduced by the Hon'ble Prime Minister at COP 26, the Summit resonates with India's vision of sustainable and resilient future through 'mindful and deliberate utilization' based on a 'Pro Planet People' approach.

GRIHA Council has steadfastly established its green footprint in the country with more than 4100 projects registered across India exceeding the 930 million square feet of built-up area. Embracing the spirit of 'Leaving No One Behind', GRIHA Council is actively engaged with students and teachers of Navodaya Vidyalaya Samiti across India, aiming to instill a proactive approach to sustainable habitats and foster future leaders in climate action and sustainability. Contributing to the net-zero climate goals, GRIHA Council through its JAN GRIHA Certification is promoting the idea of sustainability and encouraging the adoption of sustainable building practices at the grassroots level.

I am immensely pleased to share that GRIHA Council has rated its first fuel filling station in India — HPCL Petrol Pump, Pick n Drive, located in New Delhi. Representing its commitment to promoting sustainability in the built environment, the project has achieved a 5-star rating under the SVAGRIHA variant.

GRIHA Council is honoured to be associated with the iconic projects of the Government of India such as the New Parliament Building of the Central Vista Project which was inaugurated on 28 May 2023 by the Hon'ble Prime Minister of India. Along with this, the famous Bharat Mandapam where India under the G20 Presidency welcomed the global leaders of world's greatest economies for the landmark event— the G20 Summit— has been registered under GRIHA.

Extending its impact at a global scale, GRIHA Council has registered its first international airport project— Hanimaadhoo International Airport in the Republic of Maldives. It is with great joy that I share with you all that GRIHA Council has been bestowed with the 'Best National Brand of the Year 2023 Award' at the Global Smart Build Summit and Award 2023. GRIHA Council is inspired by this honour and continues fervently in its endeavour to promote sustainable habitats for all.

As the world is transitioning towards sustainable development, there is a growing awareness and market demand for trained sustainability professionals. Acknowledging the gap between theory and practice and keeping pace with the evolving industry policies GRIHA Council is playing a catalytic role through its customized stakeholder-specific training programmes and tailored training programmes for corporate professionals facilitating ESG compliance and corporate sustainability.

GRIHA Council is developing specialized ratings for interiors recognizing the importance interior spaces in energy efficiency and occupant well-being. These ratings endorse eco-friendly materials, energy-efficient designs, and innovative sustainability measures, contributing to India's green building efforts while balancing economic growth and ecological sustainability. Along with this, GRIHA Council is developing a coffee table book featuring case studies of highest rated, newly constructed projects of GRIHA, SVAGRIHA, affordable housing and large development ratings across India's various climate zones. The book provides a holistic understanding of the measures taken to reduce carbon footprint and ecological impact in the built environment.

Cultivating partnerships is a key prerequisite for realizing a sustainable future. I take this opportunity to convey my sincere gratitude to our esteemed clients and associates from across industries with whom we share profound partnerships based upon shared principles, values, vision, and goals. I extend my appreciation to my ever-committed team for their unwavering support and hard work which have been instrumental in turning every critical project into a resounding success.

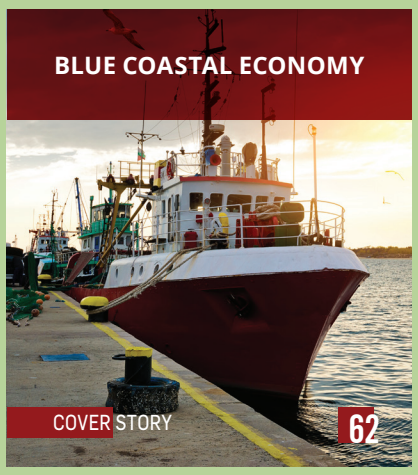
As we embark on the journey into the New Year 2024, we look forward to strengthening networks for the betterment of both environment and society. Amidst these challenging times and global unrest, let us reaffirm our commitment to holistically shaping the planet into a healthy and sustainable one which contributes to environment protection and ensures peace and tranquility for all.

Season's greetings to all and my very best wishes for a happy and healthy New Year!



Sanjay Seth
Vice President &
Chief Executive Officer, GRIHA Council





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Water-Wise Real Estate: Building a Sustainable Future Through Effective Water Management



Dr Sunita Purushottam has over 25 years of international and national multisectoral experience spanning over various aspects of sustainability. She is a postgraduate in Physics with PhD in Environmental Science and Engineering from IIT Bombay.

She is a certified GHG Emissions Inventory Quantifier and Fellow of the Royal Meteorological Society London. Currently she is associated with Global Building Policy Network as the Chair of the Board. The organization is a French-based NGO that works towards carrying out decarbonization in India, China, and Indonesia. She is also the Council Member of CSR Council at Mahindra Group. She is part of various technical committees in the built environment and advisory boards.

She has authored many white papers on sustainability and is a speaker in national and international forums.

Inadequate access to clean water and sanitation has become a global concern. Urgent need for sustainable water management practices is not just as an ethical imperative but is a strategic response to safeguard the well-being of the future generations. As we face the challenges posed by water scarcity and urbanization, the time for action is now. Through the present article, **Dr Sunita Purushottam** well establishes how infrastructure development has to prioritize responsible water management practices to suitably address this issue.

Water scarcity and inadequate access to clean drinking water and sanitation services continue to pose significant challenges globally. According to the *UN World Water Development Report 2023*, around 26% of the world's population lacked access to safely managed drinking water services and 46% lacked access to safely managed sanitation in 2020. The urgency to prioritize responsible water management practices has never been greater. Our homes, where we spend the majority of our day, also account for a significant proportion of our overall water consumption, making responsible water usage within our households crucial for sustainability. Hence, the real estate industry must step up in addressing these challenges and shaping a sustainable future for urban development. With innovative solutions and collective efforts, the real estate industry can pave the way for a water-efficient and sustainable world.

Urbanization and its Impact on Water Resources: Urgency for Action

In today's rapidly expanding cities, the consequences of uncontrolled urbanization on water resources are evident. Globally, over 85% of natural wetland areas have already been lost, and approximately 75% of the Earth's land surface has been significantly altered. These distressing statistics reflect the pressing reality—the ability of our ecosystems to sustainably manage water resources is being compromised. As responsible stakeholders, real estate developers must take proactive steps to reverse this trend and restore the balance between urban development and the natural environment. The global urban population facing water scarcity is projected to rise from 933 million in 2016 to an estimated 1.7–2.4 billion people by 2050. India, in particular, is expected to bear the brunt of this crisis, facing severe water scarcity issues. These projections emphasize the urgent need for sustainable water management practices, not just as an ethical imperative but also as a strategic response to safeguard the well-being of future generations.

Water Management in the Construction Phase

Using fly ash in concrete mixtures, adopting alternate methods of curing, promoting the use of dry mortar, and implementing proper resource management practices, we can significantly reduce water consumption. Furthermore, incorporating water-saving fixtures such as aerators and flow restrictors, dual-flush tanks, bio toilets, and monitoring water usage not only contributes to sustainability but also raises awareness among third-party contractors and vendors, thus fosters a culture of responsible water management within the construction industry.

It is imperative to prioritize water conservation during the construction phase, and by embracing these practices, we can build a more sustainable future for generations to come.

Greywater Recycling: Conserving Water and Enhancing Sanitation

Greywater recycling is another vital strategy that real estate should embrace during the use phase of residential developments. The fact that 46% of the global population lacks access to safely managed sanitation underscores the importance of conserving and reusing available water. Implementing sustainable practices, such as incorporating sewage treatment plants in projects, could play a decisive role in reducing freshwater demand. Treating and reusing water for flushing and landscape purposes, not only minimizes our environmental footprints but also alleviates the strain on municipal sewage systems. This commitment to recycling and reusing resources can exemplify dedication to responsible water management and conservation. Moreover, by educating residents about the benefits of greywater recycling, we can create sustainable communities that not only conserve water but also promote a healthier and more hygienic and sustainable living environment (Image 1).



» **Image 1** Sewage treatment plant at MWC Chennai

Water Reuse: A Circular Approach for Sustainable Development

Reuse of water presents an opportunity for sustainable water management in real estate projects. By implementing advanced wastewater treatment systems and adopting a circular approach to water usage, developers can reduce the reliance on freshwater sources and minimize water wastage. Incorporating water-efficient fixtures and appliances further optimizes water consumption without sacrificing comfort or convenience. These measures, combined with resident education and awareness campaigns, foster a culture of water conservation that extends beyond the boundaries of any project (Image 2).

Taking Action: Real Estate Developers as Catalysts for Change

Implementing public information and education programmes is essential to engage building inhabitants in water-saving initiatives. Efficient landscape design, such as reducing turf areas, employing water-efficient irrigation systems, and using native or climate-appropriate plants, significantly reduces water consumption. Specifying low-flow showerheads and faucets that meet or exceed water-efficiency standards contributes to significant water and energy savings. Real estate developers, as drivers of urban development, must lead the change in adopting initiatives like rainwater harvesting, greywater recycling, and water reuse.

Understanding Hydrology and Hydrogeology

Water is a double-edged sword—flooding and droughts can intermittently make it difficult for urban dwellers. Hence, it is important to understand systematic risk studies to assess flood and water stress risks to plan the water strategy before initiating a project. Hydrology is the study flow of water over land



» **Image 2** Wastewater treatment plant at MWC Chennai

while hydrogeology is the study of water underground. Hydrology informs the flood resilience strategy and hydrogeology enables the developers to understand how they can harvest rainwater by channelizing the water to the correct aquifers (underground water channels). The water table at a location also determines the suitability of a basement or creation of underground water tanks for storage. Returning water back to nature through recharge where suitable further helps preserve the water balance in the aquifers. Implementing these can help make developers informed decisions that ensure optimal water management and mitigate risks associated with water-related challenges. It is important to understand when to undertake hydrology and when to undertake hydrogeology. Site visit and site location help us determine if there is a need for both or either one of them needs to be undertaken. Decisions based on scientific studies are robust and ensure climate resilience for the developments.



» **Image 3** Sewage treatment plant at Mahindra World City, Jaipur

Securing Access to Water and Preserving Ecosystems

As we face the challenges posed by water scarcity and urbanization, the time for action is now. The sobering reality of billions of people without access to clean drinking water and sanitation services demands an unwavering commitment to responsible water management practices. Let us collectively recognize the urgency of these challenges and strive to create water-wise communities that prioritize the efficient and responsible use of water. By doing so, we can secure a better tomorrow for ourselves and future generations, ensuring access to clean water for all and preserving the delicate balance of our planet's ecosystems. Through collaboration between stakeholders, governments, and communities, we can implement comprehensive water management strategies that not only meet the present needs but also safeguard water resources and ecosystems in the long term (Image 3).

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Prof. Shen Xiaomeng

UNU Vice-Rector in Europe (UNU-ViE) and Director of UNU-EHS

In this conversation with GRIHA Council, **Prof. Shen Xiaomeng** discusses her journey so far on the path of sustainable development and how UNU-ViE has been instrumental in accomplishing academic responsibilities towards providing solutions to one of the most pressing global challenges—the climate change.

> **Frameworks and efforts elsewhere towards sustainable development might not be known to local communities, so dissemination and capacity development are still very important.**

1. Tell us about your journey from being a student at Beijing Foreign Studies University to the UNU Vice-Rector in Europe (UNU-ViE), and Director of the UNU Institute for Environment and Human Security (UNU-EHS).



It has been a long journey! There are many turns, ups, and, downs as we navigate our lives. My journey was no exception.

Beijing Foreign Studies University was the window to the outside world for me. I received my first degree there in 1988 when not many Chinese could speak any foreign languages. Studying English literature was the first step for me to access the rest of the world. Many of my former classmates went on to become diplomats and serve at the Chinese Foreign Ministry after their graduation. Some indeed became interpreters for the UN Headquarters in New York.

After working for three years with Air China, I chose a different path and continued my study in Germany in Translation, Linguistics and Economics at the Rheinische Friedrich Wilhelms University in Bonn, a University of Excellence in Germany, all while working as a tutor at the University and a free-lancing translator to finance my study and raising my son as a single mother. After my postgraduate degree, I was awarded a PhD stipend to conduct research on flood risks by the UNU-EHS where I am the Director now. I received my PhD degree in Geography at the University of Bonn and worked at UNU-EHS for almost seven years during and after my PhD degree researching on risk and vulnerability analysis in cultural contexts. As research institutions including UNU-EHS rely on public funding, I joined the then International Bureau of the German Federal Ministry of Education and Research to understand research and education policies and funding landscape.

Given the climate crisis, biodiversity loss, and other environmental challenges, some years ago I felt a strong urge to make my contribution to tackle these challenges which led me to my return to UNU. My multi-disciplinary background and various work experiences allow me to collect and connect many dots and use these connections for my current work.

My journey was not a linear path and full of unexpected turns. Now entering the full circle of my journey with UNU, I can say in hindsight that all the roads do lead to your original goal which is to put myself at the service of humanity.

2. As the Vice-Rector in Europe, what are your key areas of focus as part of the leadership at United Nations University? How do they impact government policies and communities?



United Nations University (UNU) is the global think tank of the United Nations. It is headquartered in Tokyo, Japan, and there are, in total 13 institutes located in 12 countries, each of them with a different research focus. The role of the Vice-Rectorate in Europe (UNU-ViE) is to facilitate collaboration amongst UNU institutes, with the wider UN system, and with external partners, notably organizations with a thematic focus that aligns well with UNU.

Each UNU institute is engaged at both the local and global levels and we are united in our common purpose of providing solutions to the most pressing global challenges. Across its institutes, UNU employs a diverse range of experts on different subject areas, and it is well-suited to generate evidence-based policy recommendations that serve sustainable development in all its facets. UNU also consistently strives to strengthen its representation in, and contribution to, UN policy processes, so that our research findings—particularly the evidence and voices we collect in the Global South—are heard in global policy processes.

3. What are the unique selling points (USPs) of United Nations University and how is your work different from that of other institutions?



The uniqueness of UNU lies first and foremost in its hybrid character as both a UN organization and a research-policy think tank. Its ability to act on different levels and contribute to different fora has helped UNU to be responsive to the rapidly changing policy climate, and in so doing, to have gained an international reputation for its academic excellence and policy recommendations alike. For example, the UNU Institute for Environment and Human Security (UNU-EHS), of which I am Director, concurrent to my role as UNU Vice-Rector in Europe, has established itself as an expert and leader in regard to climate-related policy processes. Our researchers have contributed significantly to developing the frameworks for assessing vulnerability and risk to climate change in the Intergovernmental Panel on Climate Change (IPCC) reports, and they have helped to bring the migration topic into climate policy, resulting in the UNFCCC decisions in 2010 recognizing, for the first time, the growing importance of human mobility. We are a driving force in the emerging field of loss and damage from climate change, leading the discussions and contributing evidence on how insurance could help developing countries protect themselves against such losses.

The second USP is our diversity. This is evident both in the breadth of our research areas and our cosmopolitan character. In Bonn, we have about 120 staff members from over 40 countries: We embrace and respect differences and share common objectives to work together, and our multicultural experience allows us to maintain a more balanced worldview.

4. What do you think about the existing sustainable policies at the global level and their inclination towards sustainable development of local communities? What improvements can be made to these policies?



One of the improvements that the international community could collectively make is to increase coherence among related, yet different, international goals for sustainable development. Undoubtedly, global frameworks such as the Sustainable Development Goals have a huge value in steering global development and informing national agenda-setting. However, when it comes to local development there are some crucial gaps to overcome. Two of them are awareness of these global processes and the finance flow for locally- or community-led practices. First, frameworks and efforts elsewhere towards sustainable development might not be known to local communities, so dissemination and capacity development are still very important. For finance, most of the funding does not reach grassroots organizations and local communities. To be localized, sustainable policies should not just expand the participatory decision-making process but also share more control over the resources. Local communities should be empowered and have access to all the necessary tools to adapt and protect themselves and their livelihoods against climate risks.

At UNU-EHS we are hosting and working closely together with the Munich Climate Insurance Initiative and in that work we place a great emphasis on reaching and finding solutions for the most vulnerable communities, for example, by developing climate risk insurance solutions in collaboration with local communities and making sure that they address their specific needs and are affordable to them, and we always do this in combination with capacity building activities.





5. In your opinion, how can policy-related research contribute towards achieving resilient communities?



Policy-related research can help build resilience in communities in many ways if it is designed in the interests of the communities in question.

In 2012–13, there was a study conducted in several countries under the Loss and Damage in Vulnerable Country Initiative that UNU-EHS was involved in. The study scientifically proved that the magnitude of climate change was such that society would no longer be able to fully avoid or adapt to it, and that in some cases we need to prepare ourselves for a scenario where it will lead to losses. This called for a new mechanism to address the loss and damage associated with climate change. The outcome of the study was utilized by developing country governments to prove that adaptation actions alone would no longer be sufficient. The discussion eventually resulted in the establishment of the Warsaw International Mechanism to formally address the loss and damage issues and in the subsequent decision at COP 27 in 2022 to establish and operationalize a dedicated financial mechanism.

Another example is a small-scale census in 2023, conducted by UNU-EHS experts within favela (informal settlements) in Brazil to shed light on the reality of the target local community. The results were published in Portuguese to allow local governments to use them in tailoring their community outreach strategies and development policies along with the voices of the communities. In our experience, therefore, I would say that effective policy research can help communities if they are designed accordingly.

6. What is the predicted impact of environmentally induced migration on communities at regional/national levels?



We can think of the impacts of migration or human mobility in terms of numbers and effects. Most movements of people are internal, meaning that they move within a country and not across national borders. We know that 20–30 million people are displaced internally each year by weather events. This number grows when we include those moving across borders, for which there is not yet reliable global data. Most movements are occurring in the Global South, with poorer communities in Southern Asia, the Sahel, and the Pacific islands particularly affected.

It is difficult to *predict* future numbers, but we can *project* future trends. Due to climate change, a larger population of vulnerable people will be exposed to more frequent and intense climate-related hazards, including floods, storms, and famines. But this risk does not always translate into mobility—people move depending on their aspirations and capabilities.



When people do move, the circumstances vary as well. Some people may move because they make a conscious decision to improve their circumstances, others move because they have no other choice because their livelihood may have been destroyed. What we can say is that the more control people have over if, when, where, and how they move, the more likely they are to have beneficial outcomes.

At UNU-EHS, we produce policy-relevant research to maximize the chance that future human mobility can have more adaptive outcomes for those moving and sending and receiving communities.

7. At UNU-EHS you also have an initiative that focuses on well-being, sustainability, and equity. Why is this a focus of your work?



As the world progresses further into the 21st century, our transformation initiative on Well-being, Sustainability and Equity (WiSE) recognizes the need to address the intricate interplay between environmental, societal, and political factors, which give rise to complex challenges like climate change and wealth disparities within and among nations. In line with mission of UNU-EHS to generate cutting-edge research, WiSE embraces diverse cultural perspectives, including indigenous wisdom, to redefine our understanding of a 'good life'.

We also initiate global dialogues with stakeholders, such as the Revisiting Sustainability workshop, which confirms that many of our current global issues trace their origins to a singular cultural perception of what a 'good life' means and that this perception includes a strong focus on economic growth and wealth. This past mental framing has profoundly influenced our behaviours, plans, decisions, and structures, and it has played a great role in income inequality and environmental damage.

Addressing these challenges and ensuring the well-being of current and future generations



will require a mind-set change that includes a redefinition of societal relationships with technology, economic activity, and nature, and it will also require a greater emphasis on equity. We are exploring alternatives that could help us move in that direction.

8. Who do you admire and what inspires you?



Rather than admiring a person, I admire the qualities of people I meet every day. I see the extraordinary in their seemingly ordinary existence. These people are like you and me without celebrity, but they have extraordinary qualities of generosity, compassion, and integrity that they demonstrate in their daily lives.

Of course, these people are the source of inspiration that motivates me to cultivate the same qualities in myself. My team is also a source of inspiration for me. Their dedication and passion for the work we do (we want to save the world!) is a constant reminder of what we stand for and encourage me to carry on despite the difficulties and challenges.

The title of your 10th Edition of Shashwat is called *Let Nature Be.* Nature always allows us 'humans' to be, part of nature. That alone is an inspiration for me. Some indigenous communities see nature as their teacher. I have had my own experience in learning from nature on many of my mountain treks. That is where I have learned to listen to nature and appreciate nature's beauty and wonder. Gently walking in the mountains alone is inspiring and healing. All of this motivates me to do all I can to create a transformed relationship between us and nature, seeing ourselves as part of it, not separate from it.

Sulabh's Individual Household Toilet Programme: A Tool of Socio-Economic Change

Article by **Lalit Gambhir** is autobiographical in nature. It not only highlights the relevance of a toilet in a house, but also discusses the major constraints that are to be overcome when it comes to its establishment. Case study of a village of Haryana gives authenticity to the text and establishes that finance is the most significant limiting factor when it comes to have an in-house toilet. In a nutshell, toilet in low-income groups in India is a matter that is inclined more towards affordability than accessibility.

The city-bred, who are habituated to a home toilet, are unable to imagine what it means not to have one. To have them think that a toilet could be a tool of socio-economic change for the first-time users amounts to getting them sent into a tizzy. As a research-writer, I had an opportunity to investigate the toilet dynamics and the profundity that goes into it, first hand.

Sulabh's countrywide Individual Household Toilet (IHHT) programme, as the world knows it, is an established game-changer. With over 1.6 million household toilets the Sulabh International Social Service organization provisioned for the beneficiaries and 110 million constructed under the Government of India's Swacch Bharat Mission using Sulabh two-pit toilet system technology, invented by the founder of the sanitation major, Dr Bindeshwar Pathak, the organization has come of age and is now a name to reckon with in the global sanitation space.

In our more recent IHHT project, our success with the sanitation challenge facing an acutely poverty-stricken backward community, close to the National Capital Region in the state of Haryana, presents a classic case study. It is about socio-cultural transformation brought about through Sulabh's sanitation technology and socio-economic interventions.

For nearly all villagers, the facility of a home privy did not exist even in their wildest dreams, given the cost involved and their being quite complacent with the practice of open defecation. The latter being a way of life for generations, they had embraced it as be-all and end-all, just like any other no-household-toilet community anywhere else.

How a toilet could change their life? This had not occurred to them till they witnessed it in actuality.



Lalit Gambhir is the Chairman of Sulabh International School of Action Sociology and Sociology of Sanitation. Earlier he was engaged with Sulabh International Social Service Organization as Advisor. He did carry out responsibilities of Senior Manager Communications while being associated with Tulip Telecom. He truly is a man of multiple talents. He is also a journalist, editor, researcher, and writer. Lalit Gambhir could be contacted via <lalitgambhir@gmail.com>.

Sulabh's snap survey of the beneficiaries was revealing. For all, it meant a huge saving of time it took them to walk down to a spot to answer the call of nature and back home every day, all their life. For everyone, a morning ablution was a daily struggle to look for a new spot to relieve oneself. Often there were fisticuffs between one defecating in the open and the landowner whose place or a spot close to it the former used to ease oneself on the sly.

On many occasions, such fights take place while one is in the middle of the act. One cannot imagine a daily dose of a torture of a more atrocious kind than to do with a mundane matter of relieving oneself.

For the elderly and sick, the Sulabh toilet home privy proved to be a manna from heavens. For women, it endows them with a means to their vital privacy, dignity and safety from prying eyes, of late, there has been a notable rise in sexual assaults on women when they are out for defecation in the cover of darkness, which they resort to invariably for reasons of privacy.

Of immense significance is the fact that for school-going children, the time saved is usefully spent in their classes, which was not possible before the household privies made a place in their homes.

With Sulabh toilet systems in place, squalour and recurrent epidemics in the village are now a thing of the past and a new dispensation of cleanliness, and above all, a quintessence of superior culture has taken roots.

With not even one Sulabh toilet at Marora unused, one can say that the socio-cultural-environmental transformation of the community is complete. A new paradigm thus established has successfully paved the way to an economic uplift of the community, something to be seen to be believed.

With a vocational training centre in the village in place, solar home-lighting equipment made available to each house, and more, we were able to take Sulabh's community development programme way beyond its traditionally executed sanitation projects with encouraging outcomes.

To one's sheer delight, the effect of our programme was both unexpected and inconceivably immediate. Within a space of two months post completion of the Sulabh IHHT programme, already a few householders had in place plans to have their self-funded additional privies to reduce pressure of their large families on the toilet systems provided by Sulabh. The attendance at our vocational training centre shot up to render it too small to cope up with the rush.

Marora had been a village infamous for its gross backwardness and it was a fact no neighbouring village in the area would marry off its daughter into that village before Sulabh set up its camp to have in place its sanitation and development programme.



Amid poverty, illiteracy, and everyday day of hard work there is hardly a moment to think of a home toilet.

Sulabh founder, Dr Bindeshwar Pathak nick-named Marora as Donald Trump Village after His Excellency, the President of the United States. The raison d'être for rechristening the community dates back to his meeting, in the year 1983, with H.E. the then Ambassador of the US in India, Mr Harry G. Barnes, Jr, in Patna. He had come up with an idea and a proposal of having every rural house in the country, which did not have a toilet, to be provisioned one in the name of the then US President, Mr Ronald Regan, as a great US contribution to a developing India.

The US Ambassador had offered to fund the proposed rural household toilet programme. At that time Dr Pathak couldn't come around to accepting the



financial assistance from the US. But the idea stayed with me, lay dormant at the back of his mind all these years till it found its fruition during his June 2017 trip to the country, ahead of the scheduled meeting of the Indian Premier with his US counterpart.

At a community event organized in a suburb of Washington DC, Dr Pathak made it public that Sulabh would name one Indian village after the US President as Sulabh's gesture to a close Indo–American relations. With this, he aimed to consolidate the Clean India campaign towards an open-defecation-free country to the attention of the world and to garner a possible support of well-healed NRI diaspora and like-minded institutions.

The economic viability of the seemingly monumental task of constructing roughly 110 million toilets for 600 million people in 60 months, as aimed by the government of the day, is realizable if 20 million NRIIs, non-resident lovers of India, as Dr Pathak liked to call them, come forward to see that happen. The burden on each surely could not have burned a hole in one's pocket, he believed.

Sulabh home toilets dot the landscape of a village for which open defecation, indeed a daily struggle, was the norm. A home toilet is now a prized possession for every family, especially for the woman of the house. Sulabh has brought toilet culture to the grassroots, the homes of the masses of the country.



For $500 for a Sulabh toilet system, $3000 for six home privies, payable over a few years, he felt, was a small gesture a comparatively high-income expatriate Indian could consider rendering for his motherland.

He highlighted his aforesaid proposition for a cleaner India by unveiling the world's biggest toilet replica at Trump Village, commemorating the World Toilet Day 2017.

However, the immediate upshot of his idea, taking shape as Trump Village, was the keen interest shown by several administration officials, from both Virginia and Maryland, in adopting Sulabh technology locally, so as to bring down the prohibitive cost of building and maintaining septic-tank toilets in the rural areas of the US.

A majority of American villages are not connected with sewerage. Sulabh compost toilet system thus was an appealing proposition for rural America.

The Sulabh's IHHT programme has been a game-changer for communities across the country. It extends to the school toilets programme that has proved to be critical in equipping educational institutions with basic means of health and hygiene that did not exist before. It is particularly transforming for the population of adolescent girl students who would not attend school during the days they menstruated for the lack of a clean toilet at the institution. The rising attendance of girl students owes much to safe and hygienic toilet facilities at schools, it has been observed.

Sulabh has been sensitive to the need from the very outset and at creating the facilities largely in rural schools of the country with dramatic outcomes.

Testimonial





Dr Vikram Singh, Director, Aarvy Healthcare

I'm delighted to share our experience working with the GRIHA Council for obtaining a 4-Star Green Building Certification for our project, "Aarvy Healthcare Pvt. Ltd". This achievement represents a significant milestone in our commitment to environmental responsibility.

The project is designed by Architect Anupam Bansal from ABRD and Sustainability consultants Shubham Solanki and Anmol Mathur of CoLEAD LLP, highlighting remarkable performance in sustainability. We had set out ambitious goals, and were able to achieve them with the unwavering support and guidance from the GRIHA Council.

The project has achieved 50% energy savings in Heating, ventilation, and air conditioning (HVAC) and lighting compared to a conventional building. The inclusion of 80% rooftop coverage with a 120-kWp solar panel system, low-flow fixtures, sewage treatment facilities, and lightweight infills and partitions significantly contributes to reducing the building's carbon footprint. Aarvy Healthcare is deeply committed to ensuring thermal comfort and air quality, which the project has achieved by following the Indian Adaptive Comfort Model and providing MERV13 and HEPA filters.

Our journey towards obtaining this certification had many challenges. The global COVID-19 pandemic disrupted the project schedule and forced us to accelerate the project. We had to serve patients through makeshift arrangements while still ensuring compliance and documentation to maintain our sustainability goals. The team at GRIHA Council, including Mr Akash Deep, Mr Ankit Bhalla, Ms Aakriti Sachdeva, and Ms Srishti Gaur, played a crucial role in our success. Their support and practical solutions were invaluable for us during this trying period. They understood our challenges, conducted site visits, and offered patient guidance.

In this project, CoLEAD's timely recommendations, and meticulous documentation were instrumental in achieving the rating. Several construction and monitoring & evaluation (M&E) service modifications were implemented based on their recommendations, which helped in improving the building performance.

Throughout the certification process, GRIHA Council's cooperation, support, and guidance during the post-pandemic certification phase was invaluable. They helped us navigate amendments in the project and proper documentation.

Our project's journey, which began in 2018 and concluded ahead of schedule in 2021 under challenging circumstances, was a collective effort. With GRIHA Council's support, we resumed work on the project in 2023 to complete it as originally intended and earned the prestigious GRIHA 4-Star rating. Aarvy Hospital now proudly stands as one of the first green hospitals in our neighbourhood.

In conclusion, we wholeheartedly recommend GRIHA to projects genuinely committed to sustainability. Their guidance, expertise, and unwavering commitment to sustainability are unparalleled. We extend our heartfelt thanks to the GRIHA Council for their support and cooperation throughout this incredible journey.

Aarvy Healthcare Pvt. Ltd









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Embracing Sustainability: A Path to a Resilient Future

Article by **Abhishek Singh** discusses the urgent need for utilizing sustainable means in nearly every sector, be it, agriculture, transportation, and infrastructure. In order to create an attractive and impactful narrative around sustainability, it is important to leverage various channels, including social media, entertainment, and education. By disseminating strong messages about the consequences of climate change, empowering individuals through policy measures, and fostering collaboration among different sectors, we can collectively work towards a sustainable future that ensures the well-being of both present and future generations.



Abhishek Singh is pursuing his Master's in Environmental Engineering from Indian Institute of Technology (IIT) Kanpur, specializing in air pollution and sustainable development fields. Additionally, he serves as Manager at IIT Kanpur's Sustainability Cell, working towards achieving the 'net-zero emissions' goal of the Institute. He could be communicated via <abhishekmanit007@gmail.com>.

We are living in an era where sustainability has become of paramount concern. The concept of the sustainable development, first introduced in the Brundtland report of 1987, emphasizes the importance of meeting the needs of the present generation without compromising the ability of future generations to meet their own needs. With the alarming increase in natural disasters caused by climate change, it has become crucial to limit global warming below 2°C.

To ensure a sustainable future, it is essential to recognize and adhere to planetary boundaries. These boundaries represent the environmental limits within which humanity can safely operate. Earth System Models have calculated that if annual emissions from agriculture remain below 5 gigatonnes of carbon dioxide equivalent (CO_2e), the average earth temperature will not rise beyond 1.5°C. It is important to note that similar planetary boundaries exist for other resources, such as water and land.

Sustainability has gained significant importance in all sectors, including construction, transportation, and agriculture. With data being the new oil, quantifying the environmental impact of each sector is crucial for identifying and mitigating those impacts or finding alternative solutions. However, achieving sustainability requires the active involvement of the general public, as their contributions are essential in addressing this pressing issue. Unfortunately, public participation is often hindered by the lack of knowledge and awareness, both within society and in educational institutions.

India, in particular, needs more role models like Afroz Shah who can inspire and engage the public in the fight against climate change. Afroz Shah initiated the Versova Beach Cleanup campaign in Mumbai in 2015. He was highly concerned about the severe pollution and plastic waste on the beach, where he had spent his childhood days, plunged into cleaning up the beach soon local volunteers and citizens joined him in cleaning up the coastline. Over the course of several years, Shah and his dedicated team worked tirelessly



to remove millions of pounds of trash, plastic, and debris from Versova Beach. Their relentless efforts not only transformed the Beach's appearance but also raised awareness about the urgent need to combat plastic pollution and protect marine ecosystems. Efforts should be made to raise awareness through various channels, including social media and entertainment, awareness programmes, campaigns, and road shows. It is the responsibility of our social media platforms to update their entertainment methodologies and incorporate strong messages that convey the consequences of climate change, as reflected in Western media and movies.

Public understanding of the urgency of the situation is crucial and implementation can be achieved through effective policies and technological advancements. Collaboration between different departments is essential to avoid trade-offs and ensure a holistic approach. A prime illustration of this can be seen in the groundwater policy implemented by the Punjab Government. Recognizing the detrimental impact of excessive groundwater usage on the water table, the government prohibited its use for irrigation. As a result, farmers had to rely solely on monsoons to water their rice crops. Unfortunately, this change led to a delay in harvesting, extending the period from September to November. The extended harvesting season coincided with altered wind patterns, contributing to a significant increase in air pollution levels in Delhi. Surprisingly, such elevated pollution levels were not observed before, highlighting the interconnectedness of regional factors.

Creating awareness can be accomplished through various means, including technological advancements and policy interventions. In the United Kingdom, products are being manufactured with carbon footprint labels, providing consumers with information about the environmental impact of their consumption choices (Rondoni and Grasso 2021). Environmental management methods like Payment for Ecosystem Services (PESs) create a mutually beneficial relationship between industry and the public. The PESs have gained popularity worldwide as a market-based mechanism to suitably address environmental challenges and promote sustainable development. By providing financial incentives for ecosystem conservation, PESs not only contribute to preserving biodiversity and mitigating climate change but also foster community involvement and empower local stakeholders in environmental protection. An example worth quoting is the Vittel mineral water brand, reputed to cure kidney ailments. Vittel is sourced from a natural mineral water aquifer located in the Vosges region of France. However, due to intensive agricultural practices in the area, there was a risk of nitrate pollution infiltrating the groundwater and affecting the quality of the water source. To address this environmental concern and ensure the preservation of the Vittel water source, the brand initiated a PES programme. Vittel collaborated with local farmers in the catchment area to implement sustainable farming practices that reduce the use of fertilizers and pesticides, thereby minimizing nitrate runoff. In return for adopting these eco-friendly practices, Vittel financially supports the participating farmers through the PES programme. The farmers receive compensation for their efforts in maintaining a healthy ecosystem that protects the water source from contamination (Perrot-Maître 2006).



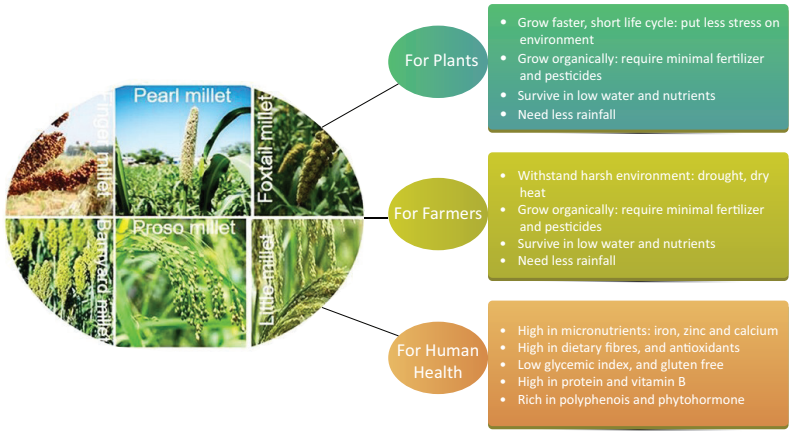
Stakeholders	Costs	Benefits
Farmers	No direct financial cost but high transaction costs: cost of learning new practices and participating in identification and testing of practices and incentive system, and negotiations.	Secured long-term farming (30 years). Cancelling of short-term and long-term debt. Additional land.
Vittel-Nestle Waters	First seven years: Land acquisition: 1.14 million Euros Farm equipment: 3.81 million Euros Farm financial compensation: 11.3 million Euros Does not include cost linked to establishing and operating Agrivair (which is at least partially self-financed).	Eliminated business risk (business of one billion bottles a year).



Schematic (from NITI Aayog) showing how building on India's existing supporting conditions can set the country's trajectory towards an advanced mobility future that is affordable, clean, safe, and accessible, leapfrogging the traditional mobility paradigm.

Policies such as subsidies on electric vehicles contribute to environmental sustainability, especially considering that India's transport sector is the third-largest emitter of greenhouse gases (GHGs). With urban populations expected to double by 2050, efforts are needed to address the increasing emissions.

The food system in India is a significant sector for achieving Sustainable Development Goals (SDGs). While around 60% of the Indian population is engaged in the food sector, it contributes only 18.3% to the Indian GDP. Agriculture alone is responsible for approximately 18% of the total GHG emissions.
To promote sustainability, dietary choices can play a crucial role. Grains like millets are more sustainable as compared to wheat and rice, since they require less water and fertilizer while offering higher nutritional value. Recognizing the importance of millets, the Government of India declared 2018 the Year of the Millet, while the United Nations declared it in 2023 (Sperotto, *et al., n.d.*).



To create an attractive and impactful narrative around sustainability, it is important to leverage various channels, including social media, entertainment, and education. By disseminating strong messages about the consequences of climate change, empowering individuals through policy measures, and fostering collaboration among different sectors, we can collectively work towards a sustainable future that ensures the well-being of both present and future generations.

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Blog



Ujjal Majumdar, Chief Operating Officer, Smart Joules Private Limited

Embrace Cool Change: India's Sustainable Independence

Smart Joules Private Limited carries out meaningful climate actions based on sustainable cooling. Their mission is to mitigate 29 million tonnes of carbon dioxide from the Earth.

As we celebrate the 77th Independence Day of our great nation this year, it is essential to reflect not only on our glorious past but also on the challenges we face today and how we are overcoming them. While the freedom fighters of the past fought for independence, today, it is our duty to fight for the liberation of our environment, our energy resources, and our future. One of the pressing issues that demands our attention is cooling wastage. Cooling plays a vital role in our lives, especially in a country like India, where summers can be scorching. However, the excessive and inefficient use of cooling technologies is taking a toll on our environment and energy resources. The statistics are startling—India's cooling energy consumption is projected to triple by 2038, accounting for nearly 40% of peak electricity demand in urban areas. This relentless demand burdens both our environment and economy, with inefficient cooling systems contributing to significant greenhouse gas (GHG) emissions and soaring electricity bills. We at Smart Joules are making this change in trajectory by deploying energy-efficient technologies, implementing accurate heating, Ventilation, and Air Conditioning (HVAC) designs, promoting smart cooling practices, and adopting high-end automation through instrumentation control to make a significant difference for businesses through energy performance contracts (EPCs).

Cooling Freedom is not an individual endeavour; it is a collective dream that binds us. I take this opportunity to express our gratitude to all the sustainable visionary leaders that have partnered with Smart Joules to mitigate cooling wastages at 45+ facilities. We are in perpetual efforts to empower more facilities that can lead the charge towards sustainable cooling by investing in energy-efficient and sustainable cooling systems.

Throughout my journey with Smart Joules, I have always been filled with excitement as we work towards a common goal—to mitigate 29 million tonnes of carbon emissions by 2030. This commitment propels us forward, and on this auspicious moment, we stand united in pledging to liberate India from the clutches of cooling wastage. It is my vision to witness our nation shining as a symbol of sustainable independence, where energy efficiency and eco-friendliness become the pillars of progress. Together, we can ignite the flame of change, rekindle the spirit of independence, and pave the path to a greener, cleaner, and more prosperous future for India and the generations to come. The time for action is now; the time for sustainable independence is here. Embrace the Cool Change!



Smart Joules empowering 45+ facilities on the Revolutionary Journey towards "Freedom from Cooling Wastages"

START-UP STORY

WALLMAKERS

Vinu Daniel, B.Arch,
The College of Engineering,
Trivandrum

Vinu Daniel completed his B.Arch in 2005 from the College of Engineering, Trivandrum, following which he worked with Auroville Earth Institute for the UNDP Post-Tsunami construction. On returning from Pondicherry in 2007 he started 'Wallmakers' which was christened thus by others, as the first project was just a compound wall. Many eye-openers in the course of his practice prompted him to resolve to devote his energies to the cause of sustainable and cost-effective architecture.



Image by Syam Sreesylam

'Chuzhi' (Malayalam for whirlpool), features swirls of precast poured debris earth composite bottle beams, fashioned from 4000 discarded plastic bottles designed around the three tamarind trees on site.



Image by Jino Sam

Leftovers from previous stages of construction was used to finish off and add character to the spaces in 'The Pirouette House'.

With a practice, spanning more than a decade, Wallmakers has won many international accolades including being selected by ArchDaily as the only Indian practice in the list of 20 Young Practices of 2020, winning 3 editions of the Design that Educates Award conducted by the Laka Foundation-Germany, being nominated for the Brick Award 2022 and The Royal Academy Dorfman Award 2022 to name a few.



Image by Anand Jaju

'The Debris house' features walls built over a discovered foundation and with materials that were recycled from the site.

Vinu Daniel believes, an unexpected meeting with Laurie Baker, much accoladed for his sustainable and unconventional approach, had a strong influence on him, making him perceive architecture as something more than just building, an influence that resonates in his projects to date. Right from the beginning, the focus of the practice was not to create something different, and establish a presence in the industry, but rather to build spaces that are easier on nature, to create homes that are part of the environment. Inadvertently, due to the radical and experimental techniques used, Wallmakers have been able to foster a change.



Image by Sagar

The 'Shikhara's' slanting wall, shades from the harsh heat and direct sunlight was to be made from the materials procured from the land itself.

From uncanny materials like plastic toys and discarded tyres, to some exceptionally unconventional methods, Vinu Daniel explores something new for each project, starting with the site. We believe that every site is unique and has its voice, the first step of every project is to listen intently to this, to take in the environment, and make sure anything that we introduce to the site is in complete harmony with what already is.



Image by Anand Jaju

'The Debris house' features walls built over a discovered foundation and with materials that were recycled from the site. Image by Anand Jaju.

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OUR PRESENCE

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Answers to “Spot the difference” are on Page No. 68

Key to Infobytes

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- Organic
- Flyash
- Daylight
- Topsoil
- Wind

The Urgency of Sustainable Cooling: Building a Resilient Future for All





Shaurya Anand is presently engaged with TERI as Research Associate. He is leading the innovative research in sustainable cooling for an accessible and resilient future. He graduated in Mechanical Engineering and has a Master's Degree in Thermal Engineering.

Article by **Shaurya Anand** dedicates itself towards significance of cooling solutions and how prioritizing development of sustainable cooling infrastructure is a global necessity. The author has well-established that cooling encompasses much more than just providing thermal comfort. It is a vital component that directly impacts various aspects of society, including food security, energy conservation, health care, and human productivity.

With the world nearing towards conclusion of 2023, the global challenges seem to exhibit an escalating pattern. From the scars of COVID-19 to geo-political tensions to the increase in impacts of climate change, one thing is evident, the vulnerable section of our society is hit hardest. As nations strategize their path towards recovery from the COVID-19 pandemic, vaccination efforts have emerged as a pivotal solution. However, a significant challenge arises in the form of temperature-sensitive vaccines and the scarcity of adequate cooling infrastructure worldwide.

At the time of the pandemic declaration, global preparedness fell short in terms of effectively managing the safe storage and widespread distribution of vaccines, given the unprecedented magnitude of the demand. The criticality of the pandemic necessitated not only the availability of COVID-19 vaccines but also equitable accessibility for individuals, on a global scale. Achieving this objective entailed the deployment of specialized cold chain infrastructure such as walk-in cold rooms, freezers, refrigerators, temperature

monitoring devices, as well as passive equipment including cold boxes and vaccine carriers.

Lying dormant the inequitable access to vaccines remerged as a key humanitarian crisis. More than 50% of countries don't have vaccines and resources to vaccinate even 10% of their population. Not surprisingly the most vulnerable countries are those which are poor and conflict-ridden mostly lying in African Continent. Gavi, the Vaccine Alliance, is a global health partnership which operates through a public–private collaboration is the forefront of this war (Gavi The Vaccine Alliance 2021). Their mission is to accelerate immunization accessibility in poor nations. One of the critical requirements for their mission is cooling infrastructure. The equitable and accessible vaccine challenge becomes a trinity, with cooling as its infrastructural challenge as shown in Figure 1.

As such multiple countries ramped up not their vaccine-manufacturing capability but also the production of cooling infrastructure. The major undertaking in this stride happened when Ghana became the first recipient of delivery of 600,000 doses of the Oxford-AstraZeneca COVID-19 vaccine from the Serum Institute of India (UNICEF 2021).

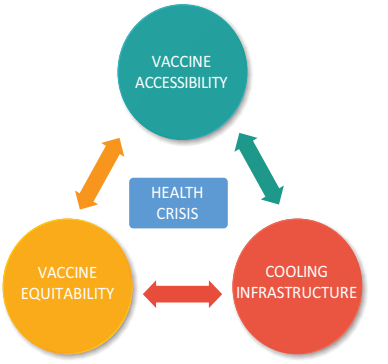
Thus, cold chain infrastructure played a pivotal role in the global COVID-19 vaccination effort. Its absence would have posed substantial challenges in achieving access to vaccines across the globe.

The insufficiency of cooling technology is a pressing concern as it severely restricts the reach of vaccination efforts, thereby exacerbating public emergencies and increasing the vulnerability of marginalized communities, potentially pushing them closer to the brink of collapse.

The other major area of cooling applications is air conditioners. As per the International Energy Agency (IEA) report published in 2018, the application of air-conditioning units and electric fans for cooling purposes currently constitutes approximately 20% of the global electricity consumption within building infrastructures and is expected to get tripled by mid of the 21st century (IEA 2018). The lifeline of any cooling equipment is refrigerants. Notably with the implementation of the Montreal Protocol (UNEP 2023) the ozone-depleting hydrochlorofluorocarbons (HCFCs) have been phased out and next in line are hydrofluorocarbons (HFCs) which are non-ODS (ozone-depleting substances) but have high global warming potential (GWP).

Implementation of the provisions outlined in the recent Kigali Amendment to the Montreal Protocol is aimed at reducing the consumption and production of HFCs and has the potential to prevent a temperature increase of up to 0.4°C by the year 2100, contributing significantly to mitigating global warming.

According to multiple scientific studies (US EPA 2023), there is evidence suggesting that



» **Figure 1** Dissecting the health crisis

human-induced climate change is anticipated to amplify the occurrence and intensity of extreme weather events such as heat waves and large storms.

According to the International Panel on Climate Change (IPCC) report (IPCC 2018), if the present situation of fossil fuel consumption and population growth continued, most land areas are expected to witness a notable increase in the frequency of hot days, with tropical regions being particularly affected. Under a 1.5°C warming scenario, approximately 14% of the global population can expect to experience severe heat waves at least once every five years. However, if the temperature increase reaches 2°C, this proportion escalates to 37%, severely impacting vulnerable communities both socially and physically.

One of such extreme weather events which is becoming frequent every year is heat waves. Despite being classified as highly hazardous natural events, it often does not receive the required

level of attention because its immediate toll in terms of fatalities and devastation may not be readily apparent. It is worth noting that between 1998 and 2017, over 166,000 individuals lost their lives as a direct consequence of heat waves (WHO 2018). Today nearly one-third of the world population is exposed to heat waves. The absence of timely and proper interventions and planning will surely make this figure much higher in the upcoming decade.

Sustainable cooling plays a foundational role in supporting the achievement of the Sustainable Development Goals (SDGs). Enhancing the availability of sustainable cooling solutions has the potential to significantly enhance the quality of life for billions of individuals worldwide. It encompasses essential services that facilitate access to vital resources such as nutritious food, safe medicines, and protection against extreme heat. Rather than being a luxury, sustainable cooling is a fundamental service required to ensure a secure and prosperous future for all. Integrating access to cooling into national strategic plans becomes crucial to fostering resilience and sustainable development.

More than one billion people are residing in informal settlements (UNSTATS 2019). These communities frequently lack the financial resources for space cooling and food refrigeration, rendering them more susceptible to extreme heat events and communicable diseases. Enhancing cold chains and local regional innovations to develop sustainable cooling will not only tackle food security but also health and social security.

Cooling is a critical element that supports the proper functioning of societies, minimizes waste, and preserves the integrity of perishable items such as food, medicines, and vaccines. Moreover, in hot and humid climates, particularly during intense efficient cooling plays a crucial role in enhancing productivity and comfort for people at home, school, and work. In the present world of digitalization, cooling infrastructure ensures the proper functioning of large data centres, enabling uninterrupted online connectivity. Additionally, cooling technology is instrumental in maintaining the optimal operating conditions of large cold chain centres enabling a continuous supply of food, milk, ice, and vegetables.

Cooling encompasses much more than just providing thermal comfort. It is a vital component that directly impacts various aspects of society, including food security, energy conservation, health care, and human productivity. As such we as humanity must strive for efficient, equitable, and accessible cooling, then only we can realize a sustainable and resilient future. This requires a cooperative public–private partnership, and effective policy implementation which taps both adaptation and mitigation with a focus on accessibility and equitability. The ingredients are always in front of us, all we need is a driving force which acts timely and effectively with accountability.

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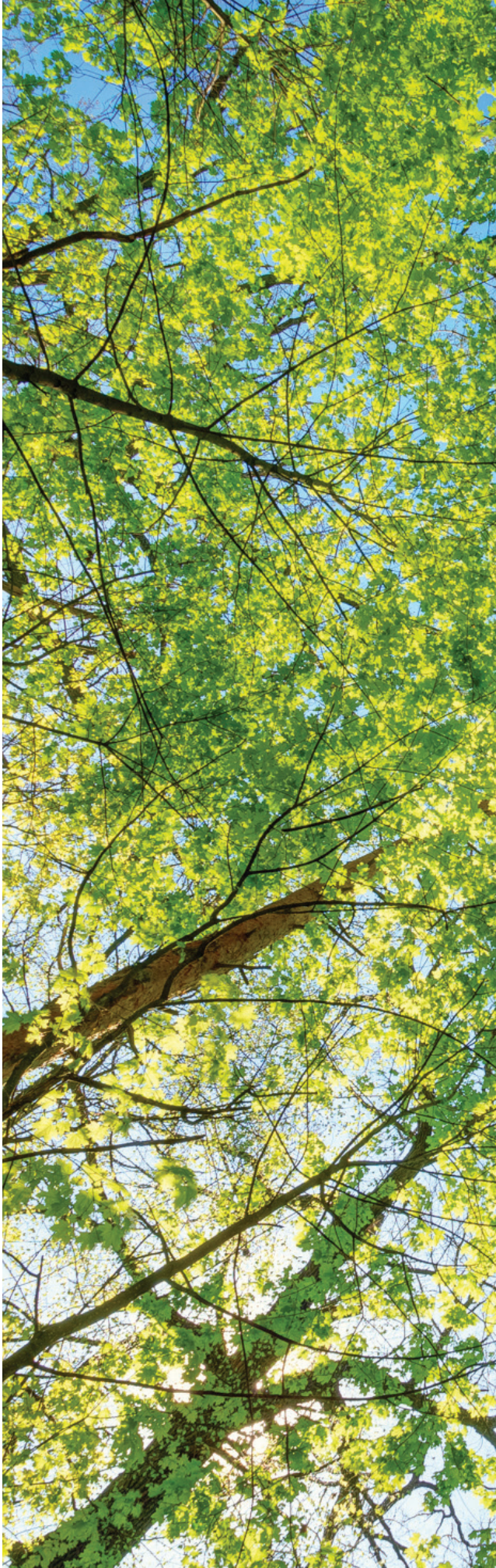
विश्व पर्यावरण



दिगंत चंद्रा

एक दिन मुझसे मिलते हो?
क्या सही काम तुम करते हो?
विश्व पर्यावरण दिवस मना कर
क्या मुझ पर
एहसान करते हो?
सुंदर प्यारा सा उपवन जग का
मैंने तुमको था सौंपा।
तुमने अपने कर्मों से
हर पल उसको ही रौंदा।
पढ़े लिखे विज्ञानी हो तुम
सिर्फ किताबे पढ़ते
बच्चों को रचनात्मक कार्य की
शिक्षा कभी न देते।
सांस प्रदूषित
भोजन दूषित
पानी गंदा होता।
पेड़ पौधे सब कटे जा रहे क्यों?
इस पर कभी है सांचा।
कृत्रिम सांस
पैकेट का भोजन
एल्कलाइन पानी
सब कुछ नकली लोगे।
अपनी धरती का संरक्षण
क्या कभी नहीं करोगे?
भूमि, अन्न,जल
शुद्ध हवा
सब कुछ मैंने था सौंपा।
पर अपनी नादानियों से
तुमने सब कुछ खोया।
एक दिवस का चिंतन
बस ....?
तुम अब भी नहीं हो जागे
सरकारें ही सब करेंगी
यही भाव हो लाते।
जन्म तुम्हारा
जीवन तेरा
सांसे तेरी
भोजन तेरा
तो पर्यावरण संरक्षण का
क्या काम नहीं है तेरा।
कल को प्रलय अगर होगी
तुम ही दोषी तब होगे
मिला तुम्हें वरदान प्रकृति का
तुम खुद ही खो दोगे।



Prelude to 15th GRIHA Summit

Paryavaran Rakshak Programme 2.0, 3rd November, 2023























Technical Workshop - Re-defining thermal comfort by Gaurav Shorey, Friday, 27th October, 2023











Stubble—No More A Trouble—A Commitment Towards Women Hygiene and Health

We have covered nearly a quarter of the 21st century and still a significant fraction of our modern-day society, notably women, doesn't have access to facilities to hygienically manage their monthly periods (menstruation). Menstrual products accrue heavy taxes and this extends their access further. Many a times, to avoid the expense of sanitary napkins, women resort to crude and unhygienic methods for managing their monthly cycle. This exposes them to various infectious diseases. This article by Prabhpreet Kaur and Dr Ruchi Agrawal serves dual purposes. It not only makes us aware about this relevant topic but also provides sustainable solutions.



Prabhpreet Kaur, currently pursuing her doctorate at the TERI Deakin Nanobiotechnology Centre, Gurugram; is enrolled with Deakin University, Australia. Her research focuses on areas such as biomass valorization, sustainable nanotechnology solutions, and applied microbiology. She could approached via <prabhpreet.kaur@teri.res.in>.



Dr Ruchi Agrawal is Scientist at TERI. She has expertise in developing process schemes around 'decarbonization and sustainable bioeconomy development'. She is the recipient of Young Scientist Uttarakhand Governor Award-2016 and DST-INSPIRE Fellowship in 2010. Dr Agrawal was Visiting Fellow at University of Tennessee, USA in 2017. Communication with her could be established via <ruchi.agrawal@teri.res.in>; <dr.ruchiagrawal010@gmail.com>.

Sadly, till date, women in some low-income countries do not have access to everything that they need to manage their menstrual periods. This includes lack of clean water and sanitation facilities. The problem is further exacerbated by 'the overly charged pink tax' on menstrual products and their disposal issues. Many a times, to avoid the expense of sanitary napkins, women resort to crude and unhygienic methods for managing periods. As a result, this exposes them to various infectious diseases.

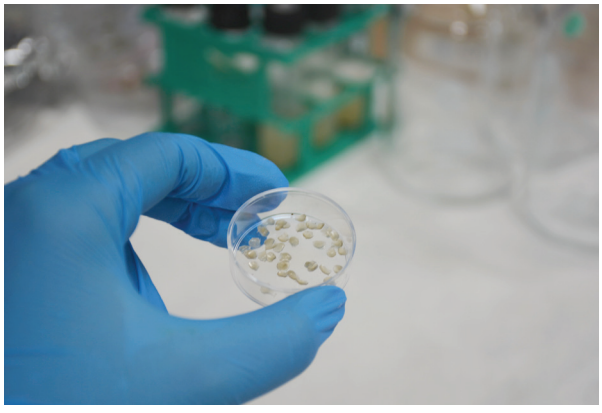
While this struggle to bleed exists, additionally, the disposal of sanitary napkins is accompanied by serious environmental repercussions as some of the materials used in the napkins are non-biodegradable. Usually, the used sanitary napkins end up in solid waste piles (refer to Image 1) before segregation by workers into non-biodegradable waste. The Pune Municipal Corporation took a worthy initiative by collaborating with SWaCH, a waste picker cooperative, to start the Red Dot Campaign. The main motive of this campaign was to empower the waste pickers and maintain their dignity of labour by easy segregation of red dot-marked packets of used sanitary products.

The collected sanitary waste is finally incinerated or buried in landfills. Incineration is a major cause of pollution worldwide that releases dioxins and furans, creating an environmental hazard. Burying rubbish in the ground is not much of an improvement because the polyethene plastics used in sanitary napkins do not biodegrade, and remain in the environment unchanged for hundreds of years. This significant portion of garbage formed by hygiene products is mainly due to the current trend of using acrylate-based superabsorbent in sanitary products. In order to overcome these issues, major focus is laid on finding less expensive and biodegradable materials for forming sanitary napkins. This scenario requires finding materials that are easily available and cost effective.



» **Image 1** The smell and the sight of piles of waste that can make anyone nauseous

Aware of the damage that the synthetic polymers and chemicals do to the environment, our team at the Sustainable Agriculture Division in TERI is dedicated towards the synthesis of bio-based Super Absorbent Polymers (SAPs) (Image 2) from the rice stubble (Image 3), the burning of which is a major issue in north-western regions of India. Around 731 million tonnes of rice stubble are generated globally, of which India contributes about 126.6 million tonnes (Bhattacharyya, Bisen, Bhaduri, *et al.* 2021) GHGs emission (7300 kg CO_2-equivalent per hectare). Over the last decade, the incidents of open field burning of rice stubble have elevated dramatically, thus posing environmental and health risks. Carbon (C) present in rice stubble is emitted as CO_2 (70% of carbon present), CO (7%), and CH_4 (0.66%) while 2.09% of nitrogen in straw is emitted as N_2O (Oanh, Tipayarom, Manandhar, *et al.* 2011). To tackle the release of these smothering air pollutants, the open field burning of rice straw (Image 4) must come to an end. A proposed strategy for the sustainable application of straw is its fractionation to yield the biopolymers for diversified commercial purposes such as in SAPs for hygiene products.

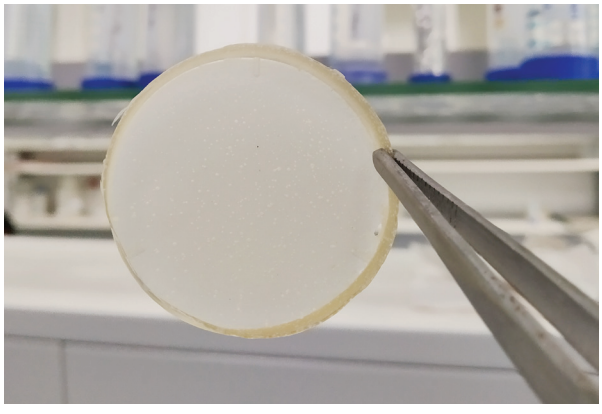


(a)



(b)

» **Image 2** SAP beads in (a) dried and (b) hydrated forms



» **Image 3** SAP sheet fabricated from rice stubble



» **Image 4** Opportunity in disguise—rice straw after its treatment was turned into high value cellulose polymer

The outcomes will greatly assist in empowering the farmers to make extra income by selling agricultural residues (Image 5). A farmer in Punjab earned INR16 lakh in a month by selling paddy stubble to a biofuel generating company (The Indian Express 2022). Additionally, the rice straw cellulose-based hydrogel will also benefit farmers for soil amendment in arid regions to achieve higher yields.

Focus of our work is to synthesize biopolymer-based superabsorbent core for sanitary products such that it is biocompatible, biodegradable, non-toxic, and easily available. Agricultural waste-derived SAPs show good water uptake capacity due to the presence of hydrophilic hydroxyl groups. The novel bio-based SAPs have given the confidence of potential conversion from the low economic value agricultural biomass resource into high value SAPs and based on the recent studies these SAPs have been discovered to hold the promise for the potential application in the sustainable and eco-friendly women hygiene products (Image 6).

Our model aims to solve dual issue of the high cost of sanitary SAPs and disposal of the agricultural stubble and women napkins in the long journey. In the way forward, there are numerous opportunities that can be explored to develop these fully functional SAPs in other hygiene products as well.



» **Image 5** A farmer picks up a matchbox, sets the stubble ablaze and doesn't look back on the impact that this has on environment



» **Image 6** A balance between environment and economic aspects needed in the modern-day sanitary napkins

Owing to the great potential of SAPs, future growth of the SAP market needs to be explored. The opportunities in the market for stakeholders and details of a competitive landscape for market leaders need to be analysed to build capacity for creating biodegradable SAPs using surplus bio renewable polymers.

There is an emerging need to develop and disseminate guidelines for the future interventions of biohydrogel in feminine products. We must ensure that concerns regarding the impact of sanitary napkins on environment find important place during the conversation of period poverty. Both period poverty and environment vulnerability to non-biodegradable sanitary products need proper discussion on same grounds. To avoid worsening the situation, the manufacturers of sanitary products must understand that empowered women and dignified workers are critical for the business and environmental consciousness is more than just ethics!

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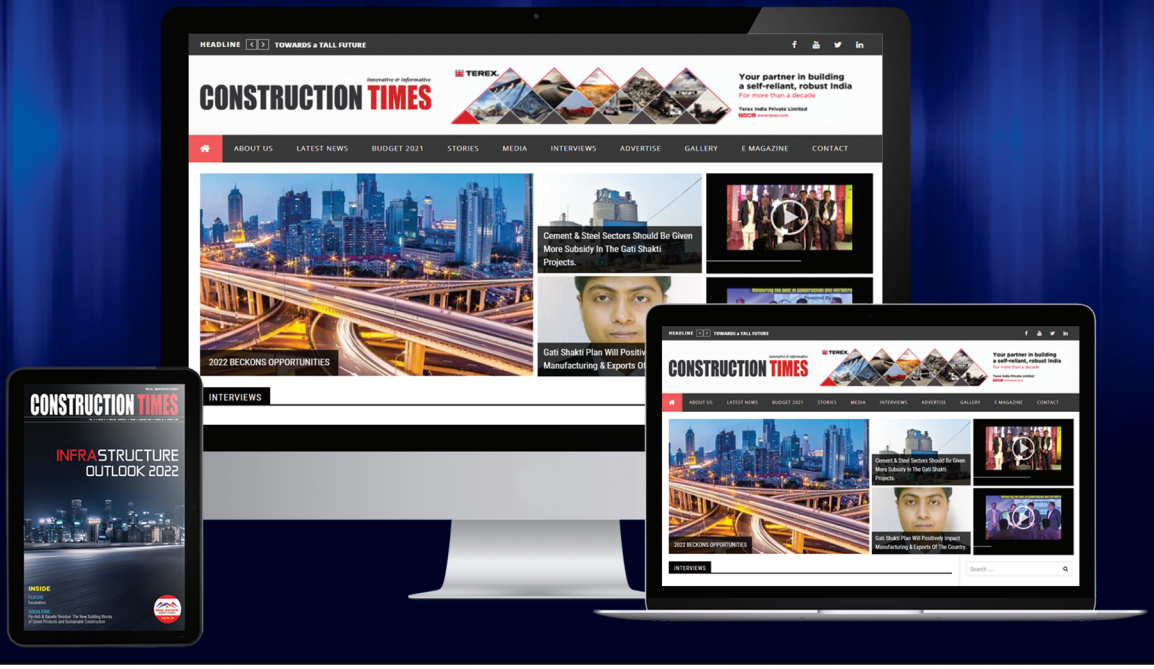

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Climate Change and its Effect on Indian Economy



Amitava Bhattacharyya, is a retired IAS and presently associated with TERI as Distinguished Fellow. His principal areas of interest are climate change, corporate social responsibility issues, drinking water and quality, sustainability issues, and energy sector. He could be approached via <bhattacharyya_aceo@yahoo.co.in>.

India's greenhouse gas (GHG) emission rose by 76% between 2005 and 2017. Even with moderate gross domestic product (GDP) growth, gross GHG emission will continue to increase. Constant demand of economic growth, especially among deprived sections of population will only fuel the GHG emission. Hence, undertaking only GHG mitigation measures is not enough for India. Climate adaptation needs immediate focus to address the more severe impacts of climate change. Article by **Amitava Bhattacharyya** lays emphasis on India's position in terms of climate change mitigation for reducing GHG count. It also takes into account how India could achieve its climate commitments as harnessing energy from renewable sources is our only hope when it comes achieving balance between energy requirement and environmental amelioration.

Climate change is the result of global warming which is caused by the gradual increase in the Earth's temperature caused by high levels of GHGs in the atmosphere. Globally, it has a number of negative consequences such as rising sea level, increase in average temperature, both onshore and offshore, increase in the frequency of droughts and floods, tornadoes, cyclones, forest fires and endangerment of many species (Image 1).

Internationally, International Panel on Climate Change (IPCC) in their climate change report (Global Warming of 1.5°C, 2018) had exhorted the countries to keep the promise made in the Paris Agreement on climate change which stated inter-alia that the average global temperature rise needed to be kept at 2°C, preferably 1.5°C. This would mean that the countries would require to pull up their socks in a significant way. At the latest meeting of the Conference of the Parties (COP 27) (Image 2) in Egypt, the IPCC warned the countries that the average temperature had already touched 1.1°C and that erratic weather patterns were all visible across the globe. The IPCC also predicted that at this rate the world could see an average temperature of 2.8°C by the end of the current century.

The Honourable Prime Minister, Shri Narendra Modi, during COP 26, held at Glasgow made major commitments at the international forum before the comity of nations. First, he



» **Image 1** Species hit hard by climate change—including one that's already extinct



» **Image 2** COP 27 in Egypt

mentioned that India would reach its non-fossil fuel energy capacity to 500 gigawatt (GW) by 2030. Secondly, India would meet 50% of its energy requirement from renewable energy sources by the year of 2030. Next was an audacious goal that India would reduce the total projected carbon emission by one billion tonnes by the end of 2030 and would also achieve the target of net-zero GHGs emission latest by the year 2070.

The main point of discussion at the meeting of the COP 27 at Sharm el-Sheikh, a beach resort with salubrious climate throughout the year, was the fixation of loss and damage amount, especially of underdeveloped counties which were facing the brunt of most of the climate change phenomena such as sea-level rise, storm surges, and draughts amongst others (Image 3).

Along with the calculation of loss and damage estimates for undeveloped nations, the question of allocating responsibility for assisting these countries among various developed countries, which

were initially accountable for the serious global warming crisis, was never resolved. In fact the question of setting up of a UN development fund for tackling major climate change issues was the topic extensively discussed for almost throughout the duration of the meeting. The positive fallout of COP 27 was the in-principle agreement to set up UN-administered fund without fleshing out any detail of the amount of contribution from various developed countries and generally how to administer this fund.

All the debates at COP 26 and COP 27, especially by the underdeveloped and developing countries veered towards resource generation to adapt, mitigate, and tackle climate change related issues. At COP 26, a group of 54 African countries had proposed that the developed countries should deliver at least 1.3 trillion US dollars per year between 2025 and 2030 for climate change to be within controllable limit. In 2009, developed countries agreed to provide the developing counterparts 100 billion US dollars each year in climate change finance. However, the commitment was more on paper. The Honourable Prime Minister has also asked for contribution from the developed countries.

Indian Scenario

India's GHG emission rose by 76% between 2005 and 2017. Even with moderate GDP growth, gross GHG emission will continue to increase. Constant demand of economic growth, especially among deprived sections of population will fuel the total GHG emission soon. Undertaking only GHG mitigation measures is not enough for India. Climate adaptation needs immediate focus to address the more severe impacts of climate change (Image 4). Adaptation is more difficult to formulate as it encompasses a whole range of macro interventions such as housing, city development, food security, disaster management, etc. Parts of some adaptation agenda, for example, disaster management are not entirely within the ambit of the Government of India (state governments are also responsible).

In the Indian scenario, a financial exercise has been done which however contains a lot of approximations but still the exercise may indicate the gigantic amount of resources necessary for making India GHG free by the end of 2070. There are three focus areas that have been attempted—one is power generation, second is sustainable agriculture and food security, third and most contentious area is building resilient cities which involves clean drinking water, sanitation, health care, having a reasonably competent disaster management infrastructure and most importantly to ensure basic human rights such as food, shelter, clothing, security for urban poor.

Assuming 100% renewable resources of energy by the year 2030 (450 GW of energy), India needs about 11 trillion INR (approx.) in investment just for generation of this amount of energy (145 billion US dollars). Another entity that is to be added to this list is the storage and management-related infrastructure cost. Resultantly, the total investment gets approximately doubled, reaching 300 billion US dollars.

In the area of sustainable agriculture, by the year 2030 India will need 206 billion US dollars, only for adaptation process. For undertaking mitigation measures, our country



» **Image 3** Climate change effects
Source: United Nations

needs almost 130 billion US dollars, so the total investment needed for this sector will be around 340 billion US dollars by the year 2030.

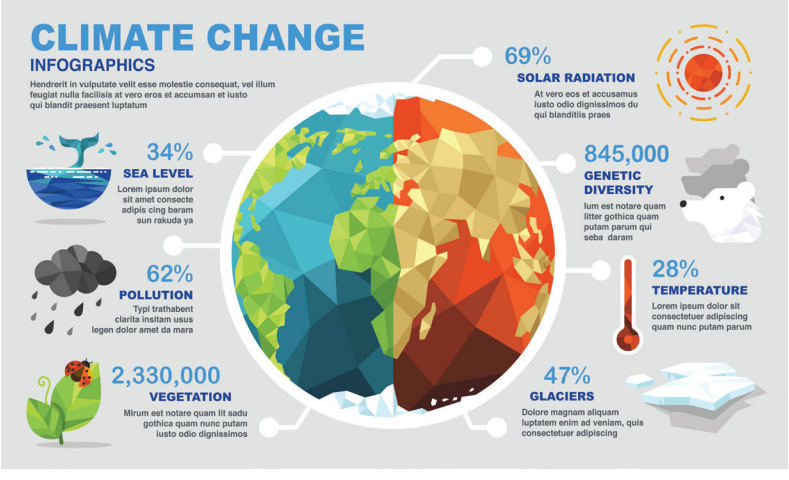
For building resilient cities, internal estimation stipulates investment needed for adaptation action as 190 billion US dollars by 2027, that is, 270 billion US dollars by 2030 through extrapolation. Overall, India needs about 900 billion US dollars to become climate friendly by the year 2030, in case we want to honour the commitment made by our Prime Minister in the COP 26 Summit.

Possible Road Map

It is becoming increasingly evident that the developed countries responsible for climate mess are not going to be of major assistance regarding financial resources or transfer of climate friendly technology. So, a large part of this climate finance, especially scalable funding for establishment of clean energy solutions should continue to come from public funds or focused investors. Private investors have, however, a big role in fueling innovation and growth in this sector. Possible investment of this magnitude needs more than just wiling investors, right instruments, and capital infrastructure along with right kind of policy initiatives by the government.

It needs an entire like-minded ecosystem of funders, venture support capitalists (organizations), mentors, advisors, supportive policy makers and most importantly supportive and quick thinking and active government system free from endless bureaucratic hurdles.

Finally, the citizens and especially the youth of this country must realize that the future for acting is now and pressing climate issues are no longer the sole responsibility of rich and developed nations.



» **Image 4** Potential impacts of climate change

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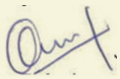
QUOTE UNQUOTE

Sustainable development is about our climate, our people, our community, our basic needs!!
Empowering communities which inspire the active participation of each, and every individual is the most effective way towards sustainable development. A community-based approach is the foundation towards a stronger and resilient future!



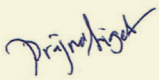
Samhita M
Director, Ela Green Building Consultants and Infrastructure
Private Limited

Our commitment to GRIHA's principles for the last 14 years has not only shaped our projects but has also shaped our perseverance in creating a greener, more sustainable future, it reflects the commitment to creating spaces that embrace environmental consciousness while delivering exceptional comfort and functionality for every project.



Anurag Bajpai
Director, GreenTree Building Energy Private Limited

GRIHA provides a holistic approach to green buildings, looking into all aspects of buildings, including energy, water, solid waste, health, and welfare. This way, GRIHA ensures that true sustainable practices are followed in the building industry.



Prajna Aigal
Research Associate – Sustainable Buildings, The Energy and Resources Institute (TERI)

This is an exciting phase in our industry where all dots are getting connected from sector to sector. People — influencing the way projects are built for a better environment, projects — influencing which environmentally responsible products are installed and manufacturers — are working on greener processes and making resources available with lower life cycle impacts. As an Indian sustainability professional, I feel obliged and excited to journey this sustainable development era!



Kanchan Sarbhukan-Sidhaye
Environmental Architect and
Jr. Partner, VK:e environmental.

GRIHA PROJECTS' FOOTPR

Upto **15%** FAR benefits for GRIHA certified projects

Exemption from environmental clearance for GRIHA projects

5% additional FAR for 4/5 star GRIHA-rated projects

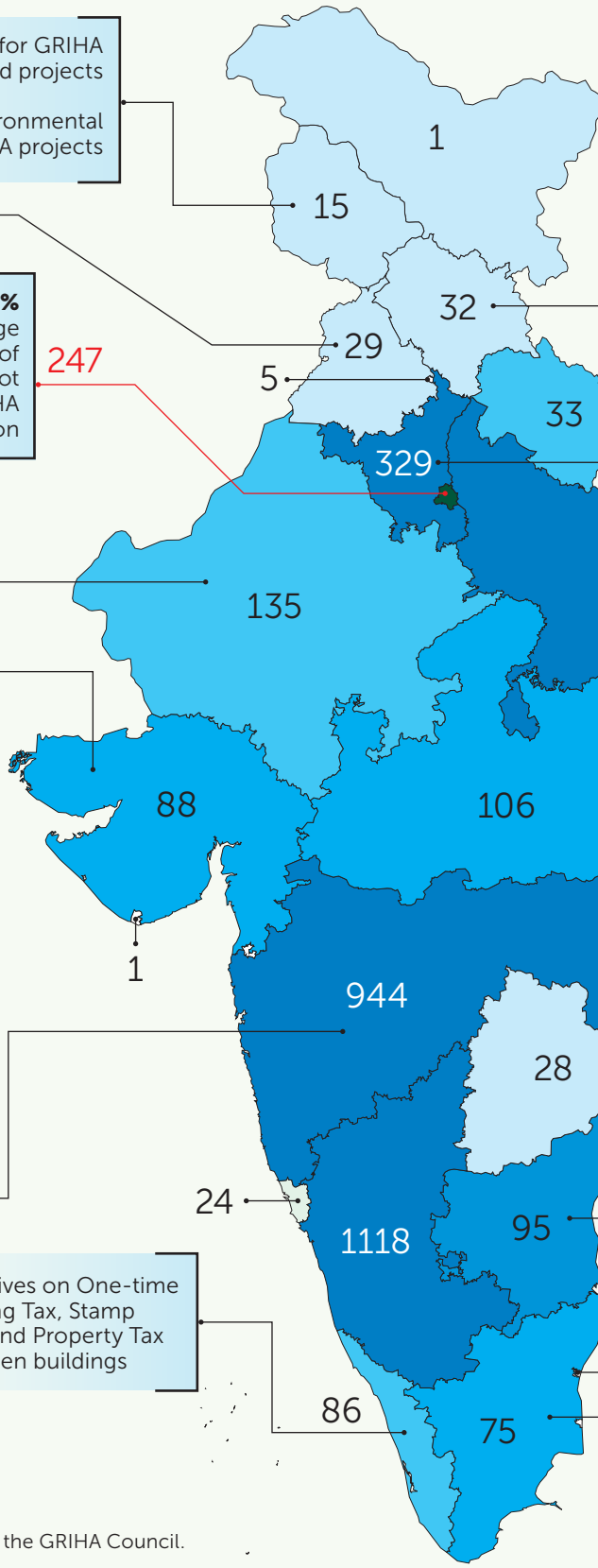
MoHUA gives **1%** to **5%** extra ground coverage and FAR for projects of more than 3,000 m² plot size on the basis of GRIHA evaluation

Buildings with GRIHA rating certificate will be eligible for availing additional **7.5%** to **15%** FAR free of charge

- AUDA: **5%** discount on chargeable FAR payable to the approving authority
- Assistance of up to **50%** of consulting charges or INR 2.5 lakh, whichever is less, for industrial buildings of more than 2,000 m² built up area which obtain green rating from GRIHA Council
- 50% (upto 10 lakh) reimbursement of GRIHA Certification fee for hotel/resort projects

- **PMC & PCMC**
  - Discount in premium charges (payable to Municipal Corporation, for both GRIHA and SVA GRIHA projects)
  - Up to **10%** discount could be availed on Property Tax for home owners for the GRIHA projects. For SVA GRIHA projects, up to **15%** discount on Property Tax for home owners
- PWD, GoM, mandates GRIHA rating for both new and existing government buildings
- **MAHARASHTRA:** Government of Maharashtra has made it mandatory to achieve a minimum of 3-star rating for construction projects under GRIHA for all buildings belonging to government, semi-government, local bodies and public sector undertakings for propagating sustainable habitat development in the state

Incentives on One-time Building Tax, Stamp Duty and Property Tax for green buildings



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

RINT & LINKED INCENTIVES

GRIHA registered projects = 4000+
GRIHA footprint = 88 MSM (APP)

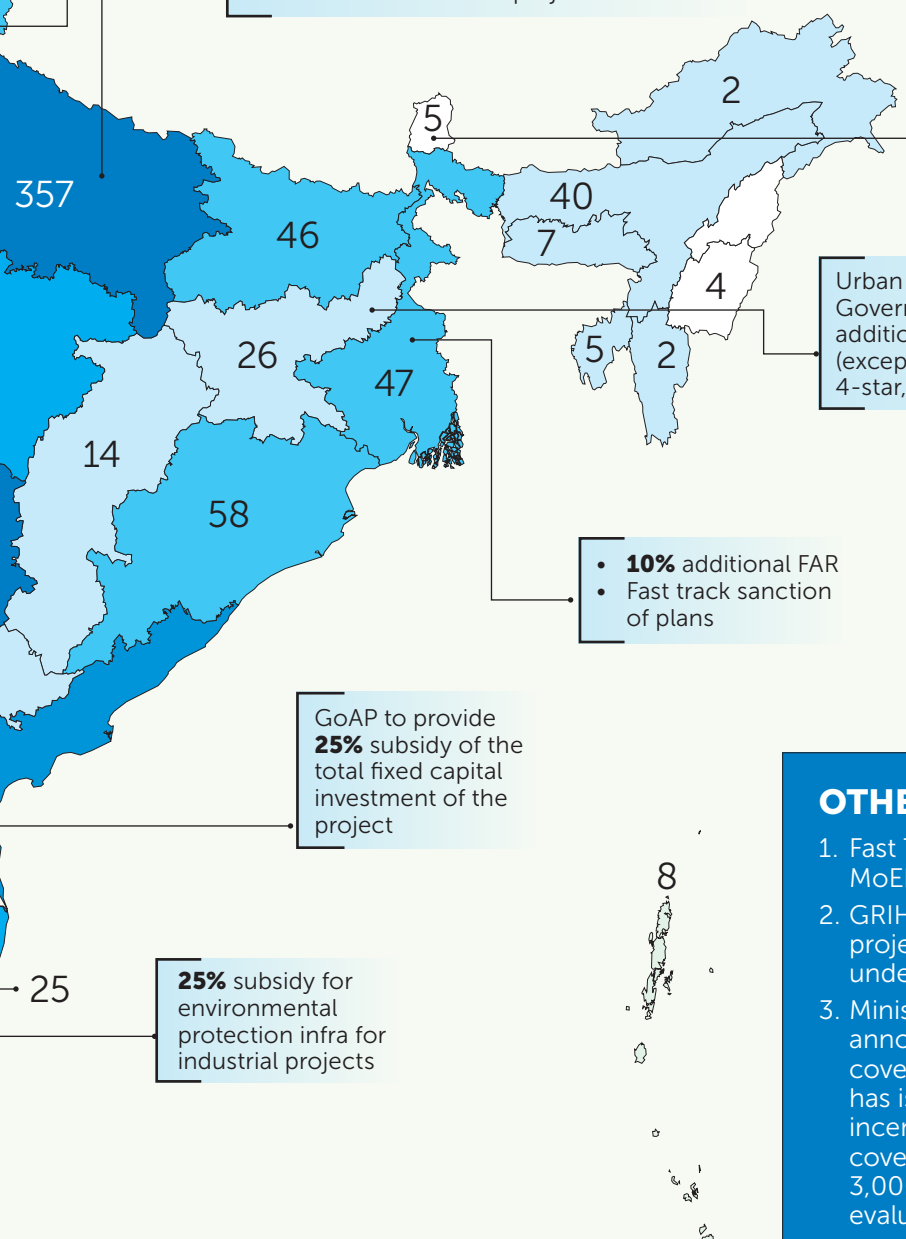
0 — 100+

10% additional FAR for GRIHA 4/5-rated projects

- Up to **15%** extra FAR for all building uses (except plotted residence) for all GRIHA variants
- All PSUs and government buildings to be constructed as per GRIHA norms

- **NOIDA & G.NOIDA: 5%** additional FAR for projects of plot area greater than 5,000 m²
- **UTTAR PRADESH: 5%** additional FAR for 4/5 star GRIHA-rated projects

Mandatory for all government and semi-government projects to go for a minimum 3-star GRIHA rating



Urban Development and Housing Department, Government of **JHARKHAND: 3%, 5%,** and **7%** additional FAR shall be awarded to all building uses (except plotted residential) for achieving a 3-star, 4-star, or 5-star GRIHA rating, respectively

- **10%** additional FAR
- Fast track sanction of plans

GoAP to provide **25%** subsidy of the total fixed capital investment of the project

25% subsidy for environmental protection infra for industrial projects

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





Lagnajeet Tripathy is a final year student of B. Sc. Sustainable Development of XIM University. His principal areas of interest include climate change, blue economy, and carbon financing. He is the recipient of National Service Scheme Leader and stood first in G20 University Connect Essay Writing on Blue Coastal Economy. He could be communicated via <ubsd21007@stu.xim.edu.in>.

Blue Coastal Economy

Through this article, **Lagnajeet Tripathy** emphasizes the significance of the blue coastal economy. Arguments put forward by the author are reinforced by facts, problems, characteristics, followed by sustainable solutions for effective realization of the environmentally benign future of marine fisheries, in both Indian and global context.

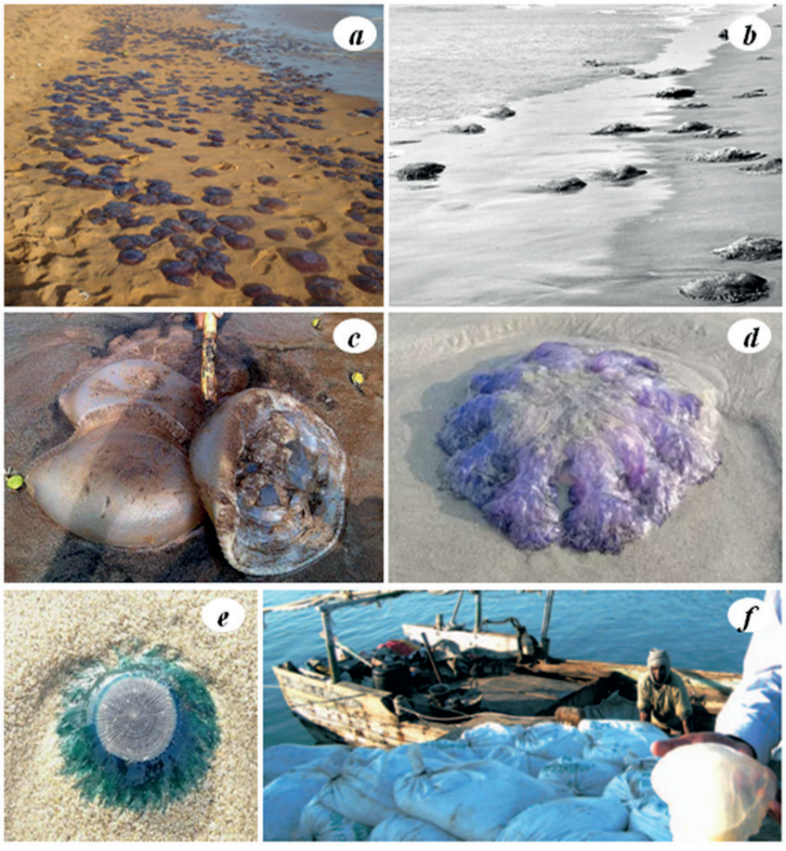
Before we dive into the topic on coastal economy let me ask the readers about their favourite seafood. Some of you will say shrimp, catfish and some would say tuna, crab, etc. I request you to imagine—these beautiful delicacies disappear. Now some will think, then should we stop eating seafood? Will this solve all the problems? The answer is NO as environment and sustainability should go hand in hand. "The ocean is the lifeblood of our planet, and the conservation of fisheries is crucial to maintaining its health and abundance." So now it's our turn to do something.

The Sustainable Development Goal 14 (Life Below Water) commits countries to work together over what is a global responsibility—the protection of our oceans and the lives that depend on it. India ranks 70th in the world for SDG 14. Linked with this, there are various targets which focus on different aspects of marine conservation. Currently India is ranked 12th among the top 20 countries responsible for marine pollution by generating about 25,000 tonnes of plastic every day, out of which about 40% remains uncollected. India is witnessing a sea-level rise of around 1.33 mm/year on coasts. India being the second-largest producer of fish has a responsibility to contribute more in making sustainable fishing a success as they serve as the world's largest source of protein, with more than three billion people depending on the oceans as their primary source of protein.

The Government of India's Sagarmala Project, also known as the Blue Revolution, is working towards improving the state of India's ports and coastlines. In the fiscal year 2019/20, India's fish production reached 14,164 thousand tonnes, with the majority, 74%, originating from inland fisheries, while the remaining 26% was contributed by marine fisheries. Nevertheless, despite a significant overall increase of more than 250% in fish production, the proportion of marine fish production has experienced a decline. While SDG 14 primarily focuses on conserving and sustainably utilizing oceans, seas, and marine resources for sustainable development, we believe that the quality of river water also plays a crucial role in safeguarding marine life.

Projects such as Clean Ganga and Swachh Bharat Kosh are sectors where corporate entities allocate their corporate social responsibility (CSR) funds. Over the past six years, a total of INR 1058 crore has been invested in these sectors. Notably, the highest contribution, amounting to INR 358 crore (34% of the total spending in these sectors), was made in the fiscal year 2015/16. This inclination towards greater contributions from public sector undertakings (PSUs) appears to be a significant driving force in these areas. India has taken steps to safeguard its marine biodiversity by establishing marine protected areas and enacting regulations. The Gulf of Mannar Marine National Park and the Great Nicobar Biosphere Reserve serve as notable instances of these conservation endeavours.

In simple words, 'blue coastal economy' refers to all such economic activities of a country that are related to oceans (Target 7), seas, and coasts. In this article, we would be focusing on various facts, problems, characteristics, and solutions for the better future of marine fisheries in India and globally. India has a coastline of nearly 7500 kilometres providing livelihood to over 250 million people, 9 of its 28 states are coastal, nearly 35% of India's population resides near the coasts and the nation's geography comprises 1382 islands. Oceans also serve as the world's largest source of protein, with more than three billion people depending on these saltwater reservoirs as their primary source of protein. These coasts include facilities such as fishing, mining, aquaculture, shipping, etc. and in the recent time due to overfishing, pollution from land-based sources (Target 14-1) such as plastic have resulted in destroying and degrading our coasts (affecting marine life and tourism), mangrove deforestation, lack of infrastructure in coastal areas, climate change and ocean acidification our marine fisheries sector is largely affected. During the late 1990s and early 2000s fish stocks were overharvested. Fishing methods such as trolling, which basically takes everything (nets) that comes into path have not only rapidly depleted our fish stocks but also made a number of other marine creatures vulnerable. Our ecosystem dependencies are so intricate and complex that we cannot exactly point out and say what exactly is happening. It is observed that the frequency of jellyfish blooms has increased who have high-predation rate and provide a conducive bed for algal blooms. This can be solved through jellyfish swarming advisory service, the killing of shark (one of the top predators), etc. are completely in the formation of an entirely different community in the oceans (Image 1). Seafood frauds during



» **Image 1** Jellyfish swarming problems: water quality deterioration, food chain alterations, hindrance in seawater uptake by power plants, clogging of nets during fishing operations

production, misleading, and packaging of low-grade seafood are some of the major concerns nowadays. Price fluctuations and increase in seafood allergies are at its peak. We are not giving time for the fish stocks to replenish and continuously pull our more fish from the ocean. The percentage of illegal, unreported, and unregulated fish is expanding. The clearing of lands and coastlines, usage of antibiotics and feed, disease outbreaks, accumulation of heavy metals is very high in aquaculture which is an unsustainable fishing practice. For example, for every 3 kilograms of wild-caught fish used as feed for an aquaculture species, only 1 kilogram of fish is produced which is not profitable in terms of energetics. So, the challenge today is how we can increase the sustainability of all these things and have a convivial future in marine fishery. Technological solutions such as Bycatch reduction device which is a window at the end of the troll net which allows the juvenile fish to pass away, the usage of round hooks does allow sharks to get trapped will help. The installation of real-time automatic weather station (RAWS) which measures wind vector, air temperature, sea surface temperature, relative humidity, rainfall, long-wave radiation, short-wave radiation, etc. will help to predict the environmental catastrophe near the coastline and provide a way to reduce losses. Early resilience's proper use of advanced echo sounders (use of multi-beam echo sounders instead of single-beam echo sounders) will help to predict if any marine creature is on the path below and avert damage to both marine life and the ship through both immediate and long-term benefits (generate high-resolution maps of harbours, berthing terminals, lake bottoms, and channels used for navigation).

Introduction of algal bloom information services (to track the increasing frequency of algal blooms) will help in predetermining the damage to the coastal fisheries and respiratory problems among coastal population as it triggers a number of major problems such as the formation of toxic aerosol, foam, discolouration, species invasion, fish kill, dissolved oxygen and submerged vegetation decline, toxic contamination of shell fish, etc. Coral bleaching alert system can prevent coral bleaching at earlier stages (Image 2). The implementation of potential fishing zone advisory services will help fishermen in their work by reducing their efforts in finding maximum fish spots by determining the exact place for

fishing. Apart from this, certain time space solutions such as during certain time fishing is not allowed, fixing catch caps and giving catch quotas to fishermen so that they don't overcatch. The use of technologies such as hyperspectral imaging in which the quality of food is assessed through the amount of light reflected from it, the fresher it is, the more moisture it has and the lighter it reflects. This will help us to reduce the food wastage and also help to know the exact species of fish. Turning crop waste into sustainability so that we can turn aquaculture in a more sustainable way. Consumer-based initiatives such as 'know your fish' is basically a calendar which guides the consumers in which month which fish to eat and which fish to avoid in order to minimize the impact on the ocean ecosystems.

Government subsidies are allowing fishing boats to continue fishing even when there are not enough fishes left for fishing to remain profitable. The way the subsidies are given now should also be minimized as it is observed, there is no profit for the fisheries without giving subsidies. These subsidies create tension between competing fishermen and nations. There should be a proper balance between imports and exports. The World Trade Organization has previously negotiated global (Target 14-C) rules for government subsidies to industry and farming. Now it's time to put an end to subsidies that harm our oceans as stated in SDG 14

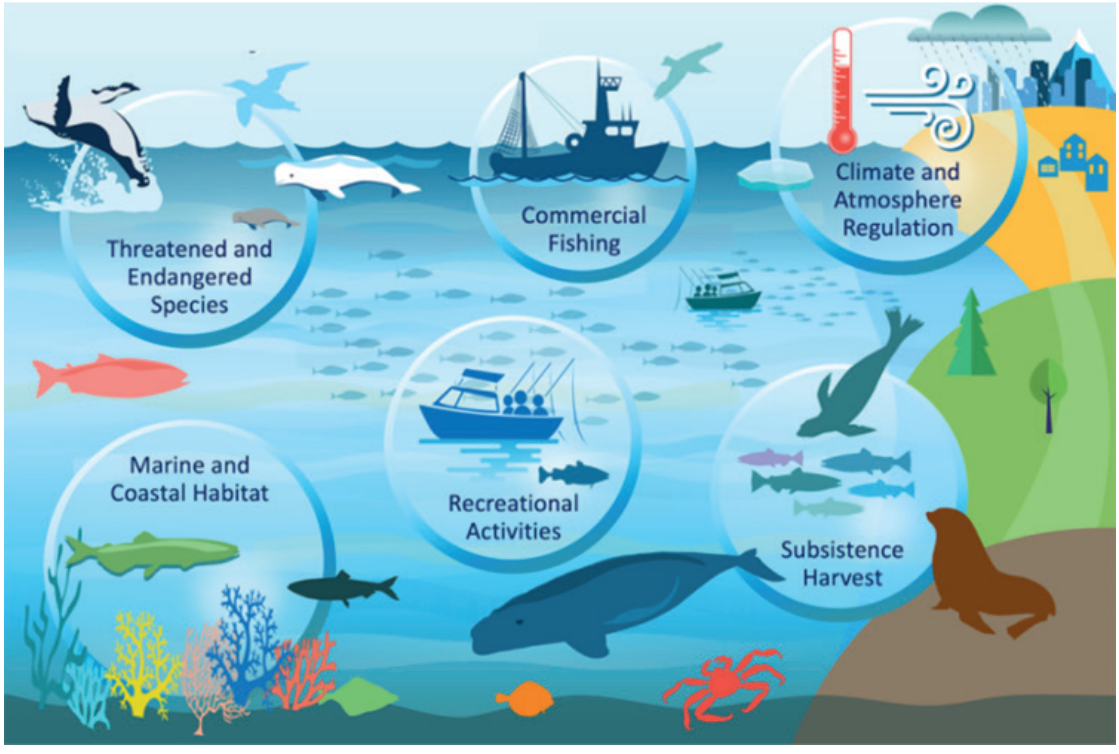


» **Image 2** Coral bleeching

(Target 14-6) too. Investments in local coastal communities can lead to remarkable recoveries under the waves. There should be a shift from quantity to quality-oriented strategies.

Three principal ingredients to achieve a convivial future for marine fishing communities are *Sangharsh*, *Nirmaan*, and *Seva*. *Sangharsh* signifies the energetic attempt to achieve something socially creative through collaborative and adversarial efforts, followed by *Nirmaan*, stating the creation and re-creation of concrete alternatives, backed by *Seva* which states to undertake joyful labour, selfless service, and doing it collectively with others.

Now it has been well established that the main factors we should consider in a sustainable fishing criterion are limiting the catch size, regulating fishing seasons, and protecting certain species which we all know than local fishermen are adept at. Local communities, particularly fishermen and women have a unique and valuable perspective on fishing and the conservation of aquatic life compelling SDG 14, Target 14-B. They have the traditional knowledge on local waters, the uniqueness of selective fishing they practise, seasonal patterns of fish migration, breeding grounds should be integrated in how we understand and manage fisheries resources and mostly the sense of transferring their knowledge to their children, helping in the conservation efforts. Fishermen are often the first to notice signs of overfishing or decline of fish population because they spend so much time in the water and they have the ability to motivate and mobilize people against unsustainable fishing practices. Fishermen can employ devices and modify their gear, like turtle excluder devices (TEDs) or bird-scaring lines, to reduce bycatch



of marine animals like sea turtles and seabird with efforts on reporting and helping to combat illegal, unreported, and unregulated (IUU) fishing. Some fishermen participate in habitat restoration projects, such as reef restoration or seagrass planting, to help rehabilitate damaged marine ecosystems. They can also support to advocate marine protected areas (MPAs) which are a crucial thing for fish populations to recover.

Apart from this, their efforts to represent themselves as environmental stewards, engaging in beach clean-up efforts, habitat restoration, etc. is appreciable. Secondly, they can collaborate with scientists and conservation organizations to collect data on fish population and participate in research projects aimed at understanding and preserving aquatic ecosystems. Putting fishermen at the centre of fishing solutions, giving them direct access and control over their local fishery, organizing with their communities, talking with their families, in a way that helps them see that it's a new approach, that is all about putting them at the centre of the solution by providing them with education and training on sustainable fishing practices as mentioned in SDG 14 (Target 14-4), importance of conservation will drastically change their behaviour and eventually lead to a much more cleaner and efficient fishing community with a vision ahead.

At the end, to facilitate understanding, a basic sustainable model through which we can observe a convivial future of marine fisheries, would be beneficial. It all starts with the catching stage where we take benefit from the ocean, at the second stage we should have an own cultivation of the fishery (greater biodiversity) to meet with the demand of growth and production of seafood. The third stage includes equal developmental stage where we develop farming areas in the sea which would attract different sea animals to the fisheries, the fourth stage follows getting the Marine Stewardship Council Licence which would inform the consumers on where the fish is caught and how. Also specifying species of the fish for ensuring sustainability, biodiversity, and good industry practice.

MoUs, Charter and Awards



MoU between Life Life Insurance Corporation of India (LIC), Mumbai
GRIHA Summit 2022

All existing buildings of LIC will be rated by GRIHA under GRIHA for Existing Buildings (GRIHA EB) rating variant.



MoU between The 2000- Watt Smart Cities Association
GRIHA Summit 2022

The GRIHA Council's Decarbonizing Habitat Programme was welcomed by '2000-Watt Smart Cities Association', a Swiss certifying organization working along similar lines who expressed their interest in collaborating for the decarbonization of built environment in India.

2023-2024 National Association of Students of Architecture, India (NASA)
September 2023

To jointly promote the concept of green buildings and sustainable habitat through the GRIHA platform and sensitize students towards sustainable design by executing the GRIHA trophy at NASA annual conventions.



Charter 2022 - 2023

GRIHA Council signed a charter on "Value Chain Approach to Decarbonize the Buildings and Construction sector in India" with the Mahindra Group on 12 September 2023.
This aims to serve as a platform to explore the common challenges and opportunities; and identify the relevant stakeholders in the movement of decarbonizing the building and construction sector.



Awards

GRIHA Council honoured with "Best National Brand of the Year"

The GRIHA Council was honoured with "Best National Brand of the Year" award under the Solutions Category at the Global Smart Build Summit and Award- 6th edition held on 13th April 2023 in Lucknow, Uttar Pradesh. The event was organized by Summentor Pro which was supported by the Ministry of Housing and Urban Affairs, Government of India, and Government of Uttar Pradesh.



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Key to Infobytes: Spot the differences

- Solar-powered exterior lighting has been installed
- To enhance daylight, skylight has been installed
- Native tree has been planted apart from exotic one
- Provides bicycle for users to promote sustainable transportation
- Solar panels have been installed
- Provision of electric charging facility for non-motorized vehicles
- Window shading has been installed to reduce solar heat gain
- Potted shrubs have been planted in the premises
- Kitchen garden has been installed on roof
- Rainwater recharging system has been installed



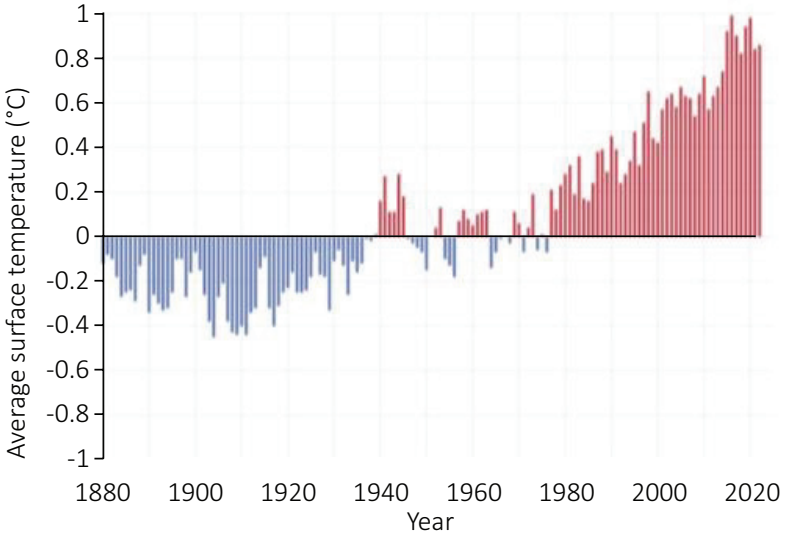
Green Hydrogen: Building Sustainable and Resilient Communities

The indiscriminate utilization of fossil fuels is accompanied by a number of environmental repercussions. In this regard, transition to renewable sources of energy has assumed significance. Hydrogen is one such viable source which is not only non-polluting but is also abundantly available. In an era marked by pressing environmental challenges and the need for sustainable energy solutions, hydrogen has positioned itself as a viable alternative to non-renewables. The present article by **Subathra Rajendran** discusses how the versatility, abundance, and zero-emission properties of hydrogen have positioned it as critical in transitioning to a greener future.



Subathra Rajendran, Founder of Aatral ESP and Aatral Hydrogen, is a passionate chemical engineer who is highly accomplished in the field of energy. She is researching on sodium-ion batteries and working on revolutionary approaches to energy storage and utilizing solid-hydrogen.

Undoubtedly, the future of the energy economy that fuels our world is transitioning into renewable energy. The need for an alternative drives this change, a cleaner energy source, as our world's reserves of fossil fuels diminish at astonishing speeds. It is worth mentioning, the world's temperature has increased by 1.1°C since 1880 (NASA 2023) as shown in Figure 1, due to our frenzied consumption of non-renewable energy, resulting in the anthropogenic emissions of greenhouse gases (GHGs).

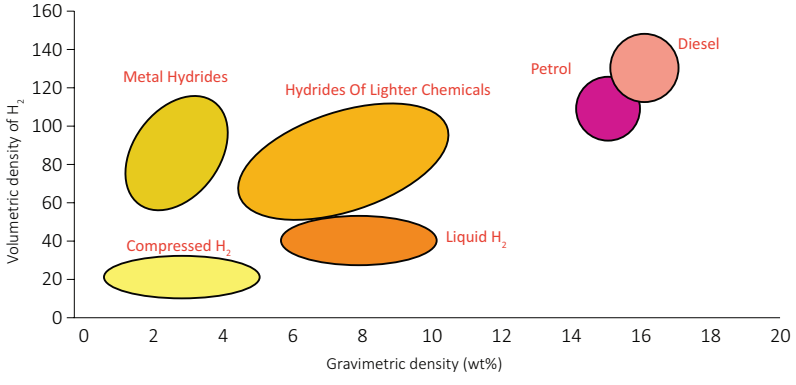


» **Figure 1** Global average surface temperature since 1880

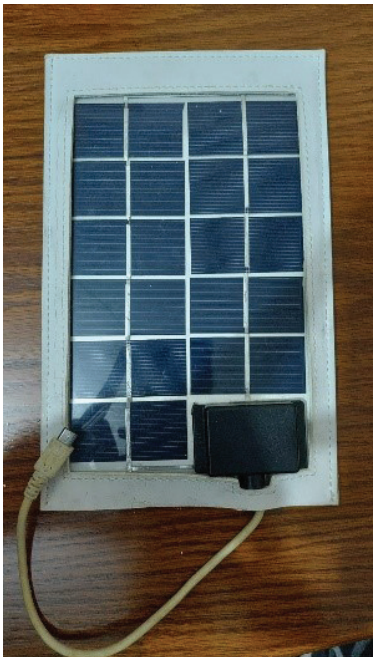
In an era marked by pressing environmental challenges and the need for sustainable energy solutions, hydrogen has positioned itself as a suitable alternative to non-renewables. Versatility, abundance, and zero-emission properties have positioned it as critical in transitioning to a greener future. Moreover, the development of solid-state hydrogen technology holds immense potential in unlocking new possibilities for empowering sustainable and resilient communities.

Hydrogen, a vastly abundant element on the Earths' surface in the form of water, has long been recognized as an efficient energy carrier, especially in the form of chemical hydrides as shown in Figure 2. Its conversion into electricity through fuel cells produces only water as a by-product and electricity, making it a clean and emission-free energy source. Deploying hydrogen fuel cells in various sectors, including transportation, industrial processes, and power generation, can significantly reduce pollution and combat climate change. By embracing hydrogen, communities can contribute to a sustainable and low-carbon future.

The advent of solid-state hydrogen technology opens new avenues for decentralized energy systems, empowering communities to become more self-reliant and resilient. Solid-state hydrogen storage offers a safe, compact, and efficient means of storing hydrogen at room temperature and atmospheric pressure, eliminating the need for expensive and complex infrastructure associated with conventional hydrogen storage methods. This technology enables the establishment of localized hydrogen production and distribution networks, allowing communities to harness their renewable energy resources, that is, solar panels



» **Figure 2** Gravimetric density of chemical hydrides vs volumetric density



» **Image 1** An affordable, home-use solar panel

that are cheap and affordable for households and create sustainable energy ecosystems tailored to their needs (Image 1). By fostering energy autonomy, solid-state hydrogen technology supports the development of resilient communities capable of withstanding disruptions and shocks to the larger energy grid.

Many modes of transport are the producers of GHGs and air pollution. Hydrogen fuel cell vehicles (FCVs) present a viable solution to mitigate these environmental impacts. FCVs offer long-driving ranges, shorter refuelling times, and emit only water vapour, making them a cleaner alternative to traditional combustion engine vehicles. By embracing hydrogen as a fuel for transportation, communities can reduce local air pollution, improve air quality, and decrease their dependence on fossil fuels. Furthermore, establishing hydrogen refuelling infrastructure encourages the adoption of FCVs and promotes the growth of a clean and sustainable mobility sector, enhancing communities' overall liveability and resilience.

The integration of hydrogen technology with renewable energy systems creates a synergistic approach to sustainable development. Excess electricity generated from renewable sources during peak production periods can be utilized for hydrogen production, effectively converting intermittent renewable energy into a storable and dispatchable form. This integration ensures optimal utilization of renewable resources and enhances the overall efficiency and resilience of renewable energy systems. Communities that adopt this approach can optimize their energy generation and consumption, reduce reliance on external energy sources, and build robust and self-sustaining energy networks.

One of the key challenges regarding renewable energy sources is their intermittency; power generation from solar and wind sources is dependent on weather conditions, resulting in fluctuations in energy supply. Hydrogen is crucial in addressing this issue as a versatile and efficient energy storage medium. Excess electricity generated from renewable sources can be used to produce hydrogen through electrolysis, and the stored hydrogen can be converted back into electricity during peak hours of high demand or low renewable energy generation. This capability enhances the stability and resilience of local energy grids, enabling communities to rely more on renewable sources and reduce their dependence on fossil fuels.

Currently, the preferred method of producing green hydrogen is using electrolyzers. Currently, the main electrolyzers are the alkaline water electrolyzer (Image 2), the proton-exchange membrane (PEM) electrolyser, and the solid-oxide electrolyzer. Utilization of PEM electrolyzers is advantageous as they can produce higher hydrogen and oxygen gas purity.

As of 2022, the US Government states a capital cost for their standard PEM electrolyzer stack model of $450, with a lifetime of 40,000 hours, and the degradation rate of the design stands at 0.25% per



» **Image 2** Working model of an alkaline electrolyzer

1000 hours (energy.gov 2023). Each stack has an electrical efficiency of 65% and, as a system, an energy efficiency of 61%. With this technology, the system can generate 1 kg of hydrogen gas for $3 (Raj, Lakhina, and Stranger 2022). India instead has a levelized cost of hydrogen, LCOH, of $4–7 per kg. The goal for many researchers and organizations, including the USA Department of Energy and the Indian Government, is to reach the LCOH of $1/kg of hydrogen in production stages, thus making the technology affordable and accessible in newly emerging economies, including India.

An analytical look into the shifting energy economies shows that hydrogen power generation is rising. For instance, Canada, a front runner in this rising industry producing 3 million tonnes of hydrogen annually, has claimed that by 2050 around 30% of the total energy supplied throughout Canada will be generated using hydrogen sources as fuel (Financial Times 2023). The oncoming times for India are such that there will be a great necessity for energy which conventional non-renewable fuel sources will never be able to produce on sustainable basis.

To bridge the gap, it has become imminent that hydrogen power generation is feasible, and India has also followed suit in tandem with the front runners. New Delhi recently announced a USD-2.3 billion injection in the production of green hydrogen (Kusuma 2023) and experts speculate that on this trajectory and sustaining such investments, it is possible for India to become completely carbon-neutral in the future.

India imports 40% of its primary energy needs, or over USD 90 billion annually (Sinha 2023), hence the ability to produce power from national sources will cut down international dependency and rid India of any extra costs such as tariffs and import taxes, upholding a more stable economy in the long run, which in turn will allow Indian communities to increase their standards of living as their costs of living improve. Hydrogen and solid-state hydrogen technology can empower sustainable and resilient communities.

By embracing hydrogen as a sustainable energy carrier, communities can contribute to a low-carbon future and combat climate change. The ability of hydrogen to store energy and enhance grid flexibility enables communities to integrate renewable energy sources effectively, reducing their dependence on fossil fuels. Communities may enhance air quality and lessen GHG emissions by embracing clean mobility solutions and encouraging the development of a hydrogen-based transportation industry. The journey towards a greener future is marked by innovative solutions ensuring a robust bloom of an industry in India and eventually the world.

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Team GRIHA at the closing ceremony of 14th GRIHA Summit



Release of JAN GRIHA Manual by Mr Sanjay Seth, Vice President and Chief Executive Officer, GRIHA Council, Mr Sharman Joshi, Renowned Indian Film Actor, Ms Leena Nandan, IAS, Secretary, Ministry of Environment, Forest and Climate Change, Government of India, Dr Vibha Dhawan, President, GRIHA Council and Director General, TERI, Mr Sonam Wangchuk, Founding Director, Himalayan Institute of Alternatives, Ladakh and Mr Shailesh Ranjan, Head – Business Planning, Operations & Technical, AIS (L to R)



Mr. Abhishek Anand, Vice President of Growth, SatSure Ltd., Dr Ritu Mathur, Consultant, Senior Energy Economics, NITI Ayog, Government of India, Dr Sandeep Maithani, Scientist/Engineer "SG" & Head, Urban Studies Department, Indian Institute of Remote Sensing, Dehradun, Ms Shabnam Bassi, Deputy CEO-Cum-Secretary & Treasurer, GRIHA Council, Mr Raj Bhagat Palanichamy, Senior Programme Manager - Geo Analytics, WRI India and Mr Rohit Kochar, Founder CEO, Exec Chairman, Bert Labs Private Limited.



Welcome address by Dr Vibha Dhawan, President, GRIHA Council



Special Remarks by Mr Sharman Joshi, Renowned Indian Film Actor



Special Address by Mr Sonam Wangchuk, Founding Director, Himalayan Institute of Alternatives, Ladakh



Prof. Paul Marcel Chamberlain, Co-Director C3RI, Head of Art & Design Research Centre, Director - Lab4Living and Director of Design Futures, Sheffield Hallam University



and Director General, TERI



Inauguration of GRIHA Exhibition by Ms. Leena Nandan, IAS, Secretary, Ministry of Environment, Forest and Climate Change, Government of India and Mr Sonam Wangchuk, Founding Director, Himalayan Institute of Alternatives, Ladakh in presence of Dr Vibha Dhawan, President, GRIHA Council & Director General, TERI and Mr Sanjay Seth, Vice President and Chief Executive Officer, GRIHA Council



Valedictory Session & Award Ceremony by H.E. Ralf Heckner, Ambassador, Embassy of Switzerland in New Delhi, India



Mr Sanjay Seth, Vice President and Chief Executive Officer, GRIHA Council, H.E. Mr Freddy Svane, Ambassador, Royal Danish Embassy, New Delhi, India, and Ms Shabnam Bassi, Deputy CEO-Cum-Secretary & Treasurer, GRIHA Council (L to R), lighting of the lamp at the inauguration of the 14th GRIHA Summit



Thematic Track on Machine Learning in Mitigating Climate Change



The signing of Memorandum of Understanding (MOU) between Life Insurance Corporation of India and GRIHA Council



The signing of MoU between 2000-Watts-Smart-Cities-Association and GRIHA Council



Cultural night at the closing ceremony of 14th GRIHA Summit

The Recipe for Net-Zero Energy

A Net-Zero Energy Building (NZEB) for its energy requirements relies on sustainable sources. There are certain parameters that a building must fulfil for being qualified to be an NZEB. The article by **Deepa Parekh** and **Manna Elisabeth** explains through case studies on four buildings and how they exemplify NZEBs in true means.





Deepa Parekh is a teacher and a sustainability consultant specializing in the buildings sector. As Associate Director at Environmental Design Solutions (EDS), she helps clients meet high-performance goals for green building design and operations. Deepa teaches at the Building Energy Performance graduate programme at CEPT University. She can approached via: <deepa@edsglobal.com>.



Manna Elisabeth is an architect by profession and an environment enthusiast. She is currently pursuing her Master's in Building Energy Performance at CEPT University.

A net-zero energy building (NZEB) produces all of its required energy through renewable energy sources. A building could achieve net-zero status if could fulfil either of the two broad prerequisites: (i) focus on reducing energy demand through building design or (ii) focus on methods to offset the energy demand through renewable sources.

This article examines four NZEBs for the approach they have taken to achieve highly energy efficient net-zero energy outcome. It finds that by combining climate-responsive design strategies with highly efficient technologies, the projects have achieved lower energy consumption compared to the Energy Performance Index (EPI) set by the Bureau of Energy Efficiency (BEE). This, in turn has helped reduce the requirement for renewable energy offset. Thus, there seems to be a recipe to achieve NZEBs.

Table 1 EPI benchmarks for office buildings

Climate zone	EPI (kWh/m²/year)		
	Office buildings		Institutes
	Less than 50% AC	More than 50% AC	Air conditioned
Warm and humid	101	182	150
Composite	86	179	117
Hot and dry	90	173	106
Moderate	94	179	129

Unnati: Office building in a composite climate

Unnati is a 4,945-m² office building located in Noida, Uttar Pradesh and is part of a five-acre industrial campus (Image 1).

Passive strategies: A square-shaped form with a central courtyard ensures daylight and ventilation to all spaces. Fenestrations are oriented northeast–southwest for efficient wind movement and are completely shaded to avoid glare and direct solar radiation. The service core areas are distributed in the east and west to reduce heat gain. Walls and roof are made of truss-reinforced insulated concrete panels and fenestrations have high-performance double glazing. Green roofs further reduce heat gain through the roof slab.

Active strategies: The building employs mixed-mode operation for thermal comfort, utilizing natural ventilation in favourable weather and a mechanical cooling system during other times. The radiant cooling system has the potential to increase chiller efficiency by 50%. Displacement ventilation efficiently supplies clean, fresh air directly to occupants. A reduced lighting power density (LPD) of 3.6 W/m² helps achieve 65% lower lighting energy demand than ASHRAE 90.1 recommendations. Lighting controls further optimize energy usage during operations.

Renewable energy strategy: A 100-kW rooftop solar plant over the adjoining workshop building makes this a nearly-zero building. The EPI of this office building at 60 kWh/m² /year is 30% less compared to the BEE benchmark of 86 kWh/ m²/year.



» **Image 1** Unnati, India

Source: NZEB India

School of Design and Environment at NUS: Institutional building in a hot-humid climate

School of Design and Environment (SDE4), spread across 8,514 m² is located on the campus of National University of Singapore. Built in 2019, this is the first net-zero building in the country. This project challenged the notion that a high-energy-efficient building has to be opaque and aimed to demonstrate that high comfort need not be necessarily technology-driven (Image 2).

Passive strategies: SDE4's unique location amidst lush vegetation allows for high window-to-wall ratio on the north–south façade, thus optimizing for natural light and ventilation. Heat gain is reduced by the linear form with an over-sailing roof shading the north–south fenestrations and semi-porous east–west facades. Daylighting is emphasized such that artificial lighting is only required later in the day to night-time. A significant reduction of 50% in cooling load has been achieved through these strategies and by considering adaptive thermal comfort.

Active strategies: Only 17% of the building is fully air-conditioned while 46% is naturally ventilated. Remaining 26% is hybrid tempered which is a combination of air-conditioning and natural ventilation.

Renewable energy strategy: SDE4's roof hosts 1200 solar photovoltaic (SPV) panels, generating electricity to power the building. With an EPI of 58 kWh/m^2/year, it is significantly below the BEE benchmark of 150 kW/m^2/year.

Centre for Advanced Research in Building Science and Energy (CARBSE): Institutional building in a hot-dry climate

The 498-m^2 CARBSE building focuses on insulation and energy storage among others with an integrated design approach to achieve an NZEB in a hot and dry climate (Image 3).

Passive strategies: CARBSE's rectangular plan with a 3:1 length to width ratio has fenestrations only on the north and south facades. Further, 26% window to wall ratio (WWR) reduces heat gain. Southern operable clerestories aid daylighting and ventilation through stack effect. The optimized envelope includes thermal mass with insulation in walls, floor and roof, light shelves, and low-e double glazing (Image 4).

Active strategies: CARBSE uses mixed-mode conditioning: variable refrigerant flow (VRF) in basement, natural ventilation on ground floor, and switchable modes on first floor. Space cooling is also provided by radiant system with a dedicated outdoor air system (DOAS). Energy efficient lighting with low LPD 4.7 W/m^2 with daylighting controls. Extensive metering and monitoring are some of the instrumental factors in achieving the NZEB status.

Renewable energy strategy: A south-facing 30° slanted rooftop houses SPV panels generating 51.2 kWh/m^2. With an EPI of 58 kWh/m^2/year, it surpasses the BEE benchmark of 106 kWh/m^2/year.



» **Image 2** School of Design and Environment, Singapore

Source: SERIE Architects

Designed strategies employed by CARBSE are detailed in Figure 1.



» **Image 3** CARBSE, India

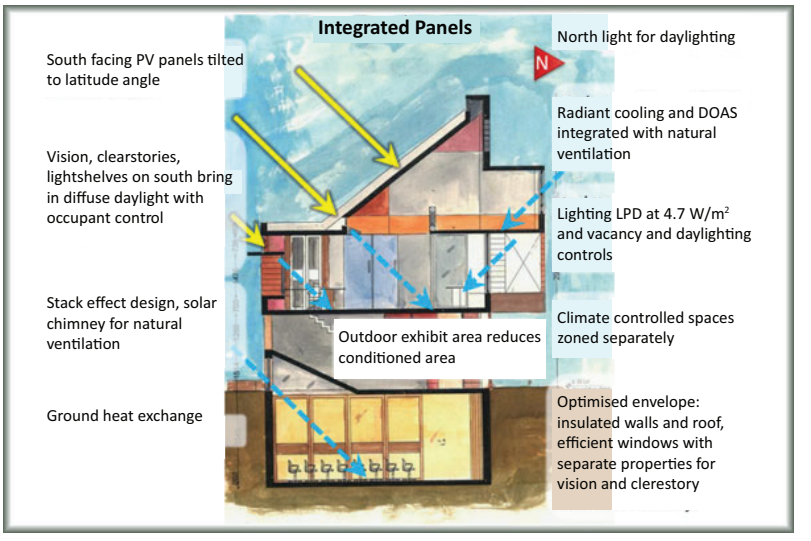
Source: NZEB India

SIERRA eFACiLiTY®: Office building in a hot-humid climate

SIERRA's eFACiLiTY® is a 2,322-m^2 software development centre in Coimbatore, India. The project leverages cutting-edge automation to manage the operational energy and carbon (Image 4).

Passive strategies: Considering the site configuration, the longer facades of the building is oriented east–west and hence have a low WWR of 40% to reduce heat gain. Thick walls, shading, solar control glazing, insulated cool roof, skylights are the passive strategies integrated in the design.

Active strategies: Cooling is provided by high efficiency VRF system with an air handling unit (AHU). State- of-the-art controls



» **Figure 1** CARBSE's design strategies



» **Image 4** SIERRA's eFACiLiTY®, India

Source: Details available at <https://nzeb.in/wp-content/uploads/2021/04/1-600x400.png>

and automation manage the building's energy, indoor air quality, waste, and water use among other aspects.

Renewable Energy strategy: The building integrates 60 kW bifacial rooftop solar PV systems and a 4.3–kW Building Integrated Photovoltaic (BIPV) on the southern façade. This meets 80% of energy demand and earning carbon neutrality with renewable energy certification. With an EPI of 56 kWh/m²/year, it surpasses the BEE benchmark of 106 kWh/m²/year.

It is evident from the stated facts that the performance of these projects is 55% to more than 70% lower than the BEE benchmarks for institutional and office buildings, respectively. There is a common thread between all the passive strategies incorporated in the projects even though the choice of cooling technology varies. Thus, the climate-responsive strategies create a strong foundation for energy conservation.

Snapshot of the four NZEBs

Name, type of project and area	Location, climate zone	Passive strategies	Active strategies	RE strategy	EPI (kWh/m²/year)
Unnati Office building 4,945 m²	Noida, India Composite	Square form with courtyard, shaded windows, insulated walls and roof, energy efficient double glazing, operable windows, light shelves, green roof	▪ Mixed mode operation ▪ Radiant cooling system, displacement ventilation ▪ Efficient lighting and controls	100 kW rooftop solar	60

Contd...

Snapshot of the four NZEBs

Name, type of project and area	Location, climate zone	Passive strategies	Active strategies	RE strategy	EPI (kWh/m²/year)
SDE4 Institutional building 8,514 m²	Singapore Hot-humid	Linear form with long façade facing north–south, shaded windows, double-height spaces, energy-efficient double glazing, operable windows, light shelves.	▪ Mixed mode operation ▪ Designed for an effective temperature of 27°C considering an adaptive comfort approach ▪ Hybrid cooling supplying tempered air with elevated air speeds	500 MWh/m²/year by 1200 solar panels	58
CARBSE Institutional building 498 m²	Ahmedabad Hot-dry	Linear form with long façade facing north–south, thermal mass, insulated walls and roof, spaces in basement, stack effect, shaded windows, energy efficient double glazing, operable windows, light shelves.	▪ Mixed mode operation ▪ Radiant cooling with a dedicated outdoor air system ▪ Extensive monitoring and controls	27 kW rooftop solar panels	58
SIERRA's eFACiLiTY® Office building 2,322 m²	Coimbatore Hot-humid	Linear form with long façade facing east–west, thermal mass, 40% WWR, shaded windows, skylights, energy-efficient double glazing	▪ Energy efficient VRF with AHU for ventilation. ▪ Automation, extensive controls and monitoring.	60 kW rooftop solar panels and 4.3 kW BIPV on south facade	56

The recipe for designing an NZEB starts with integrating passive design strategies for climate responsiveness. The next step involves designing energy-efficient cooling and lighting strategies to effectively meet energy demands. Utilizing low-energy cooling systems or a hybrid mode further enhances energy efficiency. These two steps are the key. Finally, offsetting through renewable energy sources completes the recipe.

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"The future belongs to those who understand that doing more with less is compassionate, prosperous, and enduring, and thus more intelligent, even competitive." - **Paul Hawken**, environmentalist, entrepreneur, author.

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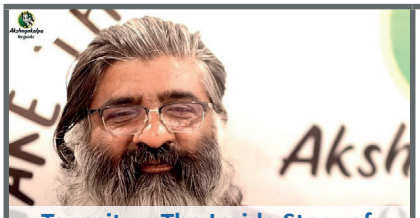

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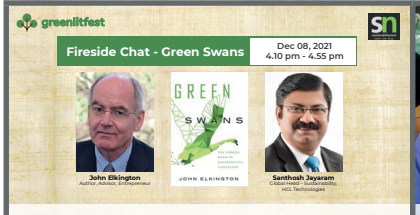

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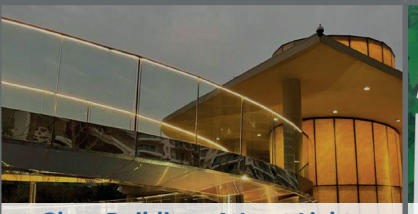

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A premier consultancy and engineering services provider in the coal sector, the CMPDI is a subsidiary of Coal India Limited (CIL), which is the world's largest coal mining company. CMPDI was established in 1975 to provide consultancy and engineering services in the coal sector. It is a Mini Ratna (Category I) company and is ISO 9001:2015 certified.

CMPDI has a team of over 3,200 highly skilled and experienced professionals, including engineers, geologists, scientists, and other technical experts. It has a nationwide network of offices and laboratories, which enables it to provide its services to CIL and other clients in all coalfields of India and abroad.

CMPDI offers a wide range of services in the coal sector, including:

- Exploration & Resource Evaluation
- Mine planning and design
- Infrastructure Engineering & Design
- Geomatics Services
- Environmental Services
- Blasting Services
- Laboratory & ICT Services
- Project Management Consultancy



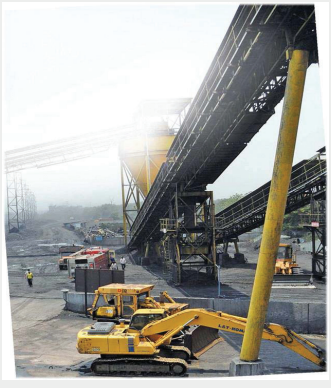
CMPDI has played a significant role in the development of the coal sector in India. It has prepared over 1000 mining project reports for CIL and other clients. It has also provided consultancy and engineering services for the construction and operation of over 500 coal mines in India and abroad.

In addition to its work in the coal sector, CMPDI is also involved in other mining projects, such as iron ore, bauxite, and limestone mining.

CMPDI is committed to providing its clients with high-quality and timely services. It is also committed to innovation and sustainable development. CMPDI is constantly working on developing new technologies and solutions to improve the efficiency, safety, and environmental performance of the mining industry.

CMPDI's Global Presence

CMPDI has a global presence and has provided consultancy and engineering services to clients in over 20 countries, including Australia,Bangladesh, Indonesia, Iran, Kazakhstan, Mongolia, Mozambique, Nigeria, Qatar, South Africa, Sri Lanka, Tanzania, Thailand, and Vietnam. CMPDI's global presence is a testament to its expertise and reputation in the mining industry. It is also a reflection of India's growing role in the global mining sector.



CMPDI's Commitment to Sustainable Development

CMPDI's commitment to sustainable development is in line with the Government of India's focus on sustainable development. The Government of India has set ambitious targets for reducing greenhouse gas emissions and increasing the share of renewable energy in the country's energy mix. CMPDI is playing a key role in helping the Indian coal industry to achieve these targets.



CMPDI is working on developing smart colonies for coal miners in India. Smart colonies are designed to improve the quality of life for residents by providing them with access to a wide range of services and amenities, including:

- Uninterrupted power supply
- Clean and safe drinking water
- Efficient waste management
- Affordable housing
- Educational and health care facilities
- Recreational facilities
- Smart security systems

CMPDI has already developed several smart colonies for coal miners in different parts of India. These colonies are equipped with a variety of smart technologies, such as:

- Smart grids for managing the power supply
- Smart water management systems for ensuring the supply of clean and safe drinking water
- Smart waste management systems for efficient waste collection and disposal
- Smart transportation systems for providing reliable and affordable public transportation



CMPDI Smart Colonies

CMPDI is also working on developing new smart technologies for smart colonies. CMPDI is developing a smart irrigation system for reducing water consumption in smart colonies. CMPDI is also developing a smart energy management system for CMPDI's work on developing smart colonies for coal miners is a significant contribution to the development of the coal sector in India. We have been successfully able to reduce energy consumption in smart colonies. Some examples of smart colonies developed by CMPDI:

- Smart Green Colony, Nagpur: This colony is equipped with a variety of smart technologies, such as solar panels, rainwater harvesting systems, and smart waste management systems.
- Smart Colony, Bilaspur: This colony is equipped with a smart grid, smart water management system, and smart rainwater and waste management system.
- Smart Colony, Ranchi: This colony is equipped with a smart security system and smart energy management system.

CMPDI is committed to developing more smart colonies for coal miners in India. Smart colonies will play a key role in improving the quality of life for coal miners and their families, and in making the coal sector more sustainable.



Urban Flooding is a Warning Sign

Urban flooding has become an increasingly frequent event. The phenomenon arises when land and structures within the urban areas become inundated, especially in densely populated cities where rainfall surpasses the drainage systems' capabilities. This can be categorized as a human-caused calamity. It doesn't solely result from intense precipitation but also from unregulated urbanization. Article by **Moumita Ghosh** underscores that the central strategy for addressing urban flooding should be developed around the implementation of sustainable stormwater management techniques.

The global rise in urban flooding is a pervasive occurrence that presents a substantial obstacle for urban planners across the world. The impacts of such a disaster are extremely complex to the developing countries such as India, in comparison to the developed counterparts. In India, the economic loss caused by floods has totalled INR 4.6 lakh crore over the last six decades (iECD 2022).

In the current year (2023), Delhi faced a critical situation during monsoon season including Himachal Pradesh, Uttarakhand, Punjab, Haryana, and Uttar Pradesh. The Yamuna's water level had crossed the danger limit, inundated neighbouring streets and public and private facilities, and created enormous sufferings to individuals living near the river. On July 13, the Yamuna reached 208.66 metres, smashing a 45-year-old record (The Times of India 2023).

This is not news about Delhi; any of the cities in India suffers a similar situation every year. For example, 2005 in Mumbai, 2007 in Kolkata, 2012 in Assam, 2015 in Chennai, 2020 in Hyderabad and 2022 in Bengaluru, and so on (NDMA).

Urban flooding has become increasingly frequent in India. This phenomenon arises when land and structures within the urban areas become inundated, especially in densely populated cities where rainfall surpasses the drainage systems' capabilities. This can



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» **Image 1** Areas near Yamuna River became flooded as the its water level exceeded the danger mark

be categorized as a human-caused calamity. It doesn't solely result from intense precipitation but also from unregulated urbanization.

The reasons behind this urban flooding are as follows:

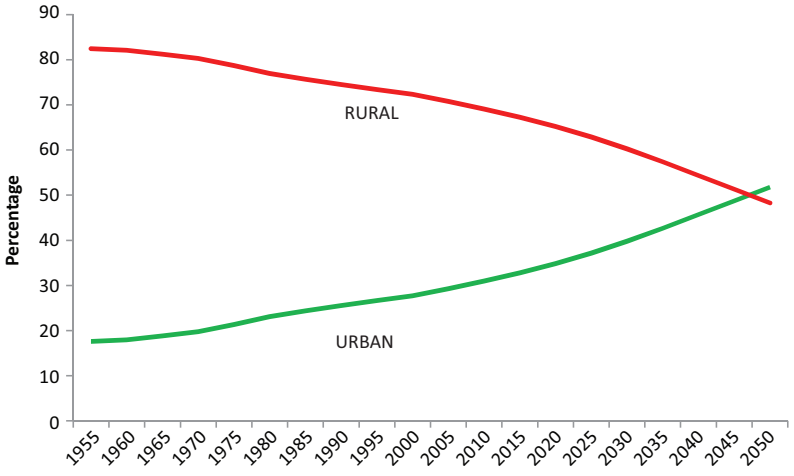
- **Rapid urbanization:** According to Rao Inderjit Singh, Minister of State for Urban Development, "by 2050, 60% population of the country will live in cities as India's rate of urbanization is dramatic" (Mint 2016).

Rapid population growth leads to urbanization, surface sealing, and loss of waterbodies. That is, concrete and paved roads minimize water seepage into the ground, which increases stormwater runoff.

- **Urban heat island (UHI) effect:** Urbanization creates heat islands, which warm surrounding area and causes precipitation.
- **Improper garbage disposal:** The inappropriate disposal of garbage and the dumping of construction waste materials into drains disrupt the smooth flow of water through drains, resulting in urban floods.
- **Inadequate stormwater drainage system:** A poor stormwater drainage system prevents excess water from flowing into the city from buildings' roofs and hard surfaces.
- **Encroachment:** Increasing encroachment on natural drains and river floodplain.
    - Unexpected upstream water release
    - On-road vehicle parking
- **Other factors:** The factors related to political, social, and economic viewpoints also have an impact on the policies that complicate the causes.

Impacts of Urban Flooding in India

- **Loss of life and property:** Urban floods frequently result in loss of life, either directly or indirectly through the spread of waterborne diseases. It causes harm to structures, buildings, property, and crops while also disturbing essential infrastructure elements such as water supply, sewage



» **Figure 1** Changes in India's urban and rural population share (1955–2050)

Source: Reconstructed graph of data from United Nations, Department of Economic and Social Affairs (DESA), Population Division (2012): World Urbanization Prospects: The 2011 Revision (accessed on 7 July 2014)

systems, electricity lines, communication networks, road traffic, goods transportation, and railways.

- **Increase in waterborne diseases:** Stagnant stormwater, polluted drinking water, solid waste, and sewage create an environment conducive to health problems like epidemics and plagues.
- **Livestock displacement:** Animals are also affected by infections and a lack of shelter as a result of flooding.
- **Disruption in metro transportation:** Urban flooding has an impact on metro transportation.
- **Trauma after a disaster:** The psychological impact of losing lives and property is huge and the recovery process is difficult and time consuming, leading to long-term trauma in people.

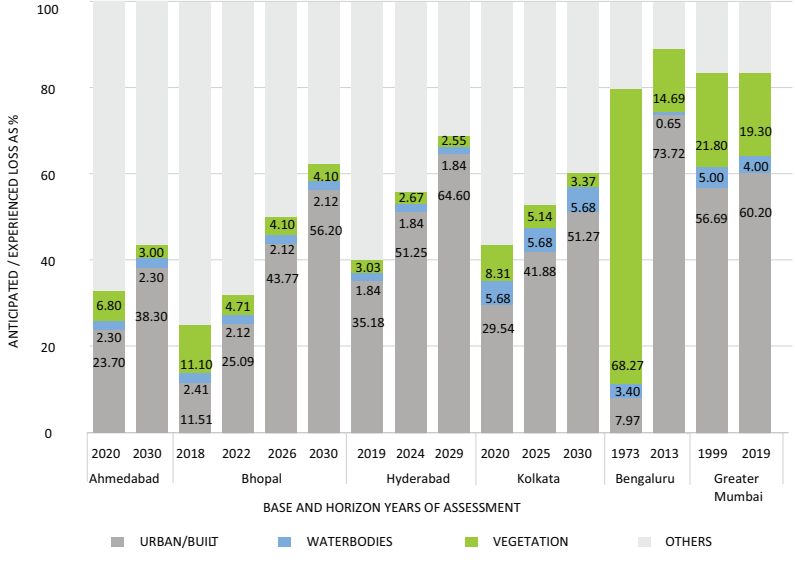
Nature-based solutions (NbS) are measures that are sustainable, environment friendly, and restore natural ecosystems to cope with any environmental challenges. The three main advantages of NbS are:

- resource efficiency,
- sustainable and integrative approach, and
- long-term cost-efficiency.

The following NbS can significantly help in controlling urban flooding:

- Adopting blue–green infrastructure (BGI): BGI is a fusion of two distinct forms of infrastructure where 'blue' represents waterbodies (that is, rivers and tanks) and 'green' indicates tree, garden, and parks. Adopting BGI as a forward-thinking approach can result in a greener future by increasing biodiversity, promoting quality of life and mitigating the effects of climate change.

As an example, Delhi stands out as one of India's pioneer cities to incorporate a blue–green policy emphasis within its 2041 masterplan, encompassing an area of 1,483 square kilometres. Other Indian cities such as Bengaluru, Bhopal, Mumbai, and Madurai have been adopted blue–green policy recently (ORF 2021).



» **Figure 2** Reduction of blue–green spaces and increase in built-up areas in major cities across India



» **Image 2** Bioswales

- **Downspout disconnection:** During heavy rain, disconnect the downspout so that water from the roof drips into the ground through a pebble filter. It can be used to hold stormwater or to let stormwater seep into the ground naturally, returningto the groundwater table. It helps in keeping excess water out of sanitary sewers.
- **Installation of permeable pavements:** Permeable pavement is a technique that collects water where it falls. They can be constructed using permeable interlocking pavers, porous asphalt, or permeable concrete. This measure is very helpful for the areas of on-road vehicle parking.
- **Bioswales:** Bioswales are an essential component of sustainable development and reducing stormwater runoff. They are basically rain gardens that are installed in long, narrow places like the space between the sidewalk and the curb. Vegetation is important in bio-swales because it increases the amount of water that can be infiltrated into the soil. Additionally, vegetation slows the spread of runoff, giving sediments more time to settle and reducing pollution load. (Image 2)

The American Society of Landscape Architects (ASLA) estimates that a 4-metre bioswale can decrease rainfall runoff by about 25%.

- **Green roof:** A study done by University of Toronto's civil engineer, Jenny Hill and co-researchers at the school's Green Roof Innovation Testing Lab (GRIT Lab) showed that green roofs possess the capacity to absorb around 70% of rainfall within a designated timeframe, thus mitigating pressure on subterranean stormwater systems and subsequently releasing the rainwater into the atmosphere. The study evaluated four green roof design variables that are commonly used in the industry: planting type (succulents, grasses, and herbaceous floral plants), soil substitute (mineral, wood compost), planting depth (10 cm or 15 cm), and

watering schedule (none, daily, or sensor-activated), as well as how these four variables influenced water capture (The Conversation 2017).

Rainwater harvesting and rain garden should also be implemented in all infrastructure builds to improve water management.

Global Actions to Urban Flooding

Many of the countries have started to address the necessity of NbS to control the urban flooding across globe. Given below are some of the approaches and initiatives employed for realizing water conservation in several countries around the world (Portland DownToEarth 2020):

- The Sponge Cities Mission in China is aimed to make cities more permeable so that rainwater can be collected and used.
- Cloudbursts management plan in Copenhagen, Denmark addresses adaptive techniques to store or drain excess rainwater to the ground level by restoring streams, building new canals, additional green spaces and employing roads with high kerbstones.
- Water Sensitive Urban Design (WSUD) is used in Australia.
- In the United Kingdom, Sustainable Urban Drainage Systems (SUDS) have been implemented.
- Implementation of Grey to Green Initiative in Portland, US.

The primary objective of this study article is to analyse the components contributing to urban flooding in India, attributed to the rise of urbanization and human activities. Despite the evident influence of climate change in exacerbating these incidents, its roots can be traced back to the indirect consequences of human-induced environmental degradation. The central strategy for addressing urban flooding should revolve around the implementation of sustainable stormwater management techniques. Effectively reducing the impacts of flooding in urban regions necessitates a fundamental shift in urban planning approaches.

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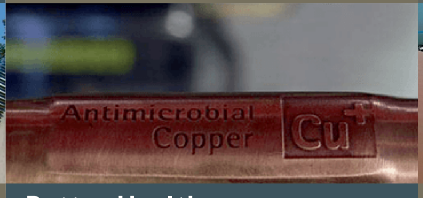

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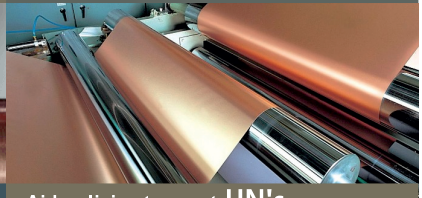

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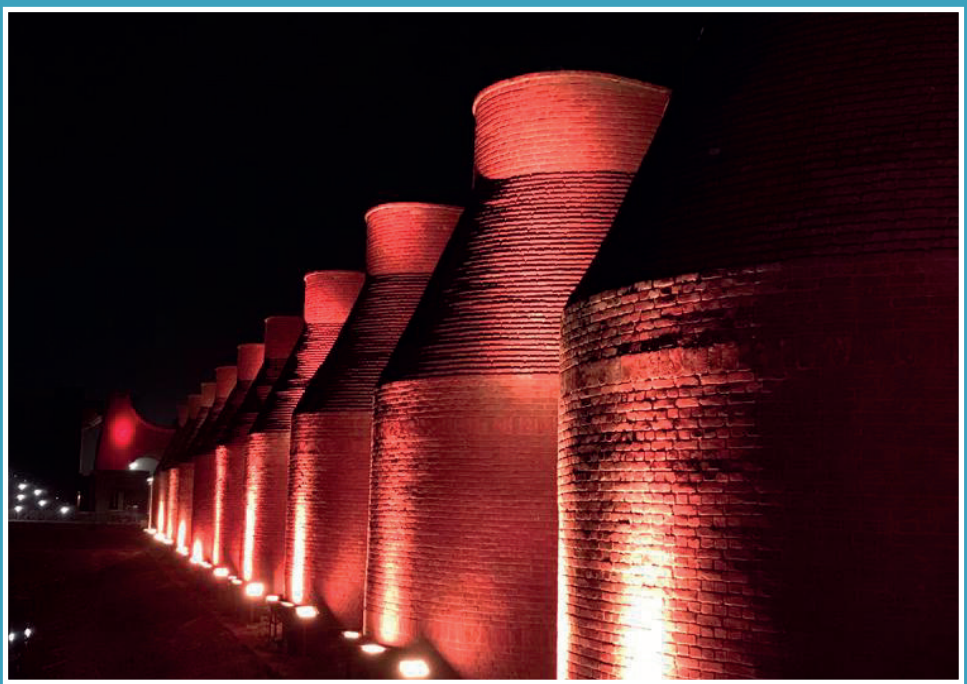



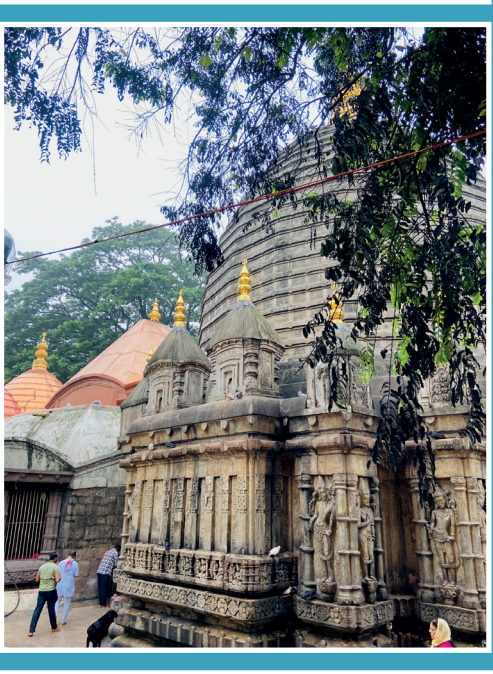























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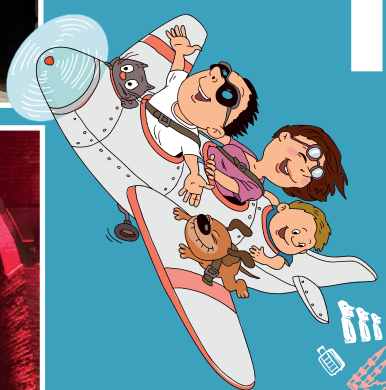

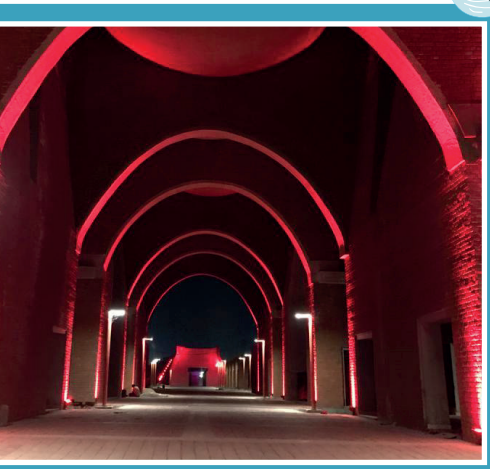



Energy Efficiency for Resilient Urban Habitats

Article by **Dr Nagaraju Kaja** is woven around the topic of resilient habitats, especially, in urban settings as it is the sector that has registered an unprecedented growth in the 21st century. This growth is accompanied by the extensive consumption of resources and energy. Consequently, this puts immense pressure on the earth's natural but depleting resources. In this regard, energy-efficient infrastructure is our only hope towards responsible urban planning.



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Understanding Energy Efficiency and Urban Resilience

Energy efficiency in buildings is the practice of performing the operations by using less energy than what is consumed traditionally. It should be considered during every stage of its life cycle—from design stage to selection of construction materials and during its operation phase. Efficient energy usage is one of the most affordable ways to reduce the negative effects on the Mother Earth. It can also lessen household expenses and carbon dioxide emissions (Hamakareem 2022). Resilience is a multifaceted concept that spans various research domains, including policy, ecology, engineering, and planning. Resilience refers to the ability of a system to absorb disturbances and adapt to changes, allowing for recovery and potentially leading to a new acceptable configuration (Walker, *et al*. 2004). In the context of cities, urban resilience involves withstanding a range of shocks and stresses, preparing for climate change effects, and adopting strategies for mitigation and adaptation. There are three approaches for building resilient habitats. The first approach views urban resilience as a system, emphasizing the city's ability to absorb disturbances. The second approach focuses on risk reduction, improving the carrying capacity of cities and infrastructure systems to recover from natural and man-made disasters. The third approach recognizes that institutional arrangements influence urban resilience and emphasizes the development of institutional mechanisms which can promote adaptation to climate change (Leichenko 2011).

Urbanization and Energy Demand

Urbanization is one of the main drivers in increasing energy demand. Owing to the improvement in economic



activities and changes in lifestyles and working conditions of human beings, a significant increase in energy consumption in urban centres has occurred (Pachauri 2012). Urbanization without much improvement in technology will lead to increase in the energy demand by two to three times by 2050 in the building and transport sectors. At the same time, as the demand for materials increases due to urbanization, the net energy consumption will increase simultaneously. According to the United Nations, the world's urban population is projected to increase from 55% in 2018 to 68% by 2050 (United Nations 2019). This rapid urbanization leads to the expansion of urban areas, increased population density, and subsequent growth in energy requirements. As urban areas grow, there is an increased need for infrastructure development, including transportation systems, buildings, and utilities, which contributes to higher energy consumption (Güneralp, *et al*. 2017). Urbanization also leads to changes in lifestyles and consumption patterns, resulting in increased energy usage.

Linking Energy Efficiency and Urban Resilience

This, in turn, enhances the resilience of cities to the impacts of climate change (Zhang, *et al.* 2019). Energy-efficient buildings are more resilient to extreme weather events and disruptions in energy supply. Studies have shown that buildings with effective insulation, lighting and good heating, ventilation, and air-conditioning (HVAC) systems maintain comfortable indoor conditions during power outages or heating/cooling system failures (Fabi, Andersen, and Corgnati 2020). Energy-efficient urban planning and design strategies, such as compact and mixed-use development, green building practices, and efficient land-use patterns, contribute to urban resilience. These strategies promote energy-efficient transportation options, reduce energy consumption, and enhance the overall sustainability of cities (Dastur, Pottinger, and Zhu 2017). The integration of renewable energy sources into urban energy systems enhances both energy efficiency and resilience.

Benefits of Energy Efficiency for Urban Resilience

The Intergovernmental Panel on Climate Change (IPCC) highlights energy efficiency as one of the most effective strategies for reducing GHG emissions in urban areas (IPCC 2015). Energy-efficient urban planning and design strategies, such as compact and mixed-use development, green building practices, and efficient land-use patterns, contribute to urban resilience. Energy efficiency reduces energy consumption and dependence on fossil fuels, leading to lower GHG emissions. Energy-efficient transportation systems, including promoting public transit, cycling infrastructure, and electric vehicles, reduce energy consumption and air pollution. Renewable technologies like wind turbines, solar panels can provide decentralized and reliable sources of energy, reducing the vulnerability of cities from energy supply disruptions



and price fluctuations (Su, Chen, and Yang 2018). Energy efficiency measures in water and wastewater systems also contribute to urban resilience. Energy conserving measures like energy-efficient appliances, building insulation, and efficient transportation systems could reduce energy consumption in urban areas significantly.

This reduction in energy demand helps alleviate the strain on energy infrastructure, reduces the need for additional energy generation, and decreases the environmental impact associated with energy production (Sorrell 2007). These measures contribute to climate change mitigation by lowering GHG emissions from the transport sector.

Barriers to Implement Energy Efficiency Measures

One of the key challenges in energy efficiency implementation is the retrofitting of existing buildings. Many buildings, particularly older ones, were constructed without energy-efficient features and technologies. Retrofitting of these buildings to improve energy performance requires careful planning, coordination, and investment (Aboulnaga and Moustafa 2016). This can be challenging due to the need for significant investments, coordination among different stakeholders, and potential disruptions during the upgrading process (Kim, *et al.* 2021). Energy efficiency implementation often involves the integration of renewable energy sources into urban infrastructure systems. This requires addressing technical challenges related to grid integration, intermittency, energy storage, and the optimization of energy flows between different sources and loads (Sims, *et al.* 2011). One of the primary constraints in energy efficiency implementation is the high upfront costs associated with adopting energy-efficient technologies and practices. The initial investments required for energy-efficient equipment, materials, and systems can pose financial barriers, especially for small businesses and low-income households (Sorrell 2015).

Achieving energy efficiency and urban resilience requires a comprehensive approach that involves various stakeholders, including policymakers, city planners, businesses, and communities. Integrated urban



planning: Adopt an integrated approach to urban planning that considers energy efficiency and resilience as core components.

This involves the incorporation of energy-efficient design strategies like compact and mixed land use, efficient transportation systems, and green infrastructure into urban development plans. Implement and enforce stringent building codes and standards that prioritize energy efficiency in new construction and renovations. Deploying smart grid technologies and energy management systems can enable efficient monitoring, control, and optimization of energy use in buildings and across the urban infrastructure. Governments can provide financial incentives, such as grants, rebates, and tax credits, to promote energy efficiency investments. Governments can establish building codes and regulations that require minimum energy efficiency standards for new construction and major renovations. Fostering community engagement and awareness about the benefits of energy efficiency and resilience can be done through educational campaigns, workshops, and incentives that empower individuals and communities to adopt energy-efficient behaviours and technologies. By implementing these strategies, cities can enhance energy efficiency, improve urban resilience, and contribute to sustainable and low-carbon urban development.

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Outlook on Hemp— A No-waste Miracle Plant



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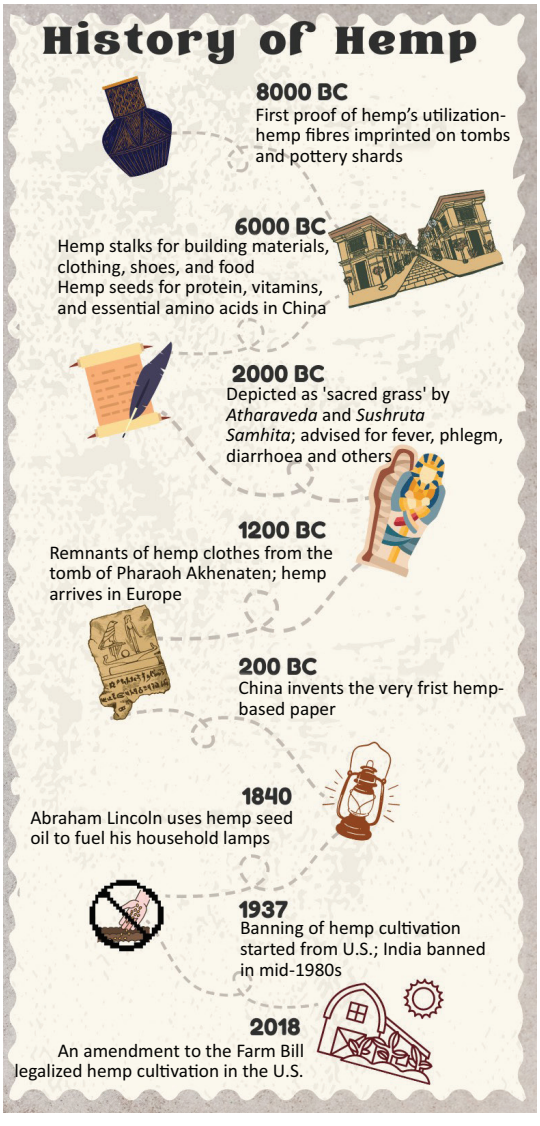
Human-induced climate change has become a major concern for the world community. If not addressed suitably, it will yield catastrophic results. At the same time, it will pose a threat to human health, food security, living, and environment. The world is looking for environmentally benign remedial solutions. In this worthy attempt, hemp has received a lot of attention because of its multi-purpose usability and carbon-negative transformation. The article by **Mehak Kaur** and **Dr Mayurika Goel** enlightens us on the significance of hemp as a very promising renewable resource.

In recent decades, the repercussions of unsustainable practices have become apparent via acceleration of climate change, worsening of working conditions, the ever-widening economic gap, and a multitude of agricultural vulnerabilities. To address these multifaceted issues, adopting sustainable agriculture and industrial practices offers a potential path forward. Hemp is one of the commonly grown innovative crops with the potential to revolutionize modern-day markets by balancing cultural, environmental, and economic factors.

Hemp (industrial hemp) is a variety of *Cannabis sativa L.* identified from the lesser amounts (~0.2%) of psychoactive compounds such as THC (Δ^9-tetrahydrocannabinol) as compared to the medicinal hemp *(Cannabis)*. Because they share the same botanical name, hemp and marijuana/*Cannabis* can give rise to confusion, however, they are entirely different species. The first proof of hemp's utilization is dated back to 8000 BC (Stone Age), with hemp fibres imprinted on tombs and pottery shards and since then, it has been historically utilized in several commodities (Figure 1). Industrial hemp has applications in agricultural bioremediation and exhibits significant potential for utilization in various sectors (Ahmad, Faiz, Islam, *et al.* 2022). These include its use in construction industry, production of paper, medicinal products, textiles, biofuels, cosmetics, polymer matrix composites, fibres, and food and beverages (Grégorio, Lichtfouse, Chanet, *et al.* 2020). The hemp industry in India is just beginning to flourish, despite the fact that its versatile applications have been recognized in Indian rural communities for centuries. The rural Himalayan villages have witnessed a rise in both the number of skilled women artisans and the production of exquisite hemp handloom products.

Hemp—Master of All Trades

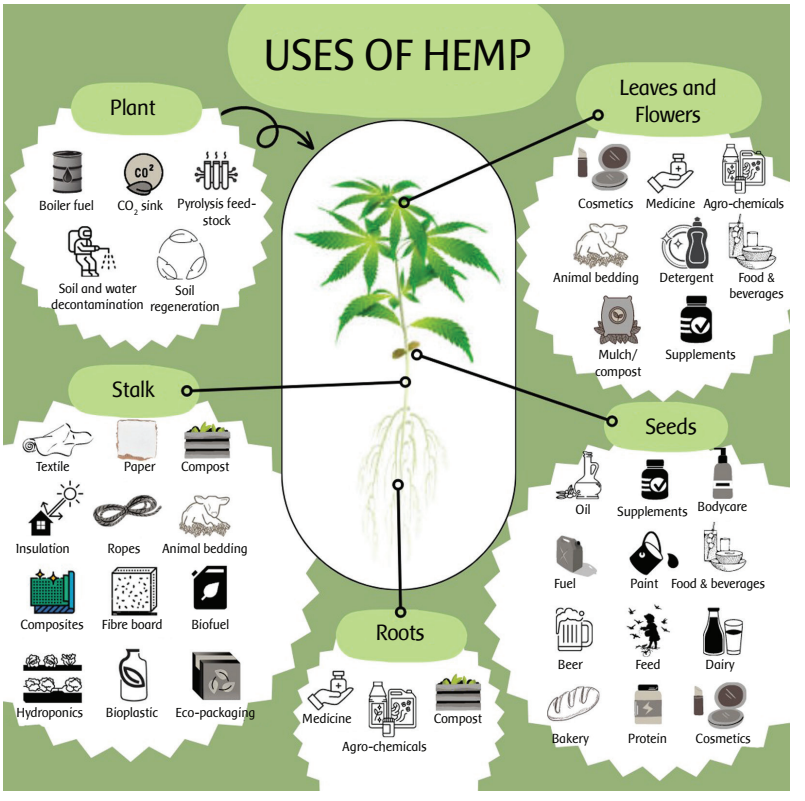
Hemp is an annual crop with high productivity and has been utilized as a fibre source to produce clothing, fabrics, paper, ropes, and construction materials. The waste by-product of fibre production, known as hurds, has been used as animal bedding. More recently, hemp has found



» **Figure 1** Hemp's extensive historical journey

applications in insulation materials for buildings, furniture, bio plastics, textile, animal feed, energy production, and fuel. Hemp seeds-based foods are globally marketed for both human and animal nutrition apart from being used as nutraceuticals. Hemp oil is further employed in cosmetics, sanitary pads, paints, printing inks, detergents, and solvents. The market for hemp encompasses an estimated 25,000 products worldwide. The exploration of fundamental and innovative applications in medicine, cosmeceuticals, phytoremediation, wastewater treatment, biofuels, bio-pesticides, and biotechnology presents several opportunities for the plant (Figure 2) (Grégorio, Lichtfouse, Chanet, *et al.* 2020).

Hemp has emerged as a prosperous commercial crop owing to its capacity for carbon sequestration and increased biomass production. The plant demands minimal resources, very little irrigation, and no pesticides. Its rapid growth and capacity of reaching up to 3 metres naturally outcompetes and suppresses the growth of weeds. Additionally, the enormous tap roots operate as treasure miners, recovering nutrients from soil along with absorbing heavy metals, reviving the soil, and preventing erosion and compaction (Kristine, Podder, Reiss, *et al.* 2022). Hemp holds potential as a viable cover crop, as it has been proven to increase the yield of wheat crop when cultivated in rotation. Furthermore, even the residues of hemp possess properties that can function as botanical insecticides/ miticides, inhibit soil nematodes, and pathogenic fungi.



» **Figure 2** Uses of hemp plant

Hemp in the Realms of Nutrition and Medicine

Hemp's therapeutic applications include usage in insomnia, chronic pain, neurological disorders, cardiovascular problems, dermatitis, arthritis, cancer, and beyond. In addition to its utilization as a medicine, hemp offers a unique nutritional profile, emphasizing it as a valuable locally derived food option. Boasting a complete protein composition, with all nine essential amino acids crucial for human health, it offers an abundance of vital omegas, with a perfect blend of omega-3 and omega-6 fatty acids (1:3 ratio). Additionally, hemp encompasses a rich assortment of vitamins, minerals and antioxidants, emphasizing its potential as a dietary resource (Burton, Andres, Cole, *et al.* 2022).

The Alliance of Hemp and Environment

With its remarkable carbon-capturing ability, hemp surpasses trees by capturing atmospheric carbon at a rate twice as efficient. Furthermore, a hemp crop yields four times more paper as compared to trees in a significantly shorter time frame. When converted into hempcrete, it emerges as an exceptional carbon-negative building material, while offering comparable strength, durability,

and fire resistance. Moreover, hemp exhibits versatility as a renewable source for biodegradable alternatives to traditional plastics, offering a sustainable solution to the growing problem of plastic waste (Grégorio, Lichtfouse, Chanet, *et al.* 2020). One of the leading hempcrete-based housing in the country is the Himalayan Hemp Ecostay which consumes zero energy because of its sustainable construction, rainwater harvesting, energy generation through solar power, hemp fibre-based textiles, papers, and other by-products (Eco Home Stay 2021). This exquisite plant thrives wildly amidst the landscapes of Himachal Pradesh, Sikkim, and Uttarakhand, as well as gracing the scenic roadsides of hilly regions such as TERI Gram.

Hemp also represents an ecologically sound alternative to cotton, one of the most environmentally harmful and water-intensive crops worldwide. Remarkably, hemp possesses the unique ability to function as a 'mop crop', actively purifying land and wastewater. A compelling example is the cultivation of industrial hemp near the abandoned Chernobyl nuclear power plant in Pripyat, Ukraine, where it has been successfully employed for over a decade to mitigate soil toxicity. The environmental repercussions of Fukushima nuclear meltdown can also be addressed with the same approach, however the Cannabis Control Law imposed by the occupying U.S. authorities in 1948 strictly regulates and requires obtaining highly restricted and challenging-to-obtain licences for hemp's cultivation in Japan (National Hemp Association 2015).

Concluding Remarks

Nevertheless, the potential benefits of hemp in rectifying environmental damage, increasing soil health, acting as nutraceuticals, food and medicine while being a sustainable raw material for biofuels, bio-plastics, fibres, paper, construction material and others, make it a compelling prospect for sustainable remediation efforts. However, the plant became controversial and started getting banned across several countries from the mid-20th century because of synthetic competition and increasing misconception. In India, after the ban in the mid-1980s, cultivation of hemp is now legalized only in Uttarakhand and Uttar Pradesh with two more states filling for legalization (Vishal 2020). Currently, over 30 countries are engaged in hemp production, with China, Europe, and Canada playing a significant role.

The bans placed upon hemp production seem even more perplexing when considering its remarkable value and adaptability. Dedicated organizations such as the Indian Industrial Hemp Association and Uttarakhand Hemp Association have been diligently striving to amplify consciousness and advocate for the legalization of hemp's industrial cultivation throughout India. Even though development may be slow, these communal efforts hold out hope for a better future for hemp farming in the country.

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आओ धरा बचाएं



शुभा प्रधान
टी.जी.टी (जीव विज्ञान)

आओ हम सब मिलकर,
कुछ और पेड़ लगाएं,
इस धरा को कुछ और सुंदर बनाएं
क्या तुम्हें,
कोयल की कूक सुहाती है?
मीठे आम से लदी टहनी अपने पास बुलाती है?
पेड़ों की छाव लुभाती है?
सौंधी मिट्टी की सुगंध बचपन की याद दिलाती है?
तो आओ हम सब मिलकर कुछ और पेड़ लगाएं
इस धारा को कुछ और सुंदर बनाएं।
क्यों ना हम ,अपनी धरती मां को प्लास्टिक से मुक्त करें,
हरे भरे पेड़ों से युक्त करें,
पदार्थों का पुनर्चक्रण करें,
जल का पुनः उपयोग करें,
ऊर्जा का संरक्षण करें,
मृदा प्रदूषण और जल प्रदूषण को कम करें,
प्राकृतिक संपदा का संरक्षण करें और इस
एकमात्र जीवन युक्त ग्रह के रक्षक बने।
गर फिर नीला अंबर देखने को मन करता है,
रात की चांदनी में तारामंडल के लिए मन मचलता है,
तो आओ अपनी अंतरात्मा को जगाएं,
अपनी जिम्मेदारियों को निभाएं और इस धरा को फिर से
जीने योग्य बनाएं।



GRIHA Training Calendar 2023-24

Date	Training Name	Details	Location/ Online
12 May 2023	Awareness Programme on GRIHA Certifications	2-hour webinar on • Water Positive Certification • Energy Positive Certification • Net Zero Waste Certification • Decarbonizing Habitat Programme	Online
24-26 May 2023	Training Programme on GRIHA V.2019	3-day offline training	Delhi
12 June 2023	Awareness Session	Session on GRIHA at the Annual NASA Convention	Lovely Professional University, Jalandhar
23 June 2023	Awareness Programme on GRIHA Certifications	2-hour webinar on • Water Positive Certification • Energy Positive Certification • Net Zero Waste Certification • Decarbonizing Habitat Programme	Online
12-14 July 2023	Training Programme on GRIHA V.2019	3-day offline training	Bengaluru
21 July 2023	Awareness Webinar	Awareness webinar for Institute of Engineers (India) members	Online
8 August 2023	Training Programme on GRIHA V.2019	1-day Online Training Programme on GRIHA V.2019 for Indian Oil Corporation Ltd (IOCL)	Online
21 August 2023	Training Programme on GRIHA for Existing Buildings (GRIHA EB)	1-day Online Training Programme on GRIHA EB	New Delhi
2 September - 23 October 2023 (for 8 weeks, every Saturday)	Corporate Sustainability Training Programme	8-day training programme (1 day / week every Saturday) for corporates to raise awareness on the crucial role of ESG in creating measurable impact by mitigating environmental risks, stimulating organization's growth, and promoting sustainable advancement.	Online

Date	Training Name	Details	Location/ Online
22 September 2023	Training Programme on GRIHA for Large Developments (GRIHA LD)	1-day Online Training Programme on GRIHA LD	Online
6 October 2023	Awareness Programme on GRIHA Certifications	2-hour webinar on • Water Positive Certification • Energy Positive Certification • Net Zero Waste Certification • Decarbonizing Habitat Programme	Online
27 October 2023	Re-defining thermal comfort – The way forward	Technical Workshop - Prelude to GRIHA Summit	Delhi
6-8 December 2023	Training Programme on GRIHA V.2019	3-day offline training	Mumbai
TBA	Training Programme on GRIHA for Existing Buildings (GRIHA EB)	1-day Online Training Programme on GRIHA EB	Online
TBA	Training Programme on GRIHA V.2019	3-day offline training	New Delhi
19 January 2024	Training Programme on Simple Versatile Affordable (SVAGRIHA)	1-day Online Training Programme on Simple Versatile Affordable GRIHA (SVAGRIHA)	Online
21-23 February 2024	Training Programme on GRIHA V.2019	3-day offline training	Guwahati
15 March 2024	Awareness Programme on GRIHA Certifications	2-hour webinar on • Water Positive Certification • Energy Positive Certification • Net Zero Waste Certification • Decarbonizing Habitat Programme	Online

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Circular Bio-economy and Sustainable Development of the Communities

The fossil fuels are limited resources and non-renewable, will eventually run out due to fast rate of consumption. Article by **Dr Sachin Kumar** and **Gaganpreet Kaur** talks about the environmentally benign alternate energy sources. Ironically, their present contribution to mitigate the energy demand is extremely less in comparison to their potential. As an alternative to solar, wind, and hydro energy sources, utilization of biomass as fuels will provide the dual advantage—efficient sustainable waste management and carbon-neutral energy source.



Dr Sachin Kumar is Deputy Director in the Biochemical Conversion Division at the Sardar Swaran Singh National Institute of Bio-Energy, Kapurthala, India. He has accomplished his PhD in Chemical Engineering from Indian Institute of Technology Roorkee, India and has research experience in biochemical conversion of biomass to biofuels including bioethanol, biogas, biohydrogen, lignin valorization, etc.

Dr Sachin is the recipient of 2016 ASM-IUSSTF Indo-US Research. He could be reached via <sachin.biotech@gmail.com> and <sachin.kumar20@gov.in>.



Gaganpreet Kaur is working as Senior Research Fellow under the guidance of Dr Sachin Kumar in the Biochemical Conversion Division, SSS-NIBE, Kapurthala, Punjab. She has been carrying out research on enriching the thermophilic consortium for enhanced biogas/ biomethane production and pursuing her PhD from NIT Jalandhar.

The world is facing challenges to combat environmental contamination and energy scarcity, largely attributable to globalization, industrialization, and urbanization. There is an extensive dependence on the fossil fuels for different applications in transportation, industry, and power generation, although the fossil fuel combustion is accompanied by the release of significant amount of greenhouse gases (GHGs). Emission of GHGs significantly contributes to global warming and climatic variations. The exponentially growing population will further increase the demand for energy at the rate of >3% per year (IEA 2022). Furthermore, the fossil fuels are limited resources and non-renewable, will eventually run out due to fast rate of consumption.

The alternate energy sources such as wind, solar, bioenergy, etc. are available in plenty in addition to being environmentally benign and renewable. Ironically, their present contribution to mitigate the energy demand is extremely less in comparison to their potential. There is a need to shift the paradigm towards renewable resources. As an alternative to solar, wind, and hydro energy sources, utilization of biomass as fuels will provide the dual advantage of efficient sustainable waste management and carbon-neutral energy source. Moreover, biofuels are counted as carbon neutral as they are generated by the photosynthesis. Therefore, the biogenic fuels have the additional benefits of being environment friendly.

Among the biogenic fuels, biogas is a potentially valuable biofuel which can be generated through anaerobic digestion (AD). The AD process produces biogas and digestate by breaking down organic materials under an anaerobic environment by using microorganisms. Biogas generation from municipal waste, animal manure, agricultural leftovers, food waste, etc. has the potential to meet the rising demand for sustainable energy. The use of AD reactors also eliminates environmental concerns such as the emission of GHGs from solid waste, sanitary conditions, and contamination of groundwater that results from leachate formation. AD by-products such as digested slurry can be used to enhance the soil health, thereby reducing the need for chemical fertilizers. In comparison to the liquid biofuels, biogas produced from waste doesn't adversely affect the land utilization since no additional agricultural cultivation is required (Singh and Kalamdhad 2022). A number of economic and social benefits can be derived from utilizing waste for bioenergy and value-added products. Further, using waste locally can contribute to the development of decentralized and resilient energy systems by reducing dependence on external sources and thereby improving energy security. Creating wealth through the conversion of waste allows efficient use of materials, reduces waste disposal, minimizes environmental impact, and facilitates the transition to a more sustainable society. For Sustainable Development Goals (SDGs) to be achieved, a circular economy must be in place (Duan, *et al.* 2022).

In contrast to other bioenergy technologies, AD can be implemented at different scales. It can be used to fuel a house with just a few thousand cubic metres of biogas or to produce large centralized biogas plants with digesters that can produce several thousands to tens of thousands of cubic metres. A small-scale anaerobic digester is more commonly found in rural areas, whereas large-scale digesters are more prevalent in developed cities. Digestion units on a small-scale are usually 2–25 m^3 in size. Governments or non-profit organizations usually subsidize them in some way (Vasco-Correa, *et al.* 2018).

The production of biomethane at large-scale plants saves the fossil fuels, improves the waste-handling efficiency, provides jobs, and reduces GHG emissions. Indian Government has therefore promoted several waste-to-energy schemes aimed at installing large-capacity biogas plants. Nowadays, modern bag-type biogas plants are attracting the attention at household level due to their benefits including cost effectiveness, flexibility, and less space requirement.

In rural areas, farmers can make use of kitchen waste and animal waste for biogas production by installing bag-type biogas plants. Most of the households use liquefied petroleum gas (LPG) for cooking which is quite expensive. Also, dairy farms that are not connected to the grid for electricity utilize diesel for electricity production. Therefore, it could be an economically feasible and sustainable way for farmers to utilize the available waste for biogas production. They can reduce LPG, electricity, and fertilizer costs by replacing them with biogas and digested slurry. For information, 1.7 m^3/day biogas and 135 L/day fertilizer can be produced from the manure of 3–4 cows which can meet the requirements of a small family (2–4 persons). Additionally, community-level biogas plants could meet the electricity demand in villages by utilizing the waste generated in the village itself. Such substitutions will be not only be economically viable but also environmentally sustainable.



» **Image 1:** Bag-type biogas plant

Several government-sponsored programmes have been promoting biogas technology in India over the past three decades. Subsidies and financial support have been provided by the Government of India (GoI) through different programmes. They support rural areas for producing biogas and have launched the Sustainable Alternatives Towards Affordable Transportation (SATAT) initiative for creating compressed biogas (CBG) for the installation of 5000 plants by 2023–24. A total of 15 MMT of CBG is expected to be produced by these plants each year. There are eight training centres of Biogas Development and Training Centres (BDTCs) across India that provide field inspections, technical and learning assistance, publicity, and information related to the development and use of biogas. The New National Biogas and Organic Manure Programme (NNBOMP) could classify state nodal agencies (SNAs), State Rural Development Departments (SRDs), and KVIC as feasible biogas plant sites/beneficiaries. A Central Financial Assistant (CFA)/subsidy is also being provided by the GoI to support the establishment of capacity-based AD plants. Several biogas plant designs have been certified by the Ministry of New and Renewable Energy (MNRE) and verified in the field. Biogas plants, accessories, and appliances have also been standardized by the MNRE and the Bureau of Indian Standards (BIS). Four basic biogas plant models and 10 other designs have been approved (MNRE 2021). Sardar Swaran Singh National Institute of Bio-energy, Kapurthala, Punjab, an autonomous R&D institute of the MNRE has been working on biogas technology. The Institute has developed in-house processes for efficient utilization of different feedstocks including paddy straw and Napier grass for biogas production. The Institute also provides the consultancy and technical support on biogas-related projects.



» **Image 2:** Biogas application for cooking purposes in the kitchen

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Valuable Insights by GRIHA Council Team

Decades of experience have honed our ability to confront challenges head-on, and our collective wisdom has been a catalyst for continuous innovation, growth, and leadership.

- SANJAY SETH

Reflecting on our journey, it is the unwavering commitment to sustainability, growth, and continuous improvement that defines our enduring success.

-SHABNAM BASSI

Working at GRIHA for over a decade has been a great journey. Working together with the young and energetic team makes all mammoth tasks very easy. Learn a lot. Work a lot. Have lots of fun.

-AKASH DEEP

At GRIHA Council, I acquired a deep understanding of design principles, sustainable materials, and technologies. This has empowered me to contribute to eco-friendly building practices.

-B VIGNESH

I feel motivated and respectful working with GRIHA Council.

-REEMA KATOCH

Working at GRIHA is very enriching experience, here seniors and colleagues all are cooperative.

- RAM PRASAD BISWAS

Working at GRIHA has been an amazing learning experience. We are not only restricted from working in the office for long hours, we also get opportunities to fly to different states and cities; and experience different cultures while conducting site visits. It has helped me to gain a better exposure and further understand the adaptability of a built mass in different climate zones.

- SRISHTI GAUR

Working at GRIHA, among the experts, has given me an innovative perspective and paved a way to enhance my technical stance in the field of sustainability.

- ANMOL CHITRANSH

My experience working at GRIHA Council has been immensely enriching, contributing significantly to the expansion of my intellectual horizons, and fostering my holistic development.

-YASH NAYYAR

I thoroughly enjoy the enriching environment and the vibrant work culture at GRIHA Council which has allowed me to build strong bonds with my colleagues.

-KAMAL KISHOR

Interning at GRIHA was a rewarding experience, contributing to sustainable initiatives and learning from industry experts. It deepened my understanding of green building practices, leaving a lasting impact on my career aspirations. HAPPY TO JOIN GRIHA

-A CECILIA MARY

I am thankful to GRIHA Council for giving me a chance to work in the company. I am fortunate to work in this positive environment. Thank you, GRIHA Council, 'once again'.

-KISHORE KUMAR

Working at GRIHA Council can be summarized as travel, fun, knowledge and a great learning experience.

-RICHA SINGHAL

It is a great learning experience to work with GRIHA Council. Excellent team with wide range of skilled sets gives me another dimension to grow and learn lot many things in my life.

-MOUMITA GHOSH

The opportunity to travel to various parts of the country has allowed me to learn about diverse cultures, observe both effective and ineffective construction practices, and understand the unique challenges faced by project teams.

-ICHHITA HANDA

GRIHA's collaborative work environment taught me the immense value of interdisciplinary collaboration. By engaging with experts from diverse fields, I realized how different perspectives contribute to innovative solutions.

-PRIY RANJAN

It's been an exciting journey so far. Growth and collaboration have been the defining elements of my experience that I wish to emphasize. I am excited to responsibly contribute to the council's sustainable building practices.

-NISHIMA GOYAL

I am captivated by GRIHA's commitment to thorough research and training, an excellent learning environment for its employees.

-SAKSHI SINGHAL

Being a part of GRIHA Council, I found a supportive and inclusive company culture.

-MANSI SUYAL

GRIHA offered me a platform to demonstrate my abilities and expand my knowledge in the domain of sustainability.

-AVINASH DUTTA

I appreciate the office's commitment to employee development. The training programmes and opportunities for skill enhancement have been instrumental in my professional growth.

-YOGESH PRATAP SINGH

Healthy work environment and respect for efforts of each team member.

-BHARAT BHUSHAN

Best thing about working with the GRIHA Council is—it nurtures talent continuously, which gives confidence and motivation to work even more efficiently.

-AAKRITI SACHDEVA

It has been a wonderful work experience engaging with colleagues, clients, and industry stakeholders. Building a strong professional and personal network is invaluable for career growth and personal development. My work experience with GRIHA has been particularly beneficial in fostering problem-solving abilities and critical thinking skills.

-ARNAB SAHA

Being a member of the sustainable infrastructure sector has always been an ambition of mine, and the GRIHA Council has been my launchpad. Travel, discovery, creativity, and a variety of other activities are all part of the workday here.

-VEENA N

I deeply appreciate the collaborative and inclusive work culture of the GRIHA Council. The organization stimulates creative thinking and fosters innovative ideas. Kudos to the GRIHA Council for being incredibly courteous and supportive across all facets of our work.

-ADITI DEV



Empowering Communities for Sustainable Water Management Through Water Stewardship

Water is an invaluable resource and safeguarding it is essential for the sustenance of both present and future generations. Article by **Metali Sarker** sheds light on the application of sustainable practices of use and saving water. Text is supplemented by the success stories of efficient water management and water conservation. The author has included discussion on community-led efforts, demonstrating how recognizing the interdependence of life can foster resilience and sustainability, help inspire and guide communities towards successful water stewardship.



Metali Sarkar is presently engaged as Associate Fellow with TERI. She is a chemical engineer and has completed her PhD from Thapar Institute of Engineering and Technology. Her research expertise lies in the field of modelling and simulation of wastewater treatment processes, particularly activated sludge process. She is passionate to pursue her career in the water and wastewater sector and make positive contribution towards implementation of sustainable water management practices in India. She could communicated via <metali.sarkar@teri.res.in>

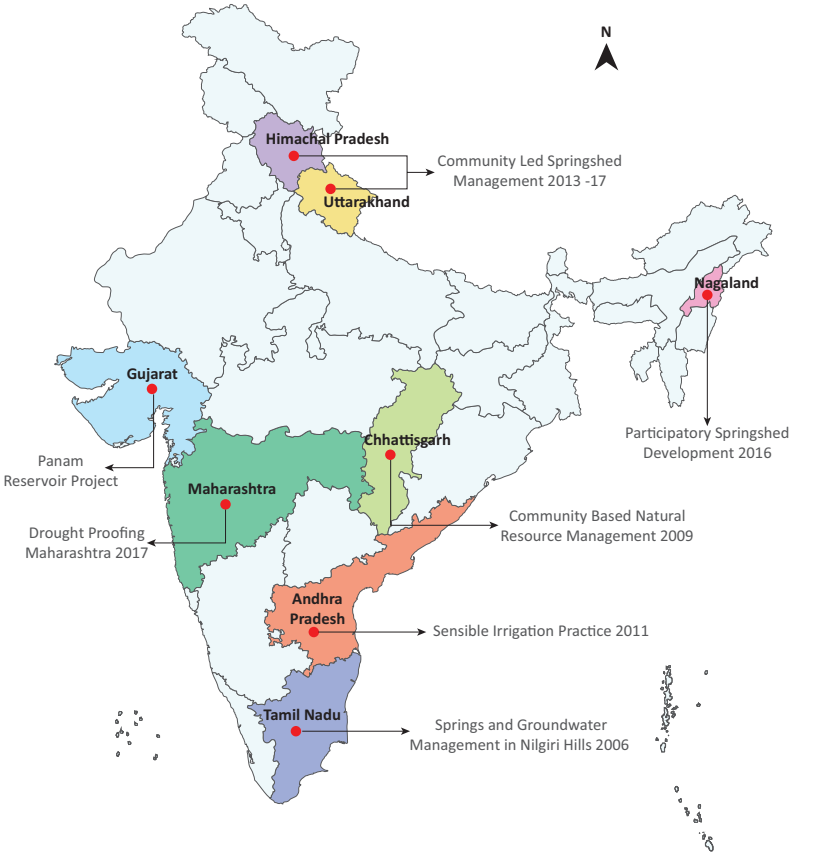
Introduction

The adverse accelerated climate change along with rapid urbanization has limited the availability of freshwater resources, making it a precious commodity that demands careful management and preservation. In India, water being a state subject, all activities regarding water management and conservation are planned, funded, executed, and maintained by the state governments with support from the Central Government. However, to develop a sustainable and resilient water

management system it is essential to empower the local communities through community sensitization, knowledge sharing, and behavioural changes. This article aims to celebrate and recognize communal groups that have achieved sustainability milestones despite the hurdles they faced and showcasing empowered communities across the globe who have set benchmarks by building a resilient and sustainable water management model and where the interdependence of all forms of life is respected and cherished.

Case Studies: India

India being an agricultural prime country, consumes more than 80% of available freshwater source in irrigation and allied activities. The lack of adequate freshwater management in the Anantpur District in Andhra Pradesh (AP) had turned the region into one of the driest in the state, highly affecting the agricultural production in the area. In 2011, the Centre for Environment Concerns (CEC) introduced a novel sub-surface moisture system named the System of Water for Agriculture Rejuvenation (SWAR) (Down to Earth 2023). This innovative system involves the storage of water in overhead tanks, which is then conveyed through a small diameter pipe to a specially designed clay pot buried near the plant's root area. The clay pot is equipped with micro-tubes that allow water to seep through a sand pouch, preventing root invasion of the pipes and pot.



» **Figure 1** Community-based sustainable water management practices in India

The gradual release of water from the clay pot ensures a prolonged supply of moisture to the plants. The amount of water released is calculated based on factors such as soil type, plant species, and their age, ensuring optimal irrigation for agricultural rejuvenation. The technology was widely accepted by AP Government and support from community not only showed enhanced soil and plant health but also improved farmers' incomes.

Despite having greatest number of dams and waterbodies in India, the state of Maharashtra was facing severe droughts due to inefficient management of water resources. The Soil and Water Conservation Department, Government of Maharashtra in 2017 rolled out Gaalmukt Dharan and Gaalyukt Shivar (GDGS) scheme, under which waterbodies were de-silted using excavating machines (India Water Portal 2020). The farmers, who were the worst affected community, came together, resulting in desilting of 5,270 waterbodies and excavation of about 32.3 million m^3 of silt. Through this community-based initiative, the water-



» **Image 1** Participatory spring-shed management in villages of Nagaland, India

Source: Details available at <https://easternmirrornagaland.com/nagaland-springshed-development-project-to-cover-100-villages/>

storage capacity of waterbodies experienced a significant increase, totalling approximately 32,300 thousand m^3. This augmentation is equivalent to the supply of around 3.2 million water tankers. As a result of this improved water management, farm productivity surged by two to four times, leading to a remarkable enhancement in agricultural incomes. Farmers experienced a notable increase in their earnings, with incomes rising by 50% to 100% as a direct consequence of the initiative's success.

Other examples include community-based spring-shed management in small villages of Uttrakhand (Tata Trusts *n.d.*) and Himachal Pradesh (World Bank. *n.d.*) that empowered the women in the community to take up leadership roles and led to better revival of springs, leading to improved groundwater recharge and access to drinking water in the Himalayan Region. Such initiatives within India have empowered communities engaged in water conservation activities, preserving the river's ecosystem, and ensuring a sustainable water supply for their villages.

Case Studies: International

The Citizen Science movement in Australia exemplifies this approach, where community members actively participate in monitoring water quality in rivers, lakes, and coastal areas. By providing communities with the necessary knowledge and tools, they become stewards of their local water resources, driving sustainable practices and fostering resilience (Vohland, Zandstra, Ceccaroni, *et al.* 2021).

Namibia, an arid and water scare country of African continent was often prone to drought. The Namibian capital city Windhoek was facing acute water crisis and realized the need for implementing advanced wastewater treatment facility that can maximize the reuse of water. They built the Goreangab Water Reclamation Plant, the first water recycling plant in the world to recycle municipal wastewater into drinking water, which is known as direct potable reuse (DPR) enabling water recycling, reuse and reducing water pollution (Fluence Corporation 2022). By showcasing such



» **Image 2** Aerial view of Goreangab Water Reclamation Plant

Source: Details available at <https://www.veolia.com/africa/en/our-solutions-namibia>

accomplishments, other communities can gain insights and inspiration to overcome their own water-related challenges.

The city of Copenhagen in Denmark offers a remarkable example of a facilitator of holistic growth through the implementation of an integrated water management approach. The city was facing intense urban densification along with severe rainfall events due to unforeseen climate changes. Along with adopting advanced technologies for better water management, the local citizens were empowered by educating them about the newer concepts. The efforts were further strengthened by involving policymakers to introduce legislations that enabled improved financing models for innovative solutions. Hence, by combining green infrastructure, such as permeable surfaces and rainwater harvesting, with advanced wastewater treatment systems in addition to public participation and awareness, Copenhagen was able to achieve sustainable water management while enhancing the city's resilience to climate change impacts (International Water Association *n.d.*).

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Sanity 2 Humanity



By Ashwini Mehra

The good life we knew, is no more
Forever worried about what's in store
Corona rampage & scale makes no sense
Virtually reduced life to mere existence !

Each day looks like a gift from God,
Making future plans, seems a bit odd
When Tomorrow itself appears distant
Be glad that Yesterday, peacefully went

Try to be happy and live for the day
Continue hoping for the best, I'd say
Science will show a way out, we trust
With altered social behaviour -a must !

To support prolific growth in population
We plundered for food, sport or subjugation
Reckless and a feared predator for all species
We fractured Nature's fine balance to pieces

Stupidly took mother Earth for granted
Uprooting all that Creation had planted
Smothering soil with concrete and asphalt
Polluting the Environment is entirely our fault

Controlling river-flows, encroaching the sea
Rapacious mining & excavating care-free
Heedlessly blanketing all with fossils' emission
Showing off Arrogance, Obstinacy & Ambition

Perhaps this Pandemic is a coded warning:
Look at the misery a tiny virus can bring!
Better mend your ways and misdeeds correct
The Garden of Eden you've got to resurrect!

Amit Kumar Sinha, MD & CEO, Mahindra Lifespace Developers Limited

In this interaction with the GRIHA Council, **Amit Kumar Sinha** shares his insights on how Mahindra Lifespace Developers Limited is making noteworthy contributions to sustainability. The organization's rise commitment reflects its dedication towards making positive changes for everyone involved, and creating thriving ecosystems through eco-friendly living spaces.

1. What are your noted accomplishments in your journey so far and how did they shape your leadership philosophy?



I would highlight two notable accomplishments. First, I was instrumental in helping my previous company setup India operations as its first employee. I moved to India from Bain & Company, Boston and bootstrapped the organization in India. Over the years, I helped create a franchise (along my colleagues) that has become quite strong vs. its global peers such McKinsey and BCG. My second accomplishment goes a few years back. I was one of the top-five students at The Wharton school, MBA class of 2002 in an 800 strong multi-country talent pool. We received Siebel scholarship that paid off our second-year tuition fees.

Both these accomplishments helped me become more confident as I pursued challenging assignments and projects globally. They shaped my understanding of true entrepreneurship, motivated me to perform and excel in ambiguity. Most critically, they helped me understand the value of teams and how to work with them, how to motivate them and how best to push each other to excellence.

2. Throughout your journey, what was the biggest challenge you had to face and how did you overcome it?



The biggest challenge I have faced is organizational inertia. We often forget that leaders need to take the organization along with them. Disparity in speed can lead huge confusion. We can make changes at leadership levels with ease but transforming a large organization is not easy. Leadership is motivated by the aspiration, the mission to excel and a desire to create a success story. However, the rest of the organization does not see the opportunity in the same way. To really create a change, we must change the mindset of people at grassroots level, one by one. This takes an inordinate amount of time, which must be accelerated if we want to see results.

I have found three mantras to address this challenge:

1. Remind everyone of the Beach, that is, the mission, the purpose, the aspiration.
2. Ensure the change happens through the spine of the organization. A single black hole can disrupt the balance. Invest in teams across the levels.
3. Be a "sponge": Unlearn many things to learn new things and build a culture that embraces this virtue.

3. What is Mahindra Group's Rise philosophy? What are the notable achievements related to its impact on the local communities?



The Rise philosophy states that what is good for the world, is good for business; what creates value also creates profit and what enriches the planet enriches the company too. This has captured succinctly in the phrase "Together We Rise".

In alignment with the Rise policy, Mahindra Lifespaces understands that we have a responsibility to address the fact that nearly 37% of all greenhouse gas emissions come from the building and construction industry. This emphasizes the need for swift action to speed up the global shift towards a net-zero future. Our Rise commitment reflects our dedication to make positive changes for everyone involved, and creating thriving ecosystems through eco-friendly living spaces. We've pledged to make all our new developments Net zero by 2030 and have already launched India's first net-zero energy residential building in Bengaluru, Mahindra Eden. We're also actively working with our partners, customers, investors, think tanks, industry peers, and global coalitions to shape a responsible future that goes beyond organizational and national boundaries.

Our commitment to sustainability extends beyond our projects. We have various initiatives aimed at promoting the overall well-being of our employees, communities, partners, and suppliers, ensuring that everyone benefits. Our "Making Sustainability Personal (MSP)" initiative showcases our dedication to sustainability. We've been early advocates of sustainable practices and encourage our team to embrace sustainability in their personal lives.

Through our #IamGreenArmy campaign, we've introduced different MSP initiatives to raise awareness and encourage sustainable practices. We've also adopted the Japanese concept of "Kaizen – continuous improvement" to keep finding new ways to integrate sustainability into our operations. We appreciate and support employees who make eco-conscious choices and initiate resource-saving projects. This comprehensive approach to sustainability and employee engagement has a positive impact on our employees and the communities they live in.

4. How does inclination towards people-centricity and ESG commitments impact the strategic growth of your company?



While we gear up for significant growth in the residential and industrial businesses, we are setting new standards of excellence and in delivering unparalleled value to our customers. Our people are the heart and soul of the organization, and we value their skills, knowledge, and dedication. By nurturing talent and fostering a positive work environment, we have achieved our organizational goals. Moreover, we will continue to make significant investments in the right talent to help us achieve our growth aspirations. We focus on the well-being and living conditions of our construction site workers, providing them with suitable facilities and dignity. Our CSR engagements focus on girl child education, women empowerment, skill development, environment and sustainability, and health and social security.

At MLDL, we strongly believe that our continued success is driven by the determination and competencies of our people. At the heart of our corporate philosophy lies an unwavering commitment to inclusivity and diversity. Our aim is to create an environment where individuals feel comfortable being their authentic selves, where their voices are valued and heard, and they are inspired to learn and evolve personally and professionally every day. A culture of continuous learning enables our employees to thrive, make meaningful contributions to our organization and the larger ecosystem, and build fulfilling careers for themselves.

In India, women make up only 25% of the construction workforce. Mahindra Lifespaces faced a talent shortage as we expanded our business. To address this, we have welcomed two all-women batches of young civil and mechanical engineers from our campus recruitment programme as Graduate Engineer Trainees (GET).

We believe in rising together with our stakeholders, empowering communities, creating sustainable habitats, and charting a course for profitable growth while leaving a lasting impact on the planet and its people.

5. Mahindra Lifespaces is gearing up for 5x growth in 5 years. Where do you see the company headed in the future, and what steps are you taking to ensure its continued growth and success?



We have had two strong years of performance, and witnessed healthy growth across all the core markets, which has given us confidence that we can do better and can pursue larger opportunities. Our aspiration now is to be 5x bigger than where we are today; growing to INR8,000 to INR10,000 crore of presales in the next five years, while focusing on customer-centricity and on profitability as we deliver this ambition. This is a significant jump from where we have been in the past, but we feel that fine-tuning the existing strategy with an eye on the future has given us confidence to aspire for more. We are also working towards augmenting our capability and portfolio.

Our unwavering commitment to customer-centricity remains paramount, upheld by innovative designs, strong customer relations, sustainability, and technology solutions. We are also leveraging the "China Plus One" theme across our IC & IC portfolio to fortify the expansion of our industrial leasing business. Lastly, we are dedicated to future-proofing Mahindra Lifespaces by adopting the right operating model, capabilities, and systems to maintain a competitive edge in the industry. These strategic pillars will collectively propel us towards a future of significant growth and continued success.

6. How do you see the current government policies related to sustainable development—a hinderance, an opportunity or both?



The adoption of the 2030 global agenda is a pivotal step forward, as countries unite in their commitment to create a world free from poverty, gender inequality, economic disparity, and to ensure a sustainable planet for future generations. These Sustainable Development Goals (SDGs) encompass a wide array of social, economic, and environmental dimensions, making them truly multi-dimensional in nature. India, in particular, has made significant strides towards achieving these goals by implementing various policies and measures centred around sustainable development, climate change mitigation, resource efficiency, and addressing issues like air pollution. The government's dedication to maintaining economic growth while aligning with the SDGs is commendable. As India progresses, the increasing demand for resources to meet various developmental needs necessitates policies that guide economic agents to maximize output from available resources. This balance is particularly crucial for developing countries like India, which must strive to make the most of their domestic resources while adhering to the imperatives of sustainable development.

The landscape for green and sustainable buildings in India is evolving positively, with several states offering incentives and additional floor area ratio for environmentally friendly construction. Maharashtra, for instance, provides FSI incentives based on the green building rating achieved, offering 3%, 5%, and 7% extra FSI for ratings of Three Star, Four Star, and Five Star or equivalent. Gujarat, Tamil Nadu, Punjab, Rajasthan, Uttar Pradesh, Himachal Pradesh, Jharkhand, Haryana, and Kerala have also introduced various FSI incentives to promote green construction, offering additional FAR or subsidies for certified projects.

7. What does the intensified international collaboration during India's G20 Presidency mean for the future of India and the Global South in achieving SDGs, and how does Mahindra Lifespaces plan to contribute to the G20 Summit's outcomes while addressing anticipated challenges?



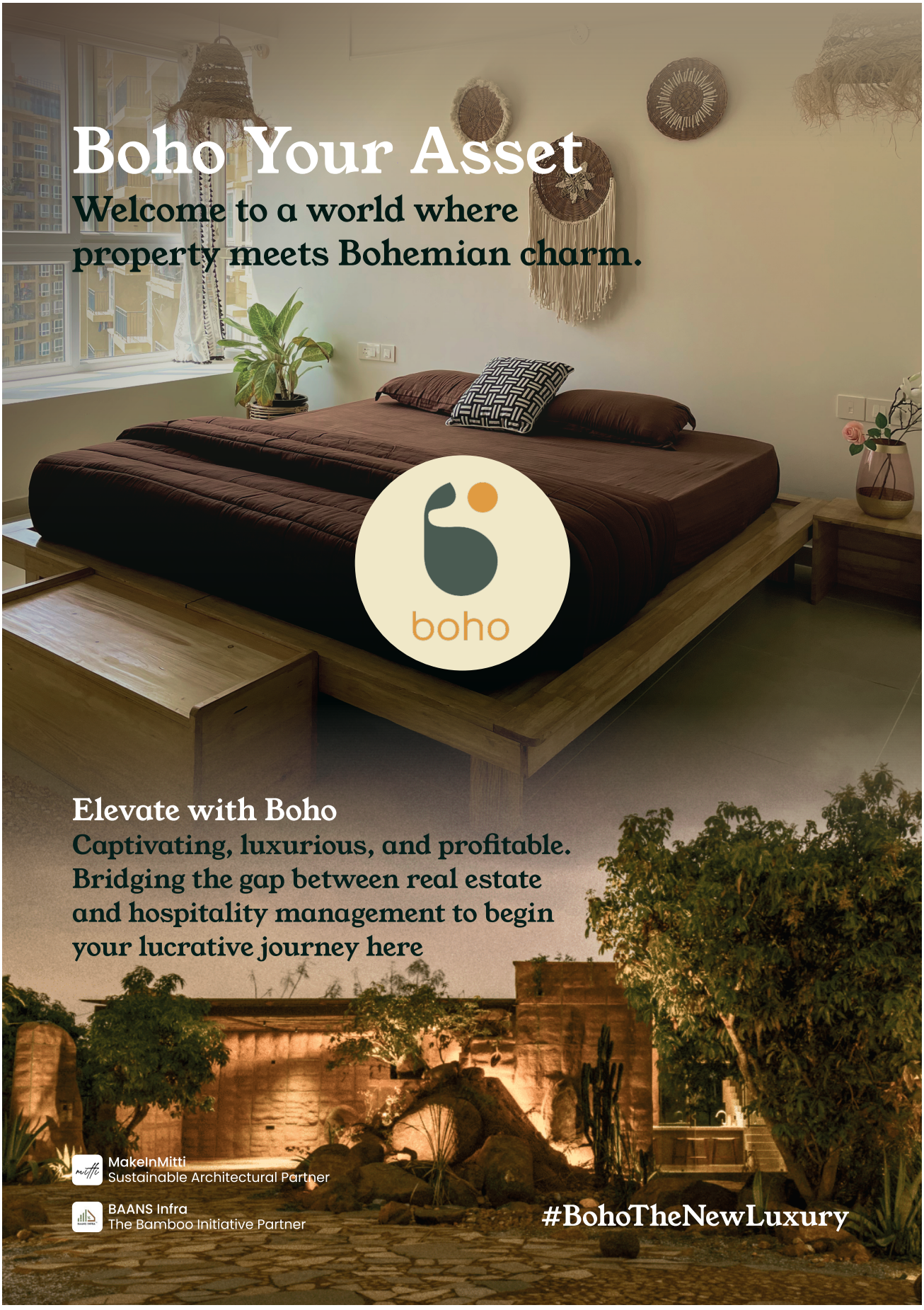
At Mahindra Lifespaces, we view the future of India and the Global South with optimism, thanks to heightened international collaborations during India's G20 Presidency. These partnerships are pivotal for advancing Sustainable Development Goals (SDGs), and several key drivers of growth that we contribute to. Our commitment to developing Net Zero buildings reflects our dedication to reducing greenhouse gas emissions and resource consumption. Our pioneering integrated cities model supports business growth and emphasizes sustainability through efficient infrastructure, governance, and resource management, offering insights for sustainable urbanization. The increased international collaborations and sustainability initiatives at the G20 are propelling India and the Global South towards a more sustainable and prosperous future, aligning seamlessly with Mahindra Lifespaces' mission of building a sustainable future.

8. What is your message to our readers considering your work experience across diverse sectors across the globe?



I have 3 simple messages for the readers:

- Strive for excellence in your chosen area of interest
- Build a winning culture around you – focus, respect and meritocracy
- Work hard, play harder!


Boho Your Asset
Welcome to a world where property meets Bohemian charm.
boho
Elevate with Boho
Captivating, luxurious, and profitable. Bridging the gap between real estate and hospitality management to begin your lucrative journey here
MakeInMitti
Sustainable Architectural Partner
BAANS Infra
The Bamboo Initiative Partner
#BohoTheNewLuxury

Conserving Freshwater Bodies for Carbon Emission Reduction: Exploring a Dynamic Approach

Changing climate can impact water availability and lead to loss of biodiversity. However, disappearing water resources too can directly contribute to climate change, mainly because waterbodies can induce carbon emission when disturbed and destroyed. Temperature changes, varying rainfall pattern, and glacial melt owing to global warming have a direct implication on hydrological processes, river systems, and other sources of water. The article by **Dr Pranab J. Patar** and **Bhaswati Das** makes us aware how conservation of waterbodies is imperative to combat climate change.



Dr Pranab J. Patar is an award-winning environment and sustainability professional with nearly 25 years of association with the non-profit sector. He is currently the Chief Executive of Delhi (India)-based environmental and social impact organization—Global Foundation for Advancement of Environment and Human Wellness. He is available at pranab.<patar@gmail.com>.



Bhaswati Das is a development specialist and management strategist with two decades of professional experience and has extensively worked with multi-lateral organizations and international non-governmental organizations. She holds a special interest in effects of climate change on differently abled people, especially speech and hearing impaired.

As per the World Bank's report, by 2050, India's average annual temperature is likely to rise by 1°C to 2°C despite taking adaptive measures in line with the recommendation of the Paris Agreement, 2015. Further, approximately 600 million people may have to live in moderate and severe climate hotspots (World Bank 2018).

While changing climate can impact water availability and lead to loss of biodiversity, disappearing water resources too can directly contribute to climate change, mainly because waterbodies can induce carbon emission when disturbed and destroyed. Temperature changes, varying rainfall pattern, and glacial melt owing to global warming have a direct implication on hydrological processes, river systems, and other sources of water. Thus, conservation of waterbodies is vital to combat climate change.

The recently released first water-bodies census report of India enumerates a total of 2,424,540 waterbodies in the country (PIB 2023, the Ministry of Jalshakti 2023). Despite having such a large number of diverse waterbodies coupled with generous rainfall, India features in the list of high-water-stressed countries (World Bank 2023), reasons are many, overexploitation and mismanagement are some of the key factors associated with this scarcity. Even the best efforts put together by the government agencies, civil society organizations as well as other stakeholders, have not been able to dispel water insecurity.



» **Image 1** Newly dug up aquaculture ponds

Like most conservation challenges, water conservation too demands innovative solutions that can offer holistic and trans-disciplinary benefits. Critical environmental issues such as climate change and the need for addressing these challenges are opening windows of opportunities through innovative technologies. The climate crisis is likely to stimulate alternative and sustainable approaches (UNECE 2009).

Transitioning into a low-carbon economy, free from fossil fuel-based mechanization and industries is never easy for a country as large as India, however, the country is already on course of its net-zero 2070 target, setting a benchmark for other economies. For long, waterbodies were perceived and utilized as the source of water but not as a carbon sink, which can have a far bigger impact in our push in carbon emission reduction. The Intergovernmental Panel on Climate Change (IPCC) in its *Fifth Assessment Report* (2013), for the first time, mentioned about highly reactive freshwater ecosystems with estimation of carbon emission and burial (IPCC 2013).

According to Gilbert and others, while freshwater ponds may store significant stocks of organic carbon and creation of ponds may be a practical way to increase carbon storage, however many a times, they don't get featured in the carbon budgeting (Gilbert, Taylor, Cooke, *et al.* 2021) (Image 1).

While Jeffries (2019) debates the ponds' organic carbon (OC) burial rate is way higher than woodland or grassland type surrounding habitats since ponds' annual organic carbon burial rate varies between 79 and 247 g/m^2. With this rate, a pond with an area of 500 m^2 can sequester up to 1000 kg of carbon annually (Stead 2022).

Taylor, Gilbert, Cooke, *et al.* (2019) too elaborates that small ponds occupy a very little land as compared to other habitats, their OC burial rates are comparable to overall annual OC burial in other landscapes including woodlands and grasslands. Skwierawski in 2022, referred to research indicating higher organic carbon sequestration in small waterbodies as opposed to earlier perceptions.

Freshwater ecosystems such as wetlands, rivers, and lakes are intimately linked to climate mitigation since aquatic environments can act as both greenhouse gas (GHG) sources and sinks, based on their environmental conditions and management practices (Anisha/ SIWI *n.d.*). While wetlands, cover only about 7% of the world's surface, in terms of carbon sequestration capacity (in a longer time-scale retrospectively as well as futuristically), they are among the most effective carbon sinks (Ramsar Convention on Wetlands 2019, Mendoza/GCF 2022) (Image 2).

Gilbert, Taylor, Cooke, *et al.* (2021) opined that the functions of a pond in aiding carbon accumulation need more detailed investigation to understand if ponds can help maximize carbon sequestration at the landscape scale. In view of the same, an urgent need is felt to systematically assess waterbodies and aquatic ecosystems of India to understand how they can contribute towards overall carbon emission reduction.

The World Bank (2022) has defined that "the Nature-based Solutions (NbS) are a set of actions aimed at protecting, sustainably managing, or restoring natural ecosystems that address complex challenges such as climate change, health, food and water security, and disaster risk reduction effectively and adaptively, simultaneously providing human well-being and biodiversity benefits" .

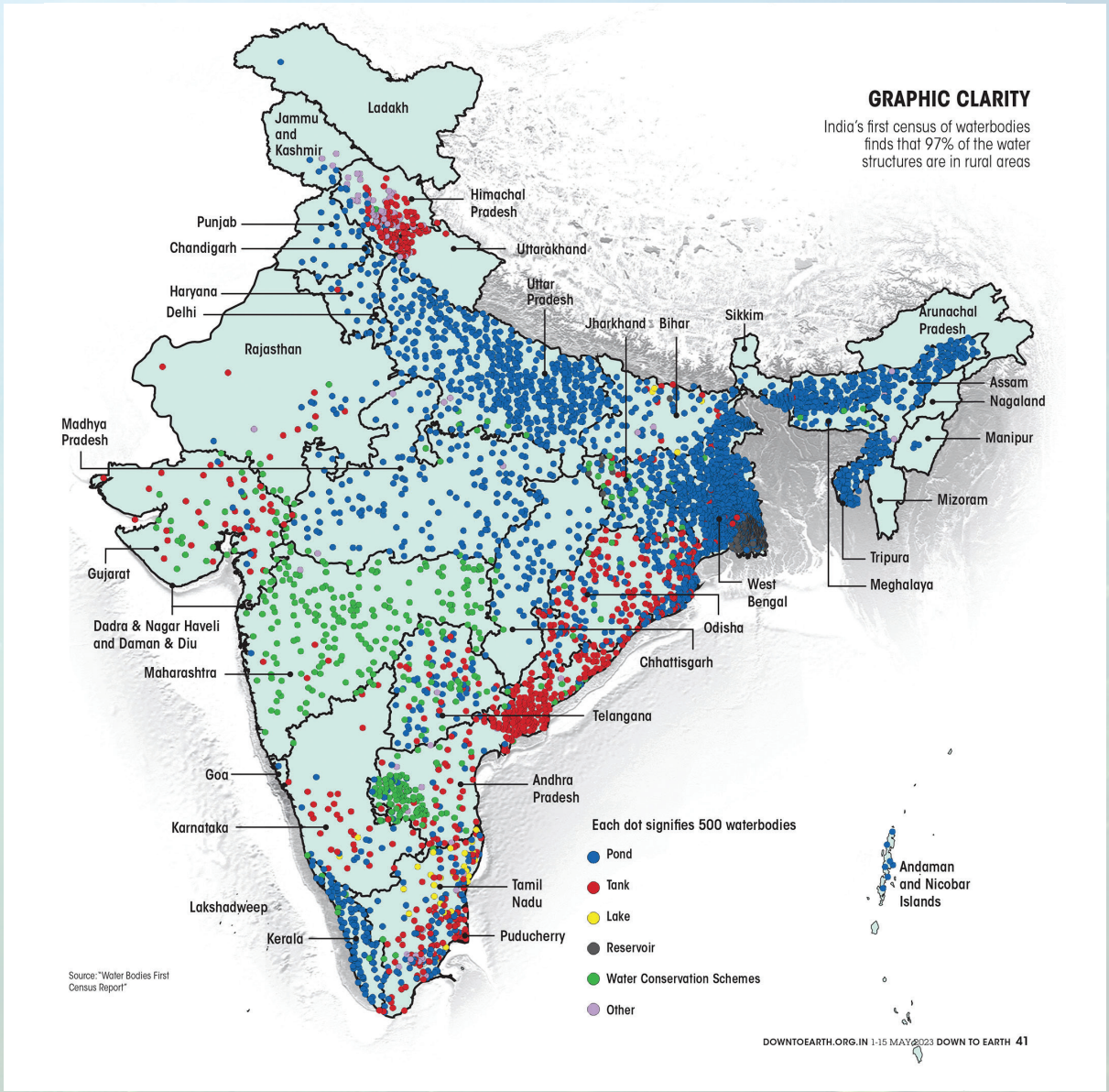
The broad features of NbS covers ponds too thus restoration and revival of waterbodies including ponds can further strengthen the on-going climate action efforts. Given the impact, NbS is capable of delivering, policies need to push for integration of NbS in urban planning, infrastructure projects and climate action. A key World Bank Group document lists a number of value NbS can secure and can be maximized further through inclusive policies. NbS can benefit the local community through access to resources, securing indigenous people's rights, generation of livelihood.

In the wake of a global climate emergency, waterbody conservation, and restoration efforts can be seen as an ideal option. Carbon projects delivered in sync with the fast-growing voluntary carbon market have the potential to fast generate revenue and livelihood accelerating Sustainable Development Goals (SDGs) especially in areas of water security and preservation of biodiversity (SDG 6, 13, 14, and 15).

As per Céréghino, Boix, Cauchie, *et al.* (2014) the pond is a commonly occurring geographic feature that accounts for about 30% of standing water available globally (in terms of surface area). Taylor (2019) indicates that ponds and wetlands (smaller) types of common aquatic features, can be a substantial source of carbon, besides being a home to local biodiversity . The first waterbody census report released by the Ministry of Jal Shakti, Government of India in 2023 that carries results of a comprehensive waterbody assessment conducted during 2018–19, covered over 2.4 million waterbodies across India, of which 59.5% are ponds (PIB 2023, Ministry of Jalshakti 2023) (Map 1).



» **Image 2** Deepor Beel Ramsar site



» **Map 1** Distribution of waterbodies covered in the census

Source: Down to Earth, 2023

For a diverse country like India, identification, listing, and notification of smaller and lesser known waterbodies (if they are not already included in this list of 2.4 million waterbodies, and there is a likelihood based on information available including civil society organizations, this number will go up) would be an important step towards ensuring India's water security. The government initiatives like Mission Amrit Sarovar (GoI 2023), have ensured the recognition of lesser known waterbodies. Now, sustained and extensive efforts are required to perceive waterbodies as climate change adaptation tools.

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Climate Change



By Indu Dambi

Pleasant mornings and chilled afternoon summer days
should I feel happy or really be saddened for these ways
Happy for the pleasant passing of summer
or sad about what actually isn't gruner.

The happy faces should see the plants and fields
Should actually feel their mourning indeed
Plants wrinkled and leaves waning for photosynthesis
to make food for themselves and food for others.

Change is a change that is for better
But the change I'm witnessing is bitter
They say change is always for good
But this change will perish earth's motherhood

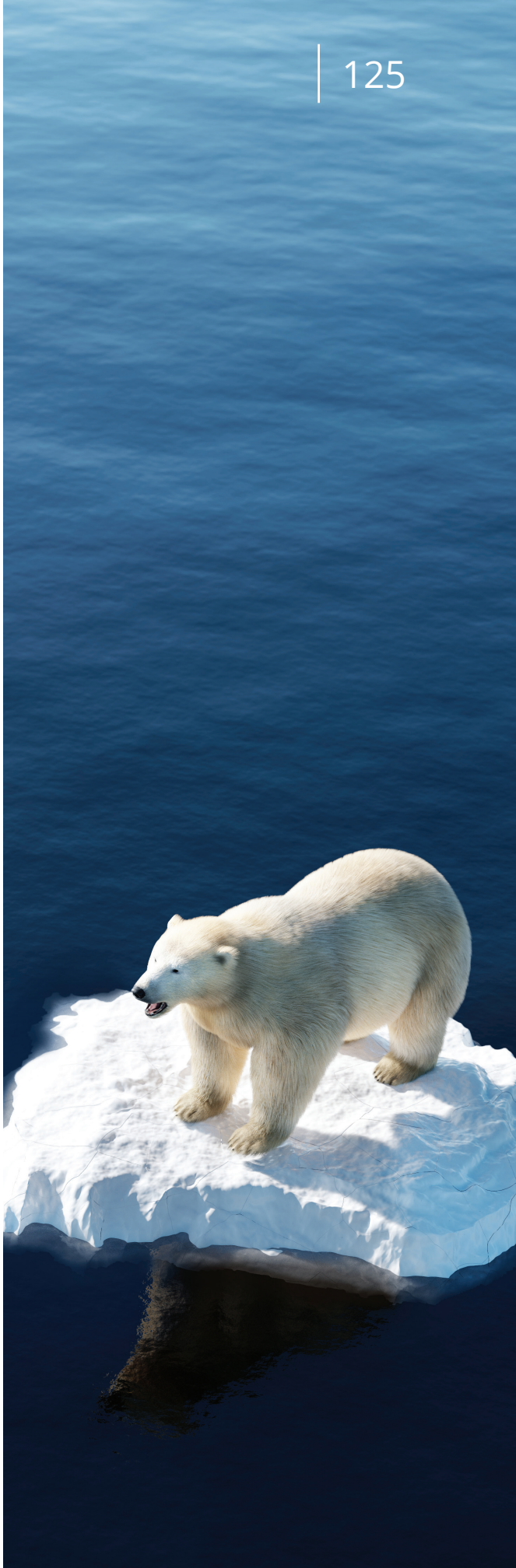
Climate change what we used to hear
in the lectures of the intellectuals dear
is becoming truth of the day
And game is really a foul play.

Temperature is increasing day by day
Cloud burst and flash floods are on the way
It is quite hard to bear the heat
Scorching summer is nature's new treat.

Sustainable development once used to be my goal
But now my skin is burnt and so is my soul
When I come home I yearn for AC
Ignoring the heat released by it you see.

I don't know what is about to come
but I know the Man who has done
will be the sufferer in the time to come.

Save us God !
Save the Earth !
The only planet with life !















Retreat















Stories

Equity: A Cornerstone for Enhancing Community Resilience to Climate Impacts



Anshika Srivastava, Senior Associate, Centre for Study of Science, Technology, and Policy

As the tangible effects of climate change become increasingly pronounced in our daily lives, Damian Barr's words, "We are not all in the same boat. We are all in the same storm. While, some are on superyachts, some have just the one oar", resonate deeply, capturing the essence of the contemporary climate crisis, highlighting how climate impacts are unevenly distributed among communities and individuals.

This disparity is especially stark in developing countries like India, where enhanced climate vulnerability is attributed to geographical location and high levels of socio-economic deprivation. According to the World Bank Group's *Climate Risk Country Profile* report of 2021, India ranks 44th in vulnerability to climate impacts.

To combat the climate challenge, India has implemented various laws and policies, addressing both climate mitigation and adaptation. While significant progress has been made across various sectors and regions, perceptible gaps do exist, resulting in instances of maladaptation. Moreover, the fundamental question: 'who will bear the burden of climate impacts?' often remains unaddressed.

It is widely acknowledged, that India's rich diversity coexists with profound divisions along the lines of caste, region, class, gender, and religion. While certain segments have prospered due to the economic liberalization policies of 1992, a large section still remains marginalized, held in the shackles of historical injustice, lacking equitable access to the benefits of the development that were promised with the new-age economic policies. These vulnerable communities are now even more exposed to escalating climate impacts, as they lack access to essential resources like capital, social networks, technology, and critical infrastructure needed to effectively adapt to climate-related risks.

To address this unjust resource distribution and alleviate the impact of climate change on the vulnerable and disadvantaged, it is imperative to establish laws and policies firmly rooted in principles of equity and justice.

Enhancing community resilience, requires a multi-faceted approach, centred on principles of justice and inclusivity. The blog discusses three dimensions of equity, along the lines of resource allocation, decision-making, and knowledge sharing.

One easily adoptable pathway for governments and institutions to address the disparities is by allocating critical resources such as capital, technology, and infrastructure.

Fairness and justice policies should also adopt a bottom–up and inclusive approach,



empowering individuals to actively shape their destinies. Engaging people in decision-making processes fosters lasting systemic changes that prioritizes people at the centre of climate governance. It facilitates collective action, allowing communities to develop context-specific adaptation strategies, pool resources, and respond effectively to climate-related challenges.

One of the key measures, to bolster community resilience is through recognizing and incorporating the distinctive knowledge and perspectives of diverse communities. For instance, many indigenous communities, possess traditional knowledge that has enabled them to adapt to changing environmental conditions. By integrating indigenous wisdom, we can harness their invaluable insights, ensuring that adaptation strategies are not only effective but also culturally appropriate, and sustainable.

In conclusion, it is crucial to emphasize that incorporating equity as a fundamental aspect of climate resilience approach is not only essential for addressing social injustices but also significant for achieving our shared climate objectives. This approach envisions a world that is both equitable and sustainable for everyone.

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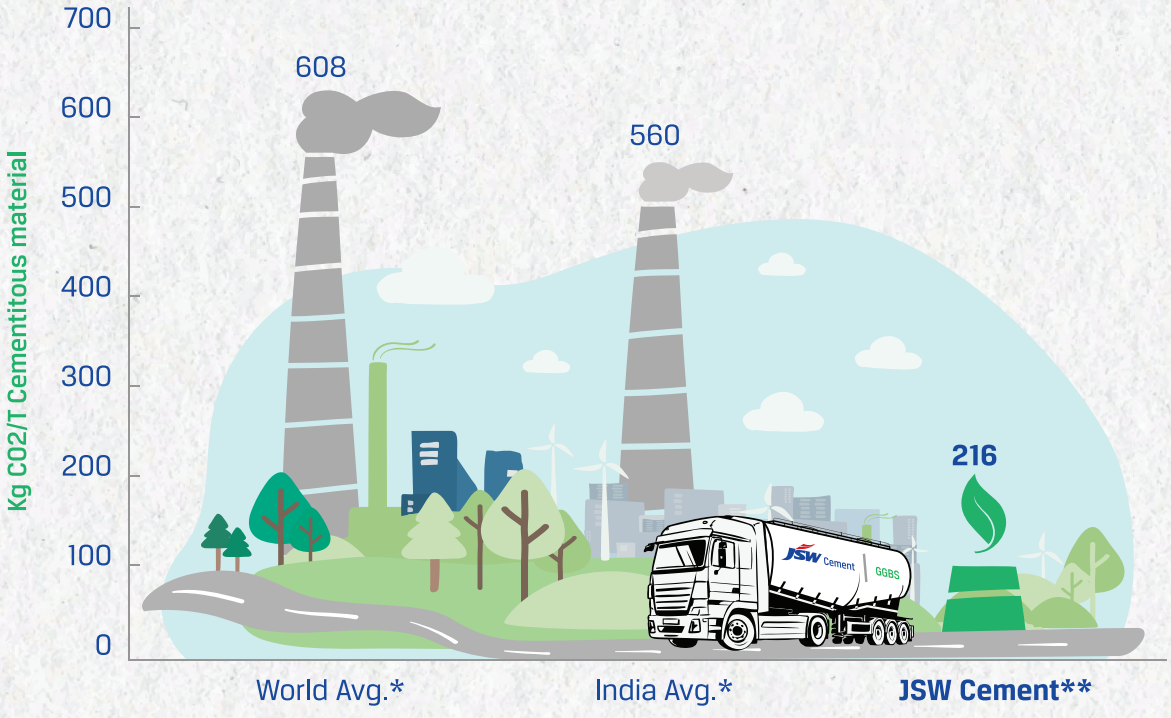

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Reclaiming My Space to Walk

Article by **Ar. Dipika Tuteja** discusses significance of resilience and sustainability. Architecture is not only about buildings, it is more than just the built environment, as it is an inseparable part of our surroundings. Responsibility of an urban planner is to create holistic environment for people with a futuristic perspective. The author has aptly explained the concept through a case study sourced from New Delhi, Saket.



Dipika Tuteja, Founder Architect, In AWE

At present she is working on creating a sustainable neighbourhood as a model to be replicated with our local government representative in South-Delhi.

Award: Best Sustainability Initiator of the Year Award #Time2Leap Awards in 2019.

Introduction

Resilience and sustainability are two sides of the same coin. Resilience not only applies to weather conditions, natural calamities, or climate change but also to circumstantial conditions. And sustainability is the ability to sustain without disturbing nature.

In both the cases we humans are the dominant contributors to climate change and create havoc in the environment. A few decades back sustainability was not a buzzword, as at that time, we were still mindful of our natural resources. Or perhaps, there were still abundant resources for us, as the population was not at the explosion level.

Gradually, with time as our demands grew, migration to cities happened and the informal economy became part of our lives. This resulted in claiming of space that in turn collapsed the pedestrian infrastructure.

Fast forward to present

Case study of a neighbourhood in Delhi – Saket.

The story unfolds how a community lost their right to space.

Why the need?

Mobility is now preferred in private vehicles, not by choice but by compulsion. It is a vicious circle with no beginnings or ends, lack of walking space has resulted in this situation.



» **Image 1:** J Block road

The road traffic impacts carbon emissions, air quality, and loss of physical activity, that has direct effect on the health of the population, especially that of vulnerable groups like children and older adults.

Secondly for happiness quotient

We humans need a reason to stay happy. There are certain factors (listed by us) that contribute to realization of happiness. These factors determine the happiness quotient. Though internationally there are seven factors, here we are looking at the environmental quotient.

Role of an urban planner

For a layman, architecture is only about buildings, however, it is more than just the built environment, it is also a part of our surroundings.

Role of an urban planner is to create holistic environment for people. But sometimes their concepts are not futuristic, as is the case in Saket.

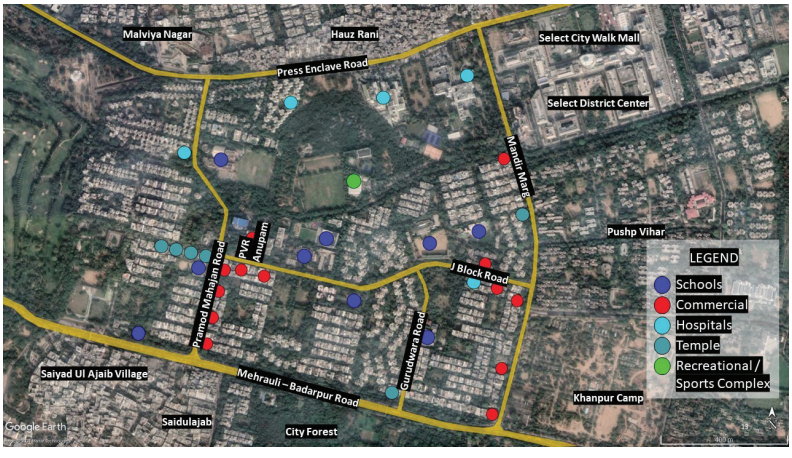
Saket—Area Analysis

The neighbourhood Saket is in the South Delhi district situated in NCT of Delhi state, with a population of 35,805. The size of the area is about 1.78 sq. km.



» **Image 2:** Saket area plan

Activity Mapping



» **Image 3:** Saket activity mapping

Issues of concern

While the planners planned this small residential neighbourhood, they did not envisage the severity of failure of urban planning. With nine schools in an area of 1.78 sq. km, six being on a stretch of less than a kilometre, there are around 15,000 students on road between 12.30 pm to 2.30 pm. The resident's population is only 35,000 and their entry and exit from homes are limited in these two hours. It is impossible in case of an emergency even for an ambulance to evacuate a patient to the nearest hospital.

This situation has been compounded by the vendors on pedestrian paths, total count is more than 400. Technology intervention of creating green corridors for emergencies has no room in such scenarios. Going further, there are two metro stations on each side of Saket, without any consideration of last-mile connectivity, without



» **Image 4:** Pedestrian path occupied by vendors



» **Image 5:** Autorickshaws parked on road

provisions for safe walking. The last-mile connectivity option is an autorickshaw, that occupies both sides of the road.

The gravity of this situation has been brushed aside by the relevant authorities, in the veil of paucity of funds. Here funding comes later, first is the implementation and planning along with some hard decisions of removal of unauthorised vendors. It is like 'waiting for a disaster to happen' to take a call!

Proposal as per Master Plan 2041

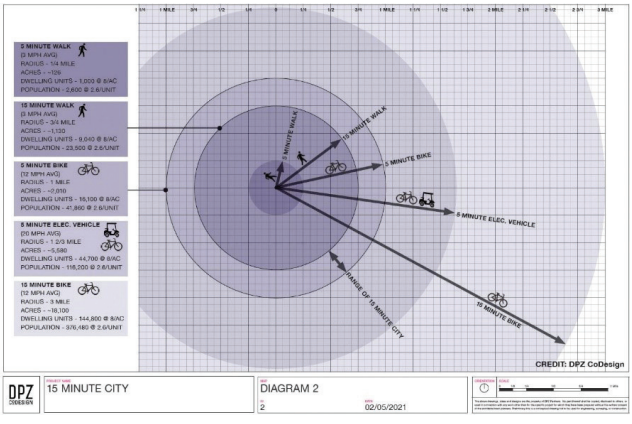
- Street improvements as well as the development of new streets shall incorporate multi-utility zones as per street design regulations for accommodating informal activities. The vending and no vending zones shall be demarcated in plans prepared for identified active travel areas.
- Improving local public spaces
- The Plan focuses on reclaiming street as places for people
- Walkability shall be facilitated across the neighbourhood providing a barrier-free environment with adequate street infrastructure, shading, and public conveniences as per the Street Design Regulations.
- Public life on streets shall be further improved by creating opportunities like street vending zones, accessibility to all types of users, pedestrian crossings and public plazas as per the Clause 5.3.2

Existing streets shall be retrofitted to serve pedestrians and cyclists better. Pedestrian walkways/footpaths shall be provided mandatorily in the arterial and peripheral roads.

Intent of this Study

To create suitable infrastructure based on the 15-minute neighbourhood concept

The 15-minute neighbourhood is an urban planning concept in which most daily necessities and services, such as work,



» **Figure 1:** 15-minute city

shopping, education, health care, and leisure can be easily reached by a 15-minute walk or bike ride from any point in the neighbourhood. This approach aims to reduce car dependency, promote healthy and sustainable living, and improve well-being and quality of life for the residents. Last-mile connectivity from metro stations is either shaded pedestrian paths or cycling tracks.





» **Image 6:** Participation of school children

Informal economy that is generated through vendors contributes to the overall economy of the nation.

With so many departments on board, the approval for even tactical urbanism is stuck in the institutional barriers!

Proposed strategies for funding

Before any permanent solutions are arrived at, it is a common practice to do a mock temporary solution. This is tactical urbanism and is followed in many countries. All one requires is bollards and paints. The two most acceptable options for funding could be:

- Any paint manufacturer company who could do it as their promotional activity.
- Any corporate can do this under CSR activity.

- There is no precedence in this, as this is a man-made problem, but surely the solution in one neighbourhood would pave a way to be replicated everywhere. This is a universal problem in most of the neighbourhoods in Delhi and beyond. It is a civic right of every citizen to have a safe walking space and that's what we intend to reclaim!

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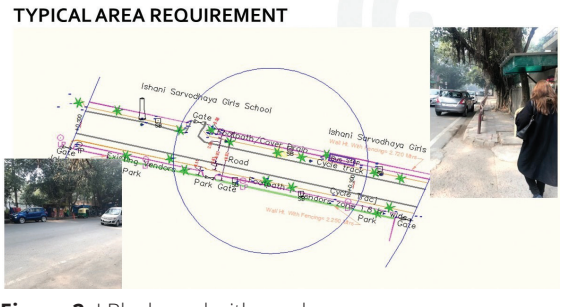
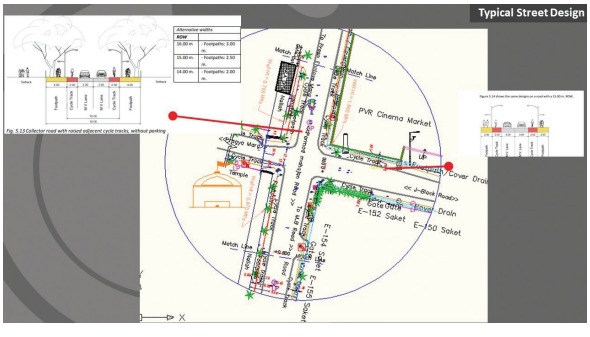


» **Figure 2:** J Block road with vendor zone



» **Figure 3:** Crossing at PVR

Outcome

With this proposal of creating pedestrian walkways and cycle tracks, the vendor zone is not getting disturbed. However, the zone is limited to a specific area, and as per the guidelines of street design it is an essential part of the infrastructure.

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Preserving the Indian Himalayan Region: Sustainable Practices and Community Empowerment

The Indian Himalayan Region truly is a gift of nature, characterized by towering peaks, lush forests, and rich cultural traditions. However, this majestic landscape is facing numerous challenges in the form of climate change, environmental degradation, and rapid urbanization. Through the article, **Aiman Shams** enlightens us on the significance of accruing the economic benefits of development while mitigating its adverse impacts, a shift towards responsible practices is pertinent. This would essentially require alignment of development and tourism with the Sustainable Development Goals (SDGs). A comprehensive framework for sustainable tourism in the Himalayan Region is needed to balance growth with conservation.



Aiman Shams is currently serving as Project Associate at TERI, Sustainable Buildings, where her expertise spans in the fields of water resource management, pollution studies, and conflict analysis and peace-building, adding a unique dimension to her work. She could be approached at <aimanshams2016@gmail.com>.

The Indian Himalayan Region (IHR) is a natural wonder, characterized by its towering peaks, lush forests, and rich cultural traditions. However, this breath - taking region, spanning eight countries, faces numerous challenges, threatening its delicate ecological balance. Climate change, environmental degradation, and rapid urbanization are reshaping the IHR's landscape and threatening traditional ways of living. To secure a sustainable future for this unique region, empowering local communities through green practices and resilience-building initiatives is of paramount importance.

The IHR is not merely a regional treasure; it also plays a noteworthy role in shaping South Asia's weather patterns. This region houses some of the world's largest glacier systems and supplies water to millions of people downstream. However, climate change poses a severe threat, leading to glacial retreat, altered snowmelt patterns, and disrupted hydrological systems. Given the IHR's status as a vital transboundary area with shared mountain ranges, its impact extends to multiple South Asian countries.

To harness the economic benefits of development while mitigating its adverse impacts, a shift towards responsible practices is essential. This entails aligning development and tourism with the Sustainable Development Goals (SDGs), particularly SDG 8 (Decent Work and Economic Growth) and SDG 12 (Responsible Consumption and Production). Attention to aspects like destination carrying capacity for tourism is critical. A comprehensive framework for



» **Image 1** Catastrophic flash floods in Himachal Pradesh

sustainable tourism in the IHR is needed to balance growth with conservation.

The development involving empowerment of communities in the IHR requires a fundamental shift away from top-down developmental models towards a grassroots approach. It is not merely about achieving economic and social development; it involves placing people at the heart of decision-making processes and development initiatives in their own localities. This empowerment extends to political participation, enabling communities to assert their rights and attain self-reliance. By doing so, sustainable development becomes a collaborative effort, benefiting all stakeholders and moving away from a profit-centric approach that often favours larger players. This also means acknowledging, respecting, and putting to use the traditional knowledge, as indigenous and traditional communities in the IHR possess a wealth of traditional ecological knowledge (TEK) that spans farming practices, natural resource utilization, health care, and more. Integrating this knowledge into environmental governance is paramount for sustainable development. These communities are astute observers of environmental changes and their impacts on their livelihoods, making their involvement in resource management and decision-making a cornerstone of success.

Various environmental challenges ail the IHR due to the impacts of climate change, with climate-induced hazards such as flash floods, forest fires, and earthquakes posing severe threats to the region. Recent flash floods and landslides in Himachal Pradesh and Uttarakhand serve as stark reminders of the devastation that can result from unplanned development, encroachments on riverbeds, rampant deforestation, and unchecked construction (Image 1). A preliminary assessment of financial losses puts it at around INR 8000 crore while 330 people died in the state of Himachal Pradesh in 2023.

Tourism has emerged as a critical driver of economic development in the IHR, providing employment opportunities and revenue to local communities and governments. However, the



» **Image 2** Bed of a dried river

rapid growth of tourism in the region has raised concerns about its environmental and sociocultural impacts. The current tourism model in the IHR is often considered a source of environmental degradation, cultural erosion, resource depletion, and numerous challenges. Inappropriate infrastructure construction, inadequate waste management, air pollution, watershed degradation, and the loss of natural resources and biodiversity collectively jeopardize the prospects of long-term tourism development in the region.

The vulnerability of the IHR, exacerbated by tourism growth, is further aggravated by human–wildlife conflicts, water scarcity due to drying springs, land degradation, and environmental issues such as solid waste and air pollution. Climate change is unmistakably leaving its mark on the region, evident through shrinking glaciers, rising temperatures, shifting monsoonal patterns, and an alarming increase in the frequency and severity of natural disasters.

Government Initiatives

The Indian Government is taking vital steps to address the challenges in the IHR. Notable initiatives include the SECURE Himalaya Project 2017 of UNDP, focusing on biodiversity conservation and the Himalayan ecosystem's safeguarding by augmenting skills of 1000 women and youth in areas like adventure and nature-based tourism. The inspiring innovation and youth participation through SECURE Himalaya Hackathon aims to develop technology-based solutions for conservation. The National Mission for Sustaining the Himalayan Ecosystem (NMSHE) aims to enhance the resilience of the Himalayan ecosystem by addressing issues such as glacial melt, biodiversity loss, and sustainable livelihoods. Led by the National Institution for Transforming India (NITI Aayog), the Sustainable Development in the IHR programme actively promotes sustainable development, emphasizing environmental conservation and socio-economic growth. Additionally, the Vibrant Village Programme selects various border villages, like Chushul in Ladakh, for development. These government initiatives complement other global efforts, including participation in G20 and UNDP meetings, emphasizing community-led action. For future enhancements, government policies could address issues like drug abuse and labour exploitation associated with tourism. Moreover, considering sustainable practices in Union Budgets could further advance sustainable development in the IHR.

Key Actions for Sustainable Tourism

Key actions for sustainable tourism include various measures that actively involve local communities in the IHR. Firstly, local communities can play a crucial role in promoting sustainable tourism by actively participating in the assessment and guidance processes, thus contributing to integrated destination and infrastructure planning. They can also engage in capacity-building initiatives, ensuring that their awareness and sensitization campaigns suitably address IHR-specific concerns. Additionally, communities can participate in creating a comprehensive



» **Image 3** Restaurant run by a woman for tourists

database for informed decision-making, which forms the basis for sustainable tourism development. Moreover, by implementing ecolabelling parameters, investment planning, robust monitoring and evaluation and market connectivity, local communities can actively shape the planning, implementation, and monitoring of tourism strategies. Finally, strengthening policies and regulations to combat issues like drug abuse and labour exploitation associated with tourism can be a collaborative effort between local communities and the government, incentivizing states based on sustainability indicators. In summary, local communities are integral to each of these key actions, contributing to the sustainability and success of tourism in the IHR.

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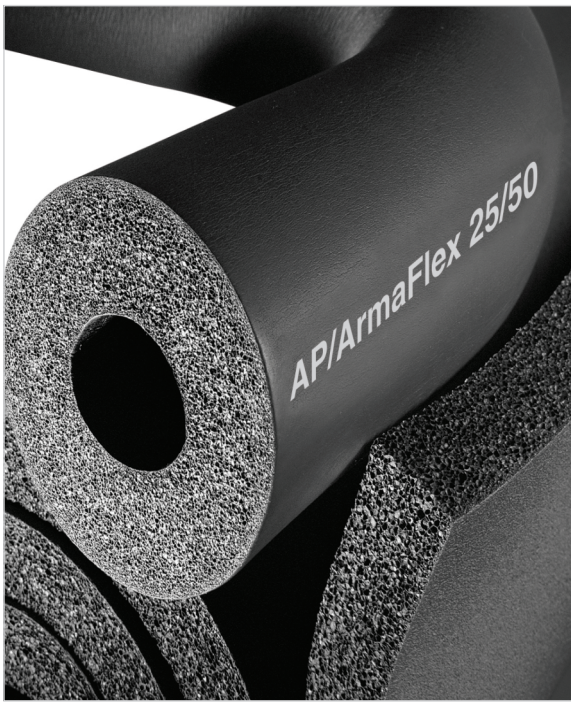

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E	T	M	D	A	Y	L	I	G	H	T
G	O	M	Q	X	C	Y	V	X	E	O
J	P	D	O	R	G	A	N	I	C	N
E	S	G	R	S	O	S	P	W	O	E
V	O	J	C	M	P	H	Y	Q	S	I
W	I	N	D	O	E	H	L	O	Y	Y
H	L	O	H	G	R	E	E	N	S	R
M	E	T	E	R	A	O	J	R	T	K
V	Q	T	T	B	I	O	F	U	E	L
I	M	R	B	X	N	I	N	U	M	A
R	R	Y	H	S	W	A	S	T	E	W
V	E	G	E	T	A	T	I	O	N	N
S	U	B	I	O	T	I	C	L	T	Y
H	S	G	D	Z	E	N	E	R	G	Y
N	E	T	Z	E	R	O	F	S	P	U

Word Split

INS	ENE	EST	ACT	RGY	SET
FOR	OFF	BON	IMP	BAS	CAR

Answers to “Word Search” and “Word Split” are on Page No. 43

Our Team



Vibha Dhawan



Sanjay Seth



Shabnam Bassi



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1. Akash Deep
2. Anupam Buttan
3. Ankit Bhalla
4. Shaily Mahera
5. Aakriti Sachdeva
6. Ahmad Saud
7. Aditi Dev
8. Arjun C Babu
9. Ichhita Handa
10. Prerona Kaushik
11. Richa Singhal
12. Sanchit Malik
13. Arnab Saha
14. Moumita Ghosh
15. Nishima Goyal
16. Prachi Pandey
17. Priy Ranjan Kumar
18. Sakshi Singhal
19. Veena N
20. Anmol Chitransh
21. Avinash Dutta
22. B Vignesh
23. Srishti Gaur
24. Yash Nayyar
25. Kamal Kishor
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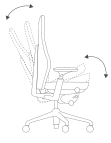

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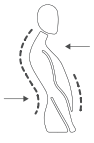

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