Ministry of New and Renewable Energy
Government of India

THE 10TH GRIHA SUMMIT 2018

SUMMIT PROCEEDINGS

December 11th–13th, 2018 | New Delhi

Fostering Partnerships for Sustainable Habitat

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CONTENTS

THE GRIHA SUMMIT

For thousands of years, human societies have proved that living sustainably — as healthy and happy individuals, within caring and stable families and communities, and in harmony with the natural world — is possible. In the last decades 'development' gradually came to be seen as a holistic notion, encompassing economic, social, cultural, political and environmental dimensions. Recently, the concept of global partnerships has gained prominence in sustainable development fora, most notably as a central element of the Sustainable Development Goal (SDG) 17, which is at the heart of the global United Nations (UN) development agenda for the period 2016 – 2030. As we move closer to 2030, the stress is on collaborating and working together towards knowledge exchange, sharing of ideas and solutions, strengthening research at a global level.

The global community finds itself at a critical juncture today. We all recognize that succeeding in the attempts to mitigate climate change, control GHG emissions and combat various environmental issues is not down to one person. It's about being resilient, with collaboration being the key ingredient that makes it all possible.

Mankind is facing emerging new challenges as well as exacerbated existing ones. Inequality has deepened, environmental degradation has increased, the energy crisis is intensifying, and urbanization is erratically increasing. At the same time, new economic powers have emerged, new technologies are shaping our societies, and new patterns of human settlement and activity are heightening the pressures on our planet. A new era demands a new vision and a responsive framework.

It has been established that the built environment can contribute to a more equal, inclusive and cohesive society if the places where we live, the facilities we use, our neighborhoods and meeting places are accessible, inclusive, resource efficient and user-centric. Education and awareness have come to the forefront as the world realizes that education must be reoriented to a vision of sustainability, one that links economic well-being with cultural traditions and respect for Earth and its resources. The collaborative efforts of GRIHA Council, University of New South Wales (UNSW), Australia, Bureau of Energy Efficiency, and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) are in synchronization with the criticality of education and research for linking social, economic, political and environmental concerns as crucial aspects of sustainable development. Interdependence between organizations and the natural environment is central to a systemic sustainability management perspective given that organizations depend on the natural environment for inputs and organizational actions directly impact the natural environment through feedback loops.

It is time to orient ourselves and embark upon the journey towards more inclusive and sustainable development. The 10th GRIHA Summit with the theme "Fostering Partnerships for Sustainable Habitat" shall serve as a platform to deliberate on interdependence between organizations, systemic sustainability management, and feedback loops for better resource efficiency. The Summit is to be held on 11th –13th December, 2018 at New Delhi. Eminent speakers and dignitaries around the world will gather to debate, discuss and deliberate on the aspects of sustainability in the context of inclusiveness, international cooperation and education.

THE GRIHA COUNCIL

Construction activities in India have been pursued without giving much attention on environmental issues. This has resulted in pressure on its finite natural resources, besides creating impacts on human health and well-being. Unplanned and unsustainable urban development has led to severe environmental pressures. Modern buildings built in our cities have high levels of energy consumption because of requirements of air-conditioning and lighting. Such buildings consume copious quantities of water for building use and landscaping and generate substantial waste during construction and operation.

Green buildings on the other hand, can reduce energy demand by as much as 40% and water demand by more than 30%. They let in more natural light, recycle wastewater, integrate natural cooling systems with conventional air conditioning systems, use renewable sources of energy to reduce dependence on conventional sources and contribute towards sustainable development.

GRIHA Council, is mandated to promote development of buildings and habitats in India through GRIHA. It was founded by TERI (The Energy and Resources Institute, New Delhi) with support from MNRE (Ministry of New and Renewable Energy, Government of India) along with a handful of experts in the sustainability of built environment from across
the country.

The Ministry of New and Renewable Energy (MNRE), Government of India and TERI have jointly developed GRIHA (Green Rating for Integrated Habitat Assessment), which has been endorsed as the national rating system for green buildings in India. With support from the Government of India and active participation of the private sector, over 43 million square metres of built up space is registered to be GRIHA compliant.

GRIHA Council, is mandated to promote development of buildings and habitats in India through GRIHA. It ensures implementation of GRIHA benchmarks in full compliance with various relevant national codes and standards (such as the Energy Conservation Building Code, the National Building Code, guidelines issued by the Central Pollution Control Board) and contributes to meeting objectives set forth in the National Mission on Sustainable Habitat and the Jawaharlal Nehru National Solar Mission. The demonstrated impact of GRIHA projects includes quantification of resource use optimization, implementation of environmental commitments and enhanced transparency through a web based portal.

In addition to all Government of India and Public Sector Undertaking buildings that have to be minimum 3 Star GRIHA compliant, the Central Public Works Department (CPWD) has also notified that all their construction shall be minimum 3 Star GRIHA rated.

AGENDA

Detailed Agenda

Curtain Raiser & Inaugural session

10th December 2018

Venue - Taj Palace, New Delhi

1900 onwards	Inaugural session followed by cocktails and dinner
	Lighting the lamp WELCOME ADDRESS India: **Dr Ajay Mathur,** President, GRIHA Council and Director General, The Energy and Resources Institute (TERI) WELCOME ADDRESS Australia: **Prof Ian Jacobs,** President and Vice-Chancellor, University of New South Wales (UNSW), Sydney, Australia SPECIAL REMARKS: **Mr Abhay Bakre,** Director General, Bureau of Energy Efficiency (BEE) SPECIAL ADDRESS: **Ms Harinder Sidhu,** Australian High Commissioner to India Release of Vision Statement Release of new GRIHA website Launch of GRIHA for CITIES rating Signing of MoU between Global Association for Corporate Services and GRIHA Council VOTE OF THANKS: **Mr Sanjay Seth,** Chief Executive Officer, GRIHA Council & Senior Director – Sustainable Buildings Division, The Energy and Resources Institute (TERI)

Day 1

11th December 2018

Venue - India Habitat Centre, New Delhi

09:00 – 09:30	Registrations
09:30 – 10:30	**Setting the theme** **Venue - Stein Auditorium**
	WELCOME ADDRESS: **Dr Ajay Mathur,** President, GRIHA Council and Director General, The Energy and Resources Institute SPECIAL ADDRESS: **Prof Ian Jacobs**, President and Vice-Chancellor, University of New South Wales (UNSW), Sydney, Australia SPECIAL ADDRESS: **Dr Winfried Damm**, Head of Indo-German Energy programme, (GIZ) GmbH Rating awards ceremony VOTE OF THANKS: **Mr Sanjay Seth**, CEO, GRIHA Council

Plenary Session 1: Fostering Partnerships for Sustainable Habitat	**10:30 – 11:45** **Venue - Stein Auditorium**
In the last decades 'development' gradually came to be seen as a holistic notion, encompassing economic, social, cultural, political and environmental dimensions. As we move closer to 2030, the stress is on collaborating and working together towards knowledge exchange, sharing of ideas and solutions, and, strengthening research at a global level. The global community finds itself at a critical juncture today. We all recognize that succeeding in the attempts to mitigate climate change, control GHG emissions and combat various environmental issues is not down to one person. It's about being resilient, with collaboration being the key ingredient that makes it all possible. Education and awareness have come to the forefront as the world realizes that education must be reoriented to a vision of sustainability, one that links economic well-being with cultural traditions and respect for Earth and its resources. This session shall focus on the possibilities of creating such links and a deeper, more ambitious way of thinking about sustainability while retaining a commitment to critical analysis while fostering creativity and innovation.	THEMATIC SPEAKER: **Mr Laurie Pearcey,** Pro-Vice-Chancellor (International), University of New South Wales MODERATOR: **Mr Atul Bagai,** Country Head of UN Environment in India SPEAKER: **Mr Aditya Bhutani,** Director and COO - AIS-GLASXPERTS **Professor Dr. N.K. Bansal,** Sintex Chair Professor, CEPT University Ahmedabad **Mr Sanjay Seth,** CEO, GRIHA Council Q & A session
Tea/ Coffee Break	**11:45 – 12:00** **Venue - The Hub**
Thematic track 1 – Sustainable materials and technologies	**12:00 – 13:30** **Venue - Jacaranda**
The past two centuries have seen unprecedented growth in human population and economic well-being. This growth has been fed by equally unparalleled material resource consumption and its associated negative environmental impacts. Making sure that material resources are managed sustainably and used efficiently through their life-cycle is vital to economic growth, environmental quality, and sustainable development. It would also help to reduce the detrimental effect associated with the production, consumption and end-of-life management of material resources. A shift from "end-of-life" thinking towards a more integrated life-cycle approach is therefore needed. Construction and demolition (C&D) waste generation and handling issues have especially been in focus to achieve sustainable goals. Owing to rapid economic growth leading to urbanization and industrialization growth in Indian construction industries, it is appropriate to link generation of C&D waste with the growth. Additionally, the embodied energy of the resources which go into construction is a relevant concern at the forefront. This session aims to provide a platform to discuss the strategies and technologies to manage the C&D waste, innovative building materials to lighten the burden on landfills and ecosystems	*Release of the 'MaS-SHIP - Mainstreaming Sustainable Social Housing in India Project' Report* MODERATOR: **Dr Shailesh Kr. Agrawal,** Executive Director, BMTPC SPEAKERS: **Dr Deepika Mathur,** Research Fellow, Northern Institute, College of Indigenous Futures, Arts & Society **Mr S Vikash Ranjan,** Programme Manager – EEB, IGEN- GIZ **Mr Pradeep Sachdeva,** Pradeep Sachdeva Design Associates **Ms Megha Behal,** Research Associate, Sustainable Buildings, TERI Q & A session

Thematic track 2 – Policy framework for sustainability	**12:00 – 13:30** **Venue - Juniper**
Policies are the foundation of the framework on which guidelines, decision, course depends. Specifically aimed guidelines at securing sustained economic growth, a healthy environment or an inclusive social development are important in their own right for sustainable development. Unsustainable practices may result from incoherent strategies in different domains. Furthermore, policy framework at the global level, country level, and the regional level are symbiotically connected. Regional policies, in particular, are occasionally introduced without due regard for the externalities being targeted by environmental policies, leading to inconsistencies and spill-over effects. Improving coherence requires better integration of economic, environmental, and social goals in different policies. The focus must be on creating a long-term solution framework to this effect. India is a complex, stunningly diverse country replete with seeming contradictions. Strong, robust policies can trigger a positive effect and chart a course for holistic, sustainable development. This session will have discourses on policies at various levels, their relevance, adequacies, and inadequacies. Experts will deliberate on issues and their impact on sustainable development.	MODERATOR: **Mr Swayan Chaudhuri,** Managing Director & CEO at Imagine Panaji Smart City Development Ltd. SPEAKERS: **Dr Sarath Mataraachchi,** Lecturer, Built Environment, University of New South Wales **Mr Vijay Garg,** President, Council of Architecture **Mr Kushagra Juneja,** Cofounder, Design2Occupancy Services LLP Q & A session
Thematic track 3 – Air Pollution – A call for urgent action	**12:00 – 13:30** **Venue - Tamarind**
Pollution of the air is an important threat to human development. SDG 3.9 seeks to "substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water, and soil pollution and contamination" by 2030. As per Global Burden of Disease (GBD) report released in 2017, air pollution in India is known to cause 1.1 million deaths, out of a total 4.2 million deaths worldwide. The sources of air pollution are quite scattered such as ambient particulate matter pollution, emitted by vehicle exhaust, factory and power plant smokestacks, and crop and garbage burning. The ambient air quality also influences the indoor air quality, where we spend majority of our time, which makes it even more critical. Reducing the various pollution sources will require a multi-faceted approach including technologies that are cleaner throughout their life-cycle, including raw material sourcing, manufacturing, and post-use disposal; forward-thinking policies, and more informed consumption patterns based on an awareness of the benefits and risks of decisions and actions. This panel brings together stakeholders from various organizations who are working to reduce ambient air pollution, and indoor air quality, who will discuss and highlight the possible solutions to reduce ambient air pollution from green buildings.	MODERATOR: **Dr Sumit Sharma,** Director, Earth Science and Climate Change, TERI SPEAKERS: **Mr R Suresh,** Area Convenor, Centre for Environmental Studies, TERI **Dr Sunil Gulia,** Scientist Fellow, CSIR-NEERI Zonal Laboratory Delhi **Ms Prarthana Borah,** India Director Clean Air Asia **Dr Sunita Purushottam,** Head – Sustainability, Mahindra Lifespace Developers Ltd (MLDL) Q & A session

Thematic track 4 – Inclusive Development	**12:00 – 13:30** **Venue - Amaltas**
Inclusiveness is a quality which accommodates differences and values diversity; be it in the built environment, urban fabric, governing policies to name a few. Inclusive development ensures that all marginalized and excluded groups are stakeholders in development processes and are not excluded from development because of their gender, ethnicity, age, sexual orientation, disability or poverty. Inclusiveness in all aspects of sustainability i.e. social, environment and economy are reflected in the equitable access to resources, affordable housing; accessible built environment and open spaces; access to clean air, open areas, green spaces, basic necessities. Social inclusiveness has its roots in human rights, inequality, redistribution, rural development, entitlements and capabilities concepts. In scalar terms, ecological inclusiveness at the local level focuses on protecting local access to and ownership of resources as well as protecting local ecosystems. This session shall explore the inclusiveness in various aspects of design, construction, planning in the urban fabric with focus on the challenges and solutions.	MODERATOR: **Dr Renu Khosla,** Director Centre for Urban and Regional Excellence SPEAKERS: **Professor Arup Mitra,** Professor, Institute of Economic Growth **Ms Shelley Poticha,** Managing Director, Healthy People & Thriving Communities Program, NRDC **Ms Swati Janu,** Creative Director, mHS CITY LAB **Mr Christopher Samuel,** Centre for Indian Bamboo Resource & Technology (CIBART) **Professor Sarnam Singh,** Dean, Nalanda University Q & A session
Lunch	**13:30 – 14:30** **Venue – The Hub**
Keynote Address 1	**14:30 – 15:15** **Venue - Stein Auditorium**
Professor Helen Lochhead, Dean, Faculty of Built Environment, UNSW Sydney. An Australian architect, and urbanist, Professor Lochhead's career has combined professional practice and teaching both in Australia and the United States, as an Adjunct Professor at the University of Sydney and also as visiting academic at Harvard, MIT and Columbia Universities. Prior to her appointment as Dean she held a number of influential positions in the NSW Government and the City of Sydney including Executive Director roles at Sydney Olympic Park Authority and Sydney Harbour Foreshore Authority, & deputy NSW Government Architect.	CHAIR: **Mr Sanjay Seth,** CEO, GRIHA Council
Felicitation of partners	**14:30 – 15:15** **Venue - Stein Auditorium**
Tea/Coffee Break	**15:30 – 15:45** **Venue - The Hub**
Thematic track 5 – Integrated mobility	**15:45 – 17:30** **Venue - Juniper**

Mobility and accessibility are key to solutions for a climate-resilient and sustainable future. One of the greatest environmental challenges we face today lies in mobility. People need a seemingly infinite network of vehicles and transportation systems to uphold societies and economies. An important metric for economic growth of any country is its burgeoning vehicle ownership. However, the indirect effect of vehicle ownership is acute traffic congestion, increased GHG emissions. We are at an environmental impasse, prompted by the CO2 emissions that are changing the climate and accelerating natural catastrophes. Road transport, being the most dominating mode of transport, has established pressure on the infrastructure especially on transport management practices in urban India. Integrated transportation systems offer a wide range of application that process and share information to ease congestion, improve traffic management, minimize environmental impact and increase the benefits of transportation to commercial users and the public in general. Sustainable urban mobility requires a mind shift: where transport in private cars and trucking give way to different modes of public transport. Like bicycle and pedestrian lanes, electric vehicles, car sharing, and rail freight. More and more cities around the world are rising to the challenge and strive to provide equitable, efficient, safe and green mobility for all. This session aims to explore the integrated transport system and sustainable urban mobility as a solution to current traffic management practices and reduce GHG emissions.	THEMATIC SPEAKER: **AProf Vinayak Dixit,** Head of the Research Centre for Integrated Transport Innovation (RCITI), University of New South Wales MODERATOR: **Ms Leena Nandan,** Additional Secretary, Ministry of Road Transport & Highways SPEAKERS: **Dr Simone Zarpelon Leao,** Senior Lecturer, City Analytics, University of New South Wales **Mr Sohinder Gill,** Director General, Society of Manufacturers of Electric Vehicles **Ms Akshima Ghate,** Principal, Rocky Mountain Institute **Dr Indradip Mitra,** Senior Technical Advisor, GIZ Q & A session
Thematic track 6 – Unwinding circular economy	**15:45 – 17:30** **Venue - Tamarind**
India stands at the threshold of profound choices about the path to future development, and choices made today will determine India's mid- to long-term progress. The country's economic growth trend, which averaged 7.4% a year in the last decade, will lead it to become the fourth largest economy in the world in about two decades. This positive prospect does not, however, come without challenges as the nation still faces significant questions about rapid urbanization, resource scarcity, and high levels of poverty. Systemic approaches to urban planning integrated with the application of circular economy principles to food and mobility systems can create more resilient cities which could manage such challenges as and when they arise. The country has the opportunity to leapfrog other economies and establish a leadership position. Traditionally, the Indian economy has been one where reusing, re-purposing and recycling have been second nature. In a world that is increasingly running out of natural resources, this thinking is an asset that must be leveraged by businesses, policymakers, and citizens in an organized manner and expanded to include other elements to make the economy truly circular. This session highlights the potential to innovative business models by accelerating cost savings, a new advance in design and practical solutions by adopting circular economy aspiration to a profitable action for a stronger competitive economy with a focus on re-thinking progress.	THEMATIC SPEAKER: **Ms Almitra Patel,** Member, Supreme Court Committee for Solid Waste Management MODERATOR: **Mr Amit Dasgupta,** India Country Director, UNSW SPEAKERS: **Dr Miles Park,** Industrial Design, Design Research Collaboration, University of New South Wales **Mr Siddharth Hande,** CEO, Kabadiwalla Connect **Mr Sumit Kumar Agarwal,** CEO, Tanjun WonderBamboo Q & A session

Thematic track 7 – Transitioning to clean energy	**15:45 – 17:30** **Venue - Jacaranda**
There is no development without fueling the engine of growth. Energy is critical and people with no sustainable access to energy are deprived of the opportunity to become part of national and global progress. Sustainable energy generates opportunity–it transforms lives, economies and the planet. There are tangible health benefits to access to electricity and a demonstrable improvement in wellbeing. Energy access, therefore, constitutes a core component of the sustainable development agenda for energy. Sustainable energy generates opportunity – it transforms lives, economies and the planet. The shift to renewable power generation is underway in India and continues to expand due to the fact of climate change and its devastating effects on the country. The states, local governments, and corporation across the country are intensifying their commitments to increasing use of renewable energy with an ambitious target of meeting 175GW by 2020. Goal 7 of the SDGs aims to increase substantially the share of renewable energy in the global energy mix by 2030. Integration of onsite renewable energy system in the building to generate power is a proven solution to reduce energy demand through electricity grid also reduces GHG emission. This session brings together industry experts to exchange knowledge and showcase resilience and reliability of renewable energy (photovoltaic) technology that will ultimately help transform India's power generation system into one that is low carbon.	THEMATIC SPEAKER: **Prof Alistair Sproul,** Head, School of the School of Photovoltaic and Renewable Energy Engineering, University of New South Wales MODERATOR: **Dr Ashvini Kumar,** Senior Director, Renewable Energy Technologies, TERI SPEAKERS: **Mr Rajneesh Rana,** General Manager (BD & Contracts), EESL **Mr Neeraj Kuldeep,** Programme Associate, Council on Energy, Environment and Water Q & A session
End of Day 1	

Day 2

12th December 2018

Venue - India Habitat Centre, New Delhi

Thematic track 9 – Climate change: The tipping point	**10:00 – 11:30** **Venue - Jacaranda**
Planetary warming and climate change are manifesting in the rainfall patterns, increasing occurrences of disasters, rapid retreat of glaciers, increasing the severity of droughts and floods, drying rivers etc. The links between climate change and sustainable development are strong. Poor and developing countries, particularly least developed countries, will be among those most adversely affected and least able to cope with the anticipated shocks to their social, economic and natural systems. The costs of strong and urgent action to avoid serious impacts from climate change are substantially less than the damages thereby avoided. Further, even with strong action to reduce greenhouse gas emissions adaptation must be a crucial part of the development strategy. The policy at national as well as global level, also requires urgent and international action supporting technology development. SDG 13 focuses on strengthening resilience and adaptive capacity, integrating climate change measures into national policies, strategies and, planning; capacity building to name a few. This session will have deliberations on the current status, initiatives, and challenges faced in the matter with a focus on the Indian scenario.	MODERATOR: **Dr Manish Shrivastava,** Department of Energy and Environment SPEAKERS: **Mr Rakesh Kamal A B,** Clean Energy Policy and Programs Consultant, The Climate Reality Project India **Assoc. Prof. Melissa Hart,** Graduate Director, ARC Centre of Excellence for Climate Extremes, University of New South Wales **Mr Khushal Matai,** Department of Architecture, School of Planning and Architecture, New Delhi **Dr Komali Yenneti,** Research Associate, Faculty of the Built Environment, University of New South Wales **Ms Raina Singh,** Senior Fellow, Urban Resilience, National Institute of Urban Affairs Q & A session
Thematic track 10 – Sustainable Cooling Alternatives	**10:00 – 11:25** **Venue - Juniper**
The demand for cooling is booming in India; without any action been taken for efficient cooling technology, it is predicted that cooling could account for 20% of the GHG emission. Cooling in a sustainable manner can impact the Paris Climate Agreement; the UN Sustainable Development Goals; and the Montreal Protocol's Kigali Amendment under one umbrella. The need for cooling is universal but cooling means very different things to different groups of people. For city dwellers, it is the air-conditioned offices, the food kept in refrigerators; whereas, for a farmer or a slum dweller, it could be impacting their livelihood or be life-threatening as it extends the life of perishables while trying to move them to market, ensures access to basic vaccines and provide bearable or barely safe work environments. This session shall focus on the policies focusing on cooling, their implementation and challenges, various cooling technologies suitable for India, alternate methods, best practices and strategies to reduce the GHG emission through efficient cooling, and access to affordable, sustainable cooling solutions for all.	THEMATIC SPEAKER: **Mr Saurabh Kumar,** Managing Director, Energy Efficiency Services Limited, Delhi MODERATOR: **Mr Markus Wypior,** Deputy Cluster Coordinator GIZ IGEN SPEAKERS: **Dr Anir Upadhyay,** Research Fellow, Faculty of the Built Environment, University of New South Wales **Mr Sunil Kher,** Managing Director, Sevcon India Private Limited, New Delhi **Mr Shadab Ahmed,** National Manager - Defence & Government Segment, India & South Asia Q & A session

Felicitation of GRIHA patrons	*11:25-11:30* *Venue - Juniper*
Thematic track 11– Smart cities and sustainability	**10:00 – 11:25** **Venue – Tamarind**
Cities are engines for sustainable development. It is where ideas, commerce, culture, science, and productivity thrive. Urban spaces offer opportunities for people to prosper economically and socially, but this is only possible in prosperous cities that can accommodate people in decent jobs and where land resources are not overwhelmed by growth. The rapid growth of cities in the developing world, coupled with increasing rural to urban migration, has led to a boom in mega-cities. In 1990, there were ten mega-cities with 10 million inhabitants or more. In 2014, there are 28 mega-cities, home to a total of 453 million people. Making cities safe and sustainable means ensuring access to safe and affordable housing, and upgrading slum settlements. It also involves investment in public transport, creating green public spaces, and improving urban planning and management in a way that is both participatory and inclusive. These challenges to urban spaces can be overcome by improving resource use and focusing on reducing pollution and poverty. The future we want includes cities that offer opportunities for all, and which provide access to basic services, energy, housing, transportation and more. This session will focus on the urbanization scenario in the country, the impact, and challenges of the smart city mission, and plausible solutions.	THEMATIC SPEAKER: **Professor Christopher Pettit,** Inaugural Chair of Urban Science, University of New South Wales MODERATOR: **Professor Jagan Shah,** Director, National Institute of Urban Affairs, New Delhi SPEAKERS: **Ms Ashu Dehadani,** Manager (Technical & Publication), GRIHA Council **Dr Sarbeswar Praharaj,** Coordinator, Australia-India Smart Cities Knowledge Exchange Network **Ms Friederike Thonke,** GIZ Q & A session

Felicitation of GRIHA patrons	*11:25-11:30* *Venue – Tamarind*
Thematic track 12: A Holistic Approach to Energy Efficient Buildings	**10:00 hours– 11:30** **Venue – Amaltas**
India has the fastest growing population and the demand for energy continues to rise; to meet this ever-growing energy demand and the significant negative environmental impacts due to heavy reliance on fossil fuels, is a captivating issue persuading the authorities across the country to pursue more sustainable options. Many policy interventions around clean energy have been made but one of the most economically feasible options available is to adopt an energy-efficient lifestyle and design to achieve the climate change and sustainable development goals. The building sector in India accounts for 33% of the nation's energy use and is growing by 8% every year. The revolution of energy efficiency in India was introduced by adopting a comprehensive policy for energy efficiency along with demand-side management programs to attain overall energy savings with a great deal of potential to reduce the GHG emissions. In this session, deliberations will focus on the ways to embrace energy efficiency into the building sector, the challenges faced and the technological solutions.	MODERATOR: **Ms Usha Batra,** Additional Director General (Arch), CPWD, Central Public Works Department (CPWD), Government of India SPEAKERS: **Dr G C Datta Roy,** Advisor Development Environergy Services Ltd. **Mr Saurabh Diddi,** Director, Bureau of Energy Efficiency **Mr Sourabh Kankar,** Marketing Manager India, Gujarat Guardian Limited **Mr Sachin Kasar,** Saint Gobain PPB **Mr Pavel Singh,** Saint Gobain Q & A session

Tea/ Coffee Break	**1130 – 12:00** **Venue - The Hub**
Plenary session 2: Innovations at work	**12:00 – 13:30** **Venue – The Stein Auditorium**
Innovation & Sustainability are crucial drivers of profitability. Whether it is a product made entirely of post-consumer content that biodegrades at the end of its useful life (innovation motivated by sustainable goals) or a clean-burning fuel additive that improves vehicle performance (sustainability motivated by innovation), the result is the same: novel products and services for the customers, financial gain for the organization and healthier relationships with people and the natural environment. There is no denying that the combination of innovation, sustainability, and profitability is powerful. The world hangs in balance with challenges, issues at every front. Change in processes, products, production, design is picking up the pace with stress being given to innovative solutions rather than the slow, transformative solutions as the upheaval being caused by climate change, greenhouse emissions, global warming is dynamic and erratic. With the surge in startups working on issues from the macro level to micro level, this session will showcase exemplary initiatives in the field of sustainability and bring their issues, challenges and the success to the forefront.	MODERATOR: **Mr Sanjay Seth,** CEO, GRIHA Council SPEAKERS: **Ms Meenakshi Sharma,** Founder, Use Me Works **Mr Shravan Shankar,** Co-Founder, @Works and Co-Founder & Managing Partner, The Binary Workshop, Chennai **Mr Anurag Kashyap,** Mentor-in-Chief, Gulmehar **Mr Anil Gokarn,** Partner DSWM (Decentralised Solid Waste Management) ProEarth Ecosystem **Mr Vishwas Singh,** Vice President, Shuttl Q & A session
Lunch	**13:30 – 14:30** **Venue – The Hub**
Keynote Address 2	**14:30 – 15:15** **Venue – The Stein Auditorium**
Scientia Professor Deo Prasad AO, Director - CRC Low Carbon Living, University of New South Wales He is an international authority and recognised as a national leader in the field of sustainable buildings and cities and among the leading advocates for sustainability in Australia, with his contributions having been widely acknowledged at all levels of government and professions in Australia. In 2004 he received the NSW State Government's individual GreenGlobe Award for 'leadership and commitment to the supply of renewable energy' He has also won the Federal Government's national award for 'outstanding contribution to energy related research'.	CHAIR: **Mr Sanjay Seth,** CEO, GRIHA Council
Felicitation of GRIHA patrons	**15:15 – 15:30** **Venue – The Stein Auditorium**
Tea/Coffee Break	**15:30 – 15:45** **Venue - The Hub**

Thematic track 13 – User Centric Design: Bane or boon?	**15:45 – 17:25** **Venue – Juniper**
The User or human-centered design approach is a task representative design interface focusing the design and development life-cycle by a deep understanding of the end user. It is a bottom-up approach, not top down. It is collaborative, not patriarchal. It is generative and iterative, not singular in concept. As users are being increasingly encouraged to participate in the design of personalized products in various ways, a new kind of user-centered business model emerges. One of the outcomes of this transformation is the restructuring of a company's products - from a one-size-fits-all to a kit-of-parts - allowing customers to mix-n-match. A similar process is taking place in architectural design, as more research projects and a few commercial applications employ mass-customization techniques to allow users to design and build their own living solutions. With the growing concerns about environmental degradation, resource deficiency, there are concerns about whether the needs of the people using the design are more important than the landfills being created or water bodies being polluted. Can architects, designers, manufacturers keep on keeping the "user" in the center or the environment be kept in the center? This session shall provide a platform for discussion and debate on human centric design, case studies, need or concerns to move towards environmental design.	THEMATIC SPEAKER: **Professor Helen Lochhead,** Dean, Faculty of built environment, University of New South Wales MODERATOR: **Professor Manoj Mathur,** School of Planning and Architecture, New Delhi SPEAKERS: **Ar Ravindra Punde,** Co-founder, Design Cell **Ar Ayush Chauhan,** Co-founder, Quicksand **Ar Amritha Ballal,** Founding Partner, SpaceMatters **Ar Annkur Khosla,** Annkur Khosla Design Studio Q & A session
Felicitation of GRIHA patrons	***17:25-17:30*** ***Venue – Juniper***
Thematic Track 14 – Water Stress: Perplexing Possibilities	**15:45 – 17:30** **Venue - Jacaranda**
Water scarcity affects more than 40% of people around the world, an alarming figure that is projected to increase with the rise in global temperatures. Qualitative and quantitative water stress results in increasing droughts, declining quality of groundwater and unabated flooding. Therefore, effective and sustainable management of water resources in order to increase water supply and manage demand under stressed water availability condition is essential to sustainable development. National policy level interventions over the past few years have been critical to integrate water resource management & help conserve water, minimize waste and ensure proper distribution of water within the country. Water, being an integral part of the construction, and operations of the built environment, is a crucial aspect of the conceptualization, design, and execution of the construction projects. This session shall provide a platform for various agencies to come together & discuss the challenges, probable solutions to ensure rapid dissemination, appropriate adaptation of water resource management in the built environment, which is key to strengthen water security.	THEMATIC SPEAKER & MODERATOR: **Professor Greg Leslie,** Acting Director of the UNSW Global Water Institute; & Director of the UNESCO Centre for Membrane Science and Technology SPEAKERS: **Professor Arun Kansal,** HoD and Professor, Department of Regional Water Studies, TERI University **Ms Tushara Shankar,** GM/Head- CSR at United Breweries Ltd **Professor Hina Zia,** Department of Architecture, Jamia Millia Islamia University Q & A session

Thematic track 15: Health and well-being in the urban environment	**15:45 – 17:25** **Venue - Tamarind**
The evidence base exploring the linkages in cities between natural and built environments, and the health and wellbeing of those living in them continues to grow, aided often by increased digitization of health and environmental data. Feedback loops and co-benefits of creating sustainable cities and opportunities to increase health and wellbeing have been characterized and continues to be measured. This has opened up new opportunities for intervention through planned designed, especially when considered through the combined lenses of increasing incidence of non-communicable disease in both high and low to middle income countries, increases in urbanization, and climate change. The opportunities to remodel and design cities to be sustainable, with these new characteristics in mind, will lead to the better health and wellbeing of those domiciled in them.	THEMATIC SPEAKER & MODERATOR: **Dr Nicholas Osborne,** Senior Lecturer, School of Public Health, Faculty of Medicine, University of New South Wales SPEAKERS: **Assoc. Professor Melissa Hart,** Graduate Director, ARC Centre of Excellence for Climate Extremes, University of New South Wales **Professor Vivekanand Jha,** Executive Director, The George Institute for Global Health, India **Dr Mohan K Dongare,** Scientist, National Chemical Laboratory, Pune **Mr Sanjeev Karpe,** Founder Director of Konkan Bamboo & Cane Development Cente Q & A session
Felicitation of GRIHA patrons	***Venue – Tamarind*** ***17:25 – 17:30***
Thematic track 16 – Market and legal perspectives	**Venue – Amaltas** **15:45 – 17:30**
The built environment industry is made up of multiple players, including owners, developers, designers, agents, builders and subcontractors, who work on projects with lengthy lifecycles, which sometimes span over years, which are in turn embedded in legal frameworks. Alongside a rapidly changing environment, stakeholder expectations are shifting: increasing disclosure requirements from investors, greater public awareness of the issues and impacts created by the property and construction industries, and the uptake of international frameworks such as the United Nations Sustainable Development Goals (UN SDGs), are catalysing conversations among stakeholders and within organizations about how they should respond appropriately to material sustainability issues through the developments they create. Many of the SDGs explicitly call for changes to the laws, policies and practices of governments, business and communities to rapidly progress that transformation. All countries have adopted these non-binding goals and many are taking steps to meet them but often in ways that are disjointed or uncoordinated, reducing the impact of that legal, policy or market-based action. Such actions also face political, cultural, economic, financial, educational and technological challenges. This track discusses some of the financial market, legal and policy mechanisms that promote sustainability.	THEMATIC SPEAKER & MODERATOR: **Dr Maria Balatbat,** Senior Lecturer; Joint Director (UNSW Business School), Centre for Energy and Environmental Markets, University of New South Wales SPEAKERS: **Mr Christopher McElwain,** Faculty of Law, University of New South Wales **Ms Xinyi Geng, Researcher,** UNSW Business School), University of New South Wales **Ms Manju Menon,** Program Director (Environment Justice), Namati **Mr Sunil Agarwal,** Associate Dean & Director - School of Real Estate (RICS) & Managing Director, Black Olive Ventures Pvt. Ltd. **Mr Pavel Singh,** Saint Gobain PPB Q & A session

Awards ceremony and cultural evening	**Venue - Stein auditorium** **17:45 onwards**
Welcome remarks - **Dr Ajay Mathur,** President, GRIHA Council and Director General, The Energy and Resources Institute Special remarks - **Mr Laurie Pearcey,** Pro-Vice-Chancellor (International), University of New South Wales Special remarks – **Dr Alka Bhargav,** Joint Secretary & Mission Director, National Bamboo Mission Special Remarks - **Ms Koyal Rana,** Femina Miss India 2014 Exemplary performance awards ceremony Vote of thanks - **Mr Sanjay Seth,** Chief Executive Officer, GRIHA Council & Senior Director – Sustainable Buildings Division, The Energy and Resources Institute (TERI) Cultural evening	
Cocktails & Dinner	**19:00 onwards**

Day 3

International Conference on Building Energy Efficiency Transformation

13th December 2018

Venue – The Ashok, New Delhi

Registrations	09:00 – 09:45
Inaugural Session	09:45–10:30
Lighting the lamp WELCOME ADDRESS India: **Dr Winfried Damm,** Head of Indo-German Energy programme, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH CURTAIN RAISER ADDRESS: **Mr Abhay Bakre,** Director General, Bureau of Energy Efficiency VOTE OF THANKS: **Mr Saurabh Diddi,** Director, Bureau of Energy Efficiency	
Plenary Session 3: Connecting the Past with the Future	**10:30 – 11:30**
Architecture as a discipline is continuously going through evolution, reimagination, and transformation. The architecture in India has vestigial influences of the British and Mughals stay in the country. Throughout the years, the impact of modern technologies also became visible on the buildings. However, passive features and climate responsive design have always been integral to the design. The challenges of urbanization in the country are manifold and exaggerated by the threats of climate change, and depleting resources. Climate responsive design is often not being given priority as meeting with the rising energy demand from a building due to increased dependence on mechanical systems for thermal and visual comfort, erratic weather patterns, evolving demands and requirements of the clients. The problems and complexities faced by the architectural practice are far more perturbing and challenging today; and designers have to respond to the changing requirements, parameters yet keep a hold on the timeless knowledge of constructing right distilled from years of wisdom. This session shall be a platform for the deliberations on how the architects are striking a balance between climate responsive design and intelligent, mechanical system driven design.	MODERATOR: **Mr Ashok B Lall,** Principal, ASHOK B LALL ARCHITECTS SPEAKERS: **Professor K T Ravindran,** Academic Advisor, RICS School of Built Environment, Amity University **Mr Sanjay Prakash,** Principal Consultant, Studio for Habitat Futures **Ms Moulshri Joshi,** Founding Partner, SpaceMatters Q & A session
Tea/Coffee Break	**11:30 – 12:00**
Thematic track 17– Policy, Regulations and Enforcement	**12:00 – 13:30**

Robust policies, action plans are impactful mechanisms to inculcate energy efficiency at various levels. Various standards and labeling programmes for equipment, appliances; Energy Conservation Building Code. Policies corelate the climate change issues and their impact on the national economy and society with an emphasis on energy efficiency, if implemented well. Community engagement, adequate humans and material resources bridge the gap between policy creation and implementation. The impending sense of doom due to global warming, disturbed weather due to climate change requires dedicated action plans, strategy documents to execute the policies derived from the SDGs, and other global agendas. Additionally, a more dynamic and evolved outlook is required towards policy formulation. The deliberations in the session shall focus on the policy framework for energy efficiency in the country, execution mechanisms, challenges and issues.	MODERATOR: **Mr Markus Wypior,** Deputy Cluster Coordinator GIZ IGEN SPEAKERS: **Mr Saurabh Diddi,** Director, Bureau of Energy Efficiency **Ms Henriette Færgemann,** Counselor Environment Energy & Climate Change at EU Delegation to India **Mr S P Garnaik,** CGM (Tech), Energy Efficiency Services Limited (EESL) **Mr Stefan Horschler,** Buofur Bauphysik Q & A session
Thematic track 18: Building Financing & Business Models	**12:00 – 13:30**
Climate change mitigation and adaptation makes a compelling global case for action; however, it is clear that an effective response still require enormous levels of investment. The low carbon growth planned at a global level to mitigate climate change requires financing opportunities, which are often constrained leading to requirement of innovative financing mechanisms to keep fueling the growth with reduced investment requirement. With the passing years, decisions are made that will lock the world in to high carbon development paths for years to come. The International Energy Agency has predicted that without concerted push from policy, 2/3rds of the economically viable potential to improve energy efficiency in buildings will remain unexploited by 2035. New forms of policy support, new institutional arrangements, new forms of finance, and new business models are therefore required if the energy efficiency opportunities in buildings are to be exploited. The deliberations in the session will revolve around building financing, business models, energy economics and affordability.	MODERATOR: **Mr Saurabh Kumar,** Managing Director, Energy Efficiency Services Limited SPEAKERS: **Ms Sandra Soares Da Silva,** Head of Energy Cell, KfW **Mr Monu Ratra,** ED & CEO, IIFL Home Finance Ltd. **Mr R V Deshpande,** DGM, Builder Finance, SBI **Ms Apurva Chaturvedi,** Sr. Clean Energy Specialist, USAID/India Q & A session
Lunch	**13:30 – 14:30**
Key note address 3	**14:30-15:00**
Scientia Professor Veena Sahajwalla, Dean, Faculty of Built Environment, UNSW Sydney and Director, Centre for Sustainable Materials Research and Technology, UNSW, Australia ARC Laureate Professor Veena Sahajwalla is revolutionizing recycling science to enable global industries to safely utilize toxic and complex wastes as low cost alternatives to virgin raw materials and fossil fuels. As Founding Director of UNSW's Centre for Sustainable Materials Research and Technology, Veena and her team are working closely with industry partners to deliver the new science, processes and technologies that will drive the redirection of many of the world's most challenging waste streams away from landfills and back into production; simultaneously reducing costs to alleviating pressures on the environment.	

Thematic track 19– Emerging Building Technologies	**15:00 – 16:30**
The advancement in the construction industry is strongly being witnessed in the emerging new building technologies, practices and techniques. Advanced technologies have been introduced from manufacturing industry with their concepts and methods to improve quality and productivity such as industrialization, prefabrication modularization, mechanization, automation and computerization. However, the uptake of such technologies is considerably slower primarily due to lack of trained man power, the acceptance by the market forces, the lack of policy mechanisms supporting the same. This session shall focus on deliberations on the emerging building technologies, the issues, challenge and way forward.	MODERATOR: **Mr Pramod Adlakha,** Managing Director, Adlakha Associates Pvt. Ltd SPEAKERS: **Mr S Vikash Ranjan,** Programme Manager – EEB, IGEN- GIZ **Ms Camille Sifferlen,** Certified Passive House Designer, Trainer and Building Certifier, Passive House Institute **Mr Harish Borah,** Consultant, ADW Developments **Mr Shailesh Ranjan,** Head – Business Planning & Operations, Asahi India Glass Ltd Q & A session
Thematic track 20– Advancements in Building Optimization	**15:00 – 16:30**
Smart / intelligent buildings, cognitive computing, Internet of Things are few of the highlighted terms as the building industry progresses towards real time data for productivity, convenience and sustainability. Additionally, building simulation is dynamically evolving to model, and predict a building's thermal, visual and acoustic performance beforehand to help it further optimize. Leveraging digital advancements is opening new avenues and proving beneficial to all stakeholders. Furthermore, it is integral to bridging silos of various component of building industry, green buildings, government initiatives, organizations, facility management agencies etc. This session shall focus on advancements in building optimization, challenges and barriers, and ways to scale up.	MODERATOR: **Mr Anurag Bajpai,** Director, GreenTree Building Energy Pvt Ltd SPEAKERS: **Mr Rohit Chasta,** Senior Engineer, Energy Efficiency, International Operations, Schneider Electric **Mr Dhiraj Wadhwa,** Director – Integrated Solutions & Key Accounts, United Technologies - Climate, Controls & Security **Mr Deepak Shapeti,** Director, Ignis IT and Rupak Group Q & A session
Tea/Coffee Break	**16:30 – 16:45**
Valedictory session	**16:45 – 17:45**
Vote of Thanks: Dr. Winfried Damm, Head of Indo-German Energy programme, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH	

PRELUDE EVENTS

Sustainability – A way of Living, November 1, 2018

The first prelude event in the run-up to the 10th GRIHA Summit titled 'Sustainability—A Way of Living' contemplated on new ideas and life of certain people who proactively practice sustainability as a way of life. During the course of the discussion, moderated by Ar. Gaurav Shorey, the panelists shared their journey towards sustainability, their struggles, successes, and the lessons learned which led them on the path of peace, knowledge, and adventure.

Ar. Gaurav Shorey, Founder Member, Swaraj & Managing Director, PSI Energy, in his thematic address, recalled his first meeting with the speakers and stressed on the importance of practicing sustainability. He explained how 'nurturing nature' has been integral to practicing religious convictions in India. He revealed how work of individuals has epitomized spirituality in India and made the audience aware of the grave danger being faced as a result of deterioration of the environment.

"Faith will teach you patience
or patience will teach you faith."
– **Ar. Gaurav Shorey**

When asked to share his story, **Prabhu Gaurang Das**, Director, Govardhan Ecovillage, spoke about the Cobra Effect—when looking at a solution that is not holistic for a problem, the solution identified could have a worse effect than the actual problem. Sharing his journey on how he became part of the Govardhan Eco-village project, he stated that a polluted conscience creates a polluted environment while a pure conscience creates a pure environment, free from the desire of exploitation. He detailed on the importance of harmony with oneself and with nature in order to create a pure environment.

"A peaceful consciousness will
create a peaceful environment."
– **Prabhu Gaurang Das**

Rev Father Stanley, Director, Ish Vatika, explained how being a student of clergy is important for bonding with nature. He described the inspiration behind the construction of Ish Vatika, a place where people can visit, pray, and spend time to attain inner peace and spirituality. Father Stanley spoke about the challenges faced during the nascent stages of establishment of Ish Vatika and added how hope kept him going strong. He quoted his source of inspiration as Pope Francis, "People have lost connect with nature" and took inspiration from it. He mentioned how he went to Narmada to learn Nachiko farming, where he realized that everyone has a right to live, including insects. He further enunciated his vision of making Ish Vatika into an urban forest. He concluded by mentioning that nature has taught him a lot of things and his learning continues on a daily basis.

"I am generally very fast but Ish
Vatika has taught me to be slow."
– **Rev. Father Stanley**

Ar. Ashok B Lall, Principal Architect, Ashok B Lall Architects, started by stating that everything is about the state of mind that produces purposeful actions. He walked the audience through his journey of practicing sustainable architecture. He added how as a professional he has conducted his life to build knowledge and devoted his energy towards the most pressing issue of the society. He emphasized on the problems of urban densification, ways to recycle waste, meeting the increasing energy demand as well as provision of affordable shelter.

"I think it's about the state of mind
that promotes purposeful action."
– **Ar. Ashok B. Lall**

Addressing the question on partnership and collaborations, **Mr Sanjay Seth**, CEO, GRIHA Council, said that GRIHA does not need to create different variants for different kinds of buildings. He highlighted that the GRIHA rating is identified as credible, honest, and completely transparent. Furthermore, he spoke about the transition he has made in his journey while working for both the government as well as the private sectors.

Ar. Gaurav questioned the panelists on the mainstreaming of spiritual education and the strategies for the same. Prabhu Gaurang Das answered by saying that Saraswati (The Hindu goddess of Knowledge) in India is still not free. He mentioned how education has been made simply by accumulation of facts and data and that stress is the gap between expectation and reality. He emphasized on the importance of education based on values, by reminding the audience of how India has been an economic superpower for 1800 years and ancient Indian cities were based on values and Sanskriti (I grow by serving you) along with a connection with Prakriti (Nature). He warned that if we keep treading on this path of education without values it is going to be detrimental for us in the long run. Adding that to be sustainable we do not have to look at the west but have to look at our past. Further stating that growth and development should not be seen only in terms of economic benefits but the experience it adds to our lives, he also explained the importance of the family unit in India. Stressing on the importance of values and culture he suggested that faith groups may not contribute towards the GDP but add value to individuals in our society. He concluded by saying that having a sustainable conscience, one can create an economy/ eco-system that is sustainable for life. The session concluded with a vote of thanks to the entire panel.

Insight 360 Workshop by Autodesk – November 16, 2018

As one of the preludes to the 10th GRIHA Summit, a technical workshop on 'Autodesk Insight 360' was organized on November 16, 2018, at TERI. The objective of the workshop was to provide participants with the basic knowledge on the Insight 360 software along with hands-on experience.

Insight 360 is an architectural design and simulation software application created by Autodesk for architects, building professionals, and energy simulation professionals. Insight 360 instantly reveals a range of millions of potential design scenarios at the users' fingertips, visualizing the impact of orientation, envelope, WWR, lighting equipment, schedules, HVAC, and solar PV on energy consumption.

The workshop covered a presentation by Mr Devansh from Autodesk on the software and the benefits of using it for design projects. This was followed by a hands-on training session where the participants were made to work on the Insight 360 software. The workshop was well-attended by students and professionals from architecture, engineering, and related fields.

Mud Workshop by Ar. Revathi Kamath – December 1, 2018

Of all natural construction material available, mud has been the most essential since centuries. Mud brick is a locally available and affordable material with a very low carbon footprint. In this age, where unsustainable practices are being adopted in the construction industry, creating awareness about the potential of mud as a green building material is necessary.

A one-day mud workshop was conducted with the intent of providing participants with the requisite knowledge to evoke their sensibility towards the benefits of using mud in construction. The workshop

commenced with a presentation by Ar. Revathi Kamath explaining some facts and properties of mud as a sustainable building material. She also shared her experience of working in mud architecture. Ar. Kamath also showcased some case studies of project she was involved in. The presentation was followed by a hands-on workshop where the participants were given the opportunity to make mud stabilized bricks using four types of mud.

The workshop was attended by 45 participants comprising of architects, consultants, and academicians, and others. The participants were made to understand the methodology of soil testing and given a hands-on experience in making bricks from the pioneer of mud architecture in India. The workshop was highly informative and very well received by the participants.

Panel Discussion: Is inclusive growth achievable by 2030? –December 3, 2018

The session commenced with a welcome address by Mr. Sanjay Seth, CEO, GRIHA Council with a brief introduction on the importance of inclusive growth in the current scenario.

Mr Jacob Koshy, Deputy Science Editor, The Hindu, initiated the discussion by introducing the panelists and the topic for discussion. He stated that 2030 is a significant year for sustainable achievement and meeting the Sustainable Development Goals (SDGs). He also walked the audience through the evolution of the Millennium Development Goals (MDGs) in 2000 and how effectively it was achieved in the past years by both developed and developing countries. Pondering on how we all live in testing times of significant progress, he questioned the panel on "What these goals have enforced in our country and how effective are we in addressing the same?"

Dr Ajay Mathur stressed on the fact that India is as much a partaker in SDGs as any other country. He added that India has always been at the forefront in achieving these goals as they are aligned with those of the government and ministries in India. He stated that a national agenda is as crucial as a global agenda along with due ownership of the same. He mentioned that there is no ambiguity in the goals, but in the means to achieve it.

> "There is no point in having global agenda, and not a national agenda. Then the ownership of the agenda is lost"
> – **Dr Ajay Mathur**

Mr Atul Bagai, Country Head of UN Environment in India, discussed the challenges and differences in the run towards the 2015 and 2030 goals. He suggested that finances are as crucial in achieving the 2015 targets as the goals associated with them and added that differential responsibilities were always debatable in both the cases stressing that developed and developing countries will come together to address these issues in the future.

> "Decentralized participatory approach is keen and the mean to achieve sustainable goals"
> – **Mr Atul Bagai**

Mr Koshy enquired about the key strategy that the country has to adopt for achieving the sustainable goal(s). **Dr Winfried Damm**, Head of Indo-German Energy Programme, GIZ, remarked that political will and good governance is the way forward, adding that India does not lack high-tech solutions or technical efficiency for its progress.

> "Political will and governance is key to achieving India's target towards sustainability goals"
> – **Dr Winfried Damm**

Professor Kavas Kapadia, Former Dean of Studies and Head Department of Urban Planning, School of Planning & Architecture, explained that if inclusiveness is not interpreted correctly, it would be counterproductive, thus suggesting that key indicators such as economics, agriculture, urban population, informal section, and its close links with

poverty have to be reviewed. He commented on the paradoxes of the national standards against the people's mindset illustrating with how despite relatively low FSI values in India, there is constant overcrowding in housing, public transport, etc. He concluded by saying that the "The biggest victory is in changing the mindset".

Speaking about the institutionalization of ideas for workability and the necessity of public participation, Mr Bagai stressed on the challenges of social engineering. He added that a decentralized participative approach is critical. Dr Ajay Mathur further emphasized the need for a participatory while referring to the challenges encountered by the standards and labeling programme in its introductory phase. He described how the programme picked up momentum after addressing that the Indian consumers are not only cost sensitive but also value sensitive. He emphasized on the need for communicating the values brought by the use of a more sustainable option brings to the consumers.

Mr Saurabh Kumar, Managing Director, Energy Efficiency Services Limited, New Delhi. expressed optimism about India's progress in achieving 'energy for all' and 'clean electricity' adding that renewables are the perfect solution for an easy, affordable energy source in the future adding how civil society discussion combined with political will paves the way forward. He further enunciated how the 'Saubhagya Scheme' has addressed the issue of inclusiveness and redefined village electrification, thus ensuring uninterrupted energy to common village facilities in response to the integration of inclusion in the electrification agenda.

Mr Kapadia stated that SDG number 11—Sustainable Cities and Communities—cannot be seen in isolation adding that they are intertwined and tricky to establish in a country of paradoxes which believes in both mythology and technology. Stressing on the need to inculcate energy efficiency in mass housing, he remarked that, besides the market, there is a design element attached as well. He illustrated the difficulties faced in the Dharavi (Mumbai) project insofar as how shifting the informal section from the ground to an elevated platform created issues. In response to how far cultural factors affect the journey towards SDGs, Mr Bagai said that while the problem is understood the gravity is not realized unless it directly affects the individuals, further stressing that the cultural factor cannot be a trade-off as SDGs stress on cultural preservation.

Summarizing the panel discussion, Mr Kumar stated that inclusive growth is achievable but is subject to certain redefinition. Mr Kapadia stressed on the importance of social engineering and quoted that, "India is an open society with closed minds while China is a closed society, with open minds". Mr Bagai stressed that monitoring is essential to verify the progress. Dr Damm remarked that "We are not on track and more ambitious goals are needed". Dr Mathur concluded by saying, "At global level all the goals will be achievable at the Indian level, 7 goals are achievable".

AAKAAR GRIHA Green Exhibition— December 5, 2018 to December 22, 2018

"AAKAAR—"Reshaping self for sustainable future", a GRIHA exhibition was set up to provide a platform for the users and the industry to experience various tools and technologies available in the building industry to make informed decisions for various choices in the built environment. Augmented and virtual reality tools help enhance the user experiences and assist them in selecting materials or any other systems based on their virtual experience and thereby saving capital costs. Along with augmented reality tools 'Sustainability one-on-one'- technologies and ideas were displayed to describe how affordable is a sustainable lifestyle.

AAKAAR GRIHA Green exhibition at the 10th GRIHA Summit

Site Visit at British School (5 star GRIHA Certified project) – December 8, 2018

As a prelude to the 10th GRIHA Summit, the GRIHA Council had organized a 'Green Building Tour' to a five-star GRIHA certified school in New Delhi on December 8, 2018. The tour demonstrated those green innovations that have been incorporated in the building design. It was an exciting opportunity to explore green buildings and help create awareness about the importance of going green. Delegates were able to familiarize themselves with various green building strategies integrated in the school as a case study for their reference. The site visit helped to disseminate knowledge and create awareness on sustainable habitat.

The delegates also experienced the school in virtual reality and augmented reality as 3D models.

CURTAIN RAISER

The curtain raiser to the 10th GRIHA Summit, based on the theme 'Fostering Partnerships for Sustainable Habitat', commenced with lighting of the ceremonial lamp by the dignitaries. The collaborative efforts of the GRIHA Council and University of New South Wales (UNSW), Australia, focused on education and research for linking the social, economic, political, and environmental concerns as crucial aspects of sustainable development.

Dr Ajay Mathur, President, GRIHA Council and Director General, The Energy and Resources Institute, in his welcome address, at the curtain raiser and inauguration, expressed his delight in partnering with the UNSW for the 10th edition of GRIHA's flagship event. Stating the similarity between India and Australia's climate, he commended Australia as the only country with an active building energy efficiency programme and stressed on the huge potential for learning as India moves towards a future where there would be more air conditioned buildings than non-air-conditioned buildings. He mentioned that the number of air conditioners sold during 2010–2017 doubled and is further expected to rise at an accelerated rate. He emphasized on the need to design building envelops with appropriate shading devices to prevent these from becoming a heat trap and therefore, leading to increased cooling load. He concluded by stating that such partnerships would help India as a country to advance by learning from the examples and best practices available.

> "The utilization of electricity in India is going to expand in the coming years and air conditioning sector is going to add to the maximum"
> – **Dr Ajay Mathur**

In his welcome address, **Professor Ian Jacobs, President and Vice-Chancellor, University of New South Wales (UNSW), Sydney, Australia**, was delighted that the UNSW and GRIHA Council co-hosted and co-created the 10th GRIHA Summit. He mentioned how the event attracts different leaders from sustainable habitats, experts from industries, government, academia, finance, and policy consumers and many other delegates around the world. At UNSW, great emphasis is laid towards fostering partnerships and also congratulated the GRIHA Council for a decade of establishment of being an invaluable commitment to the community. He said that collaboration of this kind is needed in the world and especially for India to achieve the government's aim of providing affordable housing to all citizens by 2030. He added that the ability to develop environmentally and economically-sustainable housing solutions at scale is an ambitious goal and is worthy of focus. He applauded India's commitment to green buildings through renewable energy and also appreciated TERI's role in providing clean energy, water management, pollution management, sustainable agriculture, and

> "India's commitment to green buildings and clean energy is to be applauded"
> – **Professor Ian Jacobs**

"UNSW shares the view that the government and research institutions are natural partners so as to maximize our impact on the communities we serve"
– **Professor Ian Jacobs**

climate resilience.

Mr Abhay Bakre, Director General, Bureau of Energy Efficiency, in his special remarks, congratulated TERI, GRIHA, and the UNSW for their partnership as part of the 10th GRIHA Summit. He stated the astounding amount of energy that would be consumed by the buildings sector in the years to come and went on to mention that the cooling demand today stands at around 110–120 GW and would increase to about 360–390 GW by 2030. He went on to inform the BEE's clear mandate in terms of building efficiency and the steps taken towards building partnership between the central and state government. He went on to add that the demand on energy will be huge if energy efficiency in buildings is not adopted and stressed that the greater responsibility lies with the architects' fraternity where they need to consider parameters, such as envelope design, shading/insulation and material selection such that it does not harm the environment. He also emphasized on the point that users are aware that high efficient systems are expensive but at the same time they come with a payback period of less than 2 years. Mr Bakre concluded by stating that GRIHA is one the most recognized and efficient certification bodies.

The inaugural session observed the release of GRIHA's Vision Statement—'We, at GRIHA Council, stand for credibility, integrity and inclusiveness, while upholding Indian ethos for future-ready and sustainable habitat.'

The inaugural session also witnessed the launch of GRIHA's website. The website is now more user friendly and informative with details about all the upcoming events and training programmes, GRIHA variants, manuals, GRIHA Community, product details, and various other features.

The 'GRIHA for CITIES' rating was launched as a framework for sustainable cities. The rating sets performance benchmarks for resources, such as energy, water, and waste and evaluates the projects' performance in areas, such as smart governance, social well-being, and transportation.

The event also witnessed signing of the memorandum of understanding (MoU) between the Global Association for Corporate Services and the GRIHA Council by Mr Sameer Saxena and Mr Sanjay Seth respectively.

In her special address, **Ms Harinder Sidhu, Australian High Commissioner to India**, highlighted the similarities between India and Australia and how the two countries have to deal with similar challenges in terms of diverse climates from dry deserts to tropical rainforests, abundance of sunshine, and limited water resources. She added that while the image of Australia is one with a limitless horizon, it is a highly organized country and the cities, like those of India, are a magnet for migration. She stated that Melbourne with a population of 5 billion might grow to about 12 billion till 2026, indicative of rapid urbanization and highlighted that India is no exception as the Minister for Urban Development, Government of India, often quotes, 'The cities are the engine of growth and they can be places of opportunities and hope', and in case of Australia, it is quite true as three quarters of Australia's population resides in cities and generates 80% of the country's gross domestic product (GDP), thus leading as drivers of economic development. Since India is growing rapidly, making cities sustainable and livable is imperative, and in order to achieve this, government and community collaboration is crucial. She reiterated on how urban planners should consider a range of factors, such as the quality of services in the form of power, water, waste management, and transport. She stated that each of these decisions affects sustainability and livability as well

"The greater responsibility lies with the Architects fraternity where they need to consider parameters such as envelope design, shading/insulation, material selection so that it harms less to the environment."
– **Mr Abhay Bakre**

> "The main aim is to make cities more and more sustainable and as the cities grows, urban planners need to be specific at the quality of service like utilization power, land use pattern and green space."
> – **Ms Harinder Sidhu**

as the economic success of the city and its inhabitants and was pleased to know that the UNSW is working with the GRIHA Council to share and learn sustainability.

In his vote of thanks, **Mr Sanjay Seth, Chief Executive Officer, GRIHA Council & Senior Director—Sustainable Buildings Division, TERI,** expressed his gratitude to the dignitaries at the dais, officials from various government departments, UNSW, BEE, GIZ, TERI, all the partners, stakeholders, and everyone present for taking out time to be present for the inauguration of the 10th GRIHA Summit, a significant milestone in the summits organized by GRIHA. He added that successful partnerships are based on inclusive principles and values, a shared vision and goals.

> "The cities are the engine of growth, they can be places of opportunities and hope."
> – **Ms Harinder Sidhu**


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DAY-1

Setting the Theme

Dr Ajay Mathur, President, GRIHA Council and Director General, TERI, in his welcome address, at the 10th GRIHA Summit, explained the concept behind the theme of the summit, 'Fostering Partnership for Sustainable Habitat'. Stressing on the importance of partnerships for future development of India, he expressed his gratitude towards the University of New South Wales (UNSW) Australia, for collaborating with the GRIHA Council to co-host the 10th GRIHA Summit remarking that, UNSW runs various research and regulation programmes in the area of energy efficiency of built environment; and how experts from the University will share their views, during the 3-days of the summit. Buildings which have already reached and exceeded the GRIHA benchmarks were commended for setting the path for upcoming buildings and an appeal was made to the municipalities of developing countries (with different climatic zones) to adopt energy conservation code to ensure energy efficiency in future. Dr Mathur summed up by stating the importance of community gatherings such as the GRIHA Summit and their significance in knowledge exchange between stakeholders, to build new partnerships to accelerate green building movement in India.

Professor Jacobs, President and Vice Chancellor, University of New South Wales (UNSW) Sydney, Australia, in his special address, expressed gratitude and extending partnership to co-host the 10th GRIHA Summit with GRIHA Council. He appreciated the leadership and support extended by the President and CEO, GRIHA Council, towards achieving sustainability goals. Mentioning that at UNSW, a global university of Australia, they understand complex problems, such as climate change, energy security, energy efficiency, and the challenges of rapid urbanization, which cannot be resolved by working in isolation and hence have collaborated with various groups and organizations in India, such as TATA Group, Global University, GRIHA Council, and various startups, to achieve holistic development in the future. He informed that the UNSW has established their office in Delhi to extend the collaborations with the Government of India for smart cities, low carbon living, built environment, material and computer technology, etc. With an extensive experience of 40 years in research in solar photovoltaic, the UNSW is also extending support in the area with respect to energy generation and heating and cooling. He acknowledged the presence of the delegation from UNSW—Professor Helen Lochhead, Dean and Faculty of Built Environment, UNSW Sydney, for representing various departments of UNSW and actively participating and sharing their experience for the 10th National Summit. He concluded his address wishing the Summit a great success and looking forward for deeper involvement and further collaborations in India towards achieving sustainability goals.

> "Every new building that is being made is more efficient than the one made yesterday."
> – **Dr Ajay Mathur**

Dr Winfried Damm, Head, Indo-German Programme (GIZ) GmbH, reiterated on the need of collaboration and effectiveness of collectively working together and suggested a few solutions to cope with the rapidly

> "10th GRIHA Summit, is the event, which is a testimonial to India's embrace of collaborative partnerships."
> – **Professor Ian Jacobs**

increasing population and demand. He mentioned that as part of Indo-German Energy Programme, GIZ is associated with the Bureau of Energy Efficiency to run the Energy Conservation Building Code (ECBC) and Labelling Programme in India, towards achieving sustainability goals. He concluded his address by thanking the GRIHA Council and UNSW for coming together to provide a platform to have joint learnings, interesting discussions, and exchange of ideas to deliberate for a better future.

The event also witnessed the launch of the ***Materials Handbook on Sustainability***, developed by the GRIHA Council and BMTPC (Building Material & Technology Promotion Council), for building materials and technology promotion as a guide for the selection of sustainable building materials and technology for stakeholders.

The GRIHA projects rated in 2018 were awarded with their plaques by the dignitaries under the different variants of GRIHA.

In his vote of thanks, **Mr Sanjay Seth, CEO, GRIHA Council,** acknowledged all dignitaries, delegates of UNSW, officials from Bureau of Energy Efficiency, GIZ, all partners, sponsors, organizers at GRIHA Council and TERI and the participants. Reiterating the fruitful and stimulating sessions towards understanding future development and widening the GRIHA footprint in India, he urged everyone to participate in the summit.

> "Rapid change is the only solution to cope up with limited resources available, which may last for the next 10 years only."
> – **Dr Winfried Damm**

Plenary Session 1 – Fostering Partnerships for Sustainable Habitat

THEMATIC SPEAKER

Mr. Laurie Pearcey, Pro-Vice-Chancellor (International), University of New South Wales

MODERATOR

Mr Atul Bagai, Country Head of UN Environment in India

SPEAKERS

Mr Aditya Bhutani , Director and COO - AIS-GLASXPERTS

Professor Dr N K Bansal, Sintex Chair Professor, CEPT University Ahmedabad

Mr Sanjay Seth, CEO, GRIHA Council

The session focused on possibilities of creating links and a deeper, more ambitious way of thinking about sustainability while retaining a commitment to critical analysis and fostering creativity and innovation.

Mr Laurie Pearcey spoke about a replica of Mahatma Gandhi's iconic spectacles, made on a 3D printer entirely from recycled material, developed by UNSW at its first micro factory in Sydney. In his showcase of how e-waste micro factory transfers toxic e-waste into range of valuable products, such as pigments of 3D printers, he suggested that this technology can be used for the Swachh Bharat Abhiyan of the Government of India.

Mr Pearcey indicated the value of innovations which

> "We are slowly turning the corner, creating threads, connecting science to bring innovations to weave a sustainable future for tomorrow."
> – **Mr Laurie Pearcy**

though simple are potentially quite transformative. He mentioned that the 3D printed glasses were then presented by the Australian Prime Minister to the Prime Minister of India during his formal landmark visit to India in April 2017. The knowledge exchange workshop at Sydney researched the applicability of UNSW's work in urban heat management in the Indian urban context in turn finding solutions for smarter cities as well as how best practices can be shared. He expressed his admiration towards the innovations in India with their approach to design and also emphasized on the need for making knowledge and learning accessible to all.

Further, the session focused on the possibilities of creating such links and a deeper, more ambitious way of thinking about sustainability while retaining a commitment to critical analysis and fostering creativity and innovation.

Mr Sanjay Seth discussed the demand created by the

consumer and the change in the developing market. He stated that unless the consumer demands for sustainable buildings, the market for the same will not be developed. With a shortage of 18 million houses, he added that an innovative plan is required such that the consumer demand is met and developers have to adopt sustainability. He added that the myth that 'sustainable is not affordable' has to be debunked by using platforms, such as the Bureau of Energy Efficiency (BEE).

Mr Aditya Bhutani continued the discussion about

consumer demand in relation with the growing market. While the consumers are not in a position to demand sustainability, he suggested that the consumers and end users are moving towards sustainability. Further, he said that India is too far behind European countries, where green parties are driving the political and economic agenda.

Professor Dr N K Bansal stressed the need for

> "Decentralization can help to address rising demands of future development."
> – **Mr Atul Bagai**

decentralization of industries to manage the urban surge. Emphasizing on the need for practical skill rather than academic syllabus, he added that the sustainable building habitat is itself a holistic subject and there is a need to update GRIHA rating with this change. Further, he suggested the need for efficient resource management to attract end users.

> "Awareness in the public has to be increased to have more demand for green development."
> – **Professor Dr N K Bansal**

Thematic Track 1: Sustainable Materials and Technologies

MODERATOR

Dr Shailesh Kr Agrawal, Executive Director, BMTPC

SPEAKERS

Dr Deepika Mathur, Research Fellow, Northern Institute, College of Indigenous Futures, Arts & Society, Charles Darwin Institute

Mr S Vikash Ranjan, Programme Manager – EEB, IGEN- GIZ

Ar. Pradeep Sachdeva, Pradeep Sachdeva Design Associates

Ms Megha Behal, Research Associate, Sustainable Buildings, TERI

This session contemplated strategies and research ideas from across the globe for recycling and reusing construction waste, a growing concern for majority of cities around the world. Eminent speakers from various areas of building development deliberated and shared their contribution in the field.

Dr Deepika Mathur enunciated various ways of managing waste in a small town like Alice Spring, Australia. While discussing the subject of waste management, she stated how construction waste, which amounts to about 25%–40% of the total waste, is largely ignored. Construction waste generation from a site is inevitable; however it can be managed if taken into consideration from the design stage. Waste is primarily the result of the design decisions taken during the initial phase of a project. She went on to suggest several solutions, as per available literature, such as design dismantling, sorting on site, using BIM to estimate the quantity of waste that will be generated, adding that client-driven design changes towards a later stage of project was also a major reason adding to the quantum of construction waste generated on site. Recycling as a potential solution was also suggested. However, till the time no research has been carried out to fix the desired percentage of waste material into the building construction material, this strategy is hard to adopt on a wider scale, further stating the benefits of recycling waste during the construction phase. Dr Mathur also stressed on the need to create awareness amongst designers and clients for early stage design decisions and collaborative contracts to share the benefits and risks involved.

Mr S Vikash Ranjan introduced ECO-NIWAS, a new web-based tool being developed in collaboration with Ministry of Power and Bureau of Energy Efficiency (BEE). Running through a comparison between AAC blocks and conventional bricks in terms of their life cycle cost and embodied energy, he elaborated that they are in the process of creating a directory of energy-efficient building materials along with their cost and its availability in the region which can be fed into the tool to analyse the buildings' life cycle cost as well as its embodied energy. A mapping plan is also being carried out for these materials wherein they will be conducting market research and a techno-economic analysis of these materials.

Ar. Pradeep Sachdeva reiterated on the need for out-of-the-box thinking to take sustainable construction to the next level. Further, suggesting the need to depart from resource-intensive buildings, he demonstrated some of his work along with those of many other architects highlighting the use of local materials, such as bamboo, timber, mud, thatch, jute, stones, etc., and adopting passive design strategies. Thus, suggesting that sustainable buildings can be designed and operated using natural and rapidly renewable materials, hence reducing the need for high embodied metals and materials.

> "Waste is inevitable, whatever we may do. Material cost is the least for the contractors in comparison to time and labour cost and thus is wasted considerably."
> – **Dr Deepika Mathur**

> "We need to be frugal for a sustainable future and have to shift our buildings from being extensively resource consuming."
> – **Ar. Pradeep Sachdeva**

Ms Megha Behal spoke about sustainable building materials and technologies in the context of social housing. She elaborated on the MaS-SHIP project funded by the United Nations Environment Programme (UNEP). The study focused on guiding developers to the kind of materials they should use while constructing houses. During the study, they evaluated about 17 building materials and technologies, out of which 12 are established while 5 are from the Building Materials & Technology Promotion Council's (BMTPC) material list on the basis of 18 attributes under the broad parameters, including resource efficiency, operational performance, economic impacts, and user experience. Under the study, a GIS-based mapping of various materials has also been undertaken.

Thematic Track 2: Policy Framework for Sustainability

MODERATOR

Mr Swayan Chaudhuri, Managing Director & CEO at Imagine Panaji Smart City Development Ltd.

SPEAKERS

Mr Swayan Chaudhuri, Director and CEO at Imagine Panaji Smart City Development Ltd

Dr Sarath Mataraachchi, Lecturer, Built Environment, University of New South Wales,

Mr Vijay Garg, President, Council of Architecture

Mr Kushagra Juneja, Cofounder, Design2Occupancy Services LLP

Setting the theme of the session, **Mr Swayan Chaudhuri** discussed how policy guidelines must be symbiotically connected at regional, national, and global levels. He emphasized on the need for strong and robust policies which are effective in the long term and are contextual to the society at this point in time. He concluded by stating that no city can be 'smart' without its smart citizens that can provide a sustainable policy framework.

> "The dynamics to tackle the national, city or urban level issues lies with strong policy framework."
> – **Mr Swayan Chaudhuri**

Dr Sarath Mataraachchi discussed the common expectations of the stakeholders, particularly the end users, from the policy framework perspective and how public participation is imperative in framing robust policies. He stressed on the fact that the emphasis of this process should be on mitigation and adaptation. He rightly pointed out to the fact that the built environment has enormous capacity to strive towards sustainability. He deliberated how stakeholder participation is essential and policy makers must devise ways to facilitate capacity building. He also urged the audience that the focus of capacity building should be directed to Tier 2 and Tier 3 cities in order to utilize their complete potential.

Mr Vijay Garg spoke about the need for post-construction assessment of infrastructure facilities and the need to assess the actual deliverance of the rated green buildings. He too stressed on the need for capacity building and creating awareness around cost-effectiveness of green buildings so that uptake of green building practices is upscaled. He stated that a regulatory framework needs to be in place which would focus on performance documentation, which should then be awarded and incentivized. He added that these regulations should help the stakeholders make informed decisions and be user friendly in order to be adopted by more. He advocated for parity between the existing green building rating systems for easier understating amongst the masses.

"The green building tag should be incentivized for the tax payers, thus increasing the demand for sustainable buildings."
– **Mr Vijay Garg**

Mr Kushagra Juneja began his address by discussing the complexity and diversity of existing policy framework and the challenges regarding sustainability. He stated optimistically that the government is supportive of these endeavours and has been incentivizing these as well. Appreciating the role of the GRIHA Council in implementation of the ECBC Code in several Indian states, he stated that the government can only provide the platform and the policies, but the impact it creates always depends on the end-users which is why localization of these implementation programmes is helpful and more effective.

"The government can only provide the platform & the policies, but the impact it creates always depends on the end-users."
– **Mr Kushagra Juneja**

Thematic Track 3: Air Pollution – A Call for Urgent Action

MODERATOR

Dr Sumit Sharma, Director, Earth Science and Climate Change, TERI

SPEAKERS

Mr R Suresh, Area Convenor, Centre for Environmental Studies, TERI

Mr Sunil Gulia, Scientist Fellow, CSIR-NEERI Zonal Laboratory Delhi

Ms Prarthana Borah, India Director, Clean Air Asia

Dr Sunita Purushottam, Head – Sustainability, Mahindra Lifespace Developers Ltd (MLDL)

This session contemplated the areas of research work done on indoor air quality as well as outdoor air quality of urban and rural areas and the people who proactively practice sustainability as a way of life. Eminent speakers shared various research and trends of air pollution over the decade in Delhi and of other places in India.

Dr Sumit Sharma stated how various particles and dangerous gases cause cancer to human beings as well as impact the heritage buildings. He further demonstrated a 20%–30% reduction in wheat production in the country due to the prevalence of a high amount of ozone. Thus, air pollution is not only

affecting humans, crops, and buildings but is also deteriorating the image of the city and the country worldwide. As per the standards of the World Health Organization (WHO), he further added that air quality in India is the worst. He described the tremendous measures taken in first half of the last decade, such as promotion of CNG gas for vehicles, biofuels, etc.; these however did not result in a reduction of particulate matter and as a result their concentration went up. The average levels of PM10 and PM 2.5 went over 250 mg/m^3 and 160 mg/m^3, respectively in the Delhi NCR region, with reasons ranging from agricultural residual burning in upwind states, increase of local air pollution sources, industries, crackers, etc., to accumulation of high PM. While there are many different sources of air pollution; the contribution from vehicles and industries stands at 30% and 35%, respectively; burning of biomass, coal and other banned fuels has also contributed to increased air pollution in Delhi NCR region. **Mr R Suresh** spoke about source management of various air pollutants, their administration, engineering, and indoor horticulture to improve the indoor air quality and detailed how inhaling bad air leads to loss of productivity. He added that volatile organic compounds (VOCs) in urban areas are more dangerous and it contributes 2.5 times more pollution than outside air. He mentioned that HVAC systems not being cleaned and maintained appropriately, parking areas near residential buildings, schools, hospitals, etc., are the cause of secondary air pollution, which aids in increase in carbon dioxide (CO_2) levels, relative humidity and temperature, etc.

Mr Sunil Gulia spoke about various monitoring points at the city level which measure the CO_2, PM10, and PM 2.5 levels across the city. Developed countries are going through more air pollution issues than developing countries and placing many monitoring stations helps in studying the current and past problems. Understanding current and past air pollution issues by setting up monitoring stations would help find the causes and, in turn, help mitigate these as well. Pointing to the increasing level of NOx in Delhi since 2003, he spoke about his research at various locations in the city as well as inside buildings to study the indoor air pollution levels. It was found that the ambient indoor air quality was below global standards with PM10 and PM 2.5 levels in indoor air nearly equal to outside air. VOCs, formaldehydes in building materials and carpets, and other building materials are primarily responsible for

> "The problem of air pollution is not just for developing world, but the only difference is that we have failed to tackle it."
> – **Mr Sunil Gulia**

indoor air pollution. Mr Gulia suggested the application of titanium dioxide as a measure for reducing indoor and outdoor air pollution.

Ms Prarthana Borah shared the details of her research work carried for indoor air quality in rural locations. She further added that air pollution is not an Indian problem. Ms Borah also discussed the research conducted to study indoor air quality in schools in four different cities to monitor PM in outdoor and indoor areas, such as playgrounds and classrooms. She informed that in upcoming smart cities, like Bhopal, monitoring stations would be installed to monitor and store data as well as engage with the public to improve air pollution.

> "We should not look at air pollution as environmental problem, but should look at it as a development problem."
> – **Ms Prarthana Borah**

Dr Sunita Purushottam shared her ongoing research on indoor air quality. She stated that clean air is a prerequisite of all occupants and therefore, Mahindra Lifespace is transforming urban landscape by creating sustainable communities and manufacturing 100% green products. She mentioned that garbage burning and vehicle emissions were the main cause for air pollution in urban sprawls and the contribution of non-polluting industries adding to the quantum of pollution generated by service industries. Stressing on the need for including mobility, waste management, and polluting industry regulation in planning of cities and urban areas, she concluded by adding that polluting industries should be segregated from residential areas and proactive measures should be taken to reduce air pollution.

Thematic Track 4: Inclusive Development

MODERATOR

Dr Renu Khosla, Director Centre for Urban and Regional Excellence

SPEAKERS

Ms Shelley Poticha, Managing Director, Healthy People & Thriving Communities Program, NRDC

Mr Christopher Samuel, Centre for Indian Bamboo Resource & Technology (CIBART)

Professor Arup Mitra, Professor, Institute of Economic Growth

Ms Swati Janu, Creative Director, mHS CITY LAB

Mr Sarnam Singh, Professor and Dean, School of Ecology and Environment Studies

As moderator of the session, **Dr Renu Khosla** gave a brief description of the current condition of Indian cities. Bringing in the people perspective, she explained how the ever-changing ecosystem of the city contributes to climate change. In this context, she reiterated on the need to appropriately design the ecosystem of Indian cities.

Speaking about climate change in the US, **Ms Shelley**

Poticha identified buildings and transportation as the two largest sources of carbon emissions. She added that the cities need to reduce building energy demand and vehicle mile travel, increase use of renewable energy, and use electric vehicles to reach the cities' climate goals. She added that cities will make an impact through a mix of policies and programmes.

Mr Christopher Samuel stated how inclusive growth benefits both peri-urban and urban habitats, adding that increasing urbanization impacts peri-urban areas [1]. He designated Delhi NCR as the first city where the interdependent economic models in India were validated. He also described the basic aim of the Centre for Indian Bamboo & Technology (CIBART) as addressing issues concerning dust, water, soil pollution, and carbon dioxide (CO_2) in peri-urban Delhi NCR. He explained how this would be accomplished by use of bamboo which is fast growing, more productive, and resilient to the same climatic conditions which act as a bane to agriculture.

[1] denoting or located in an area immediately adjacent to a city or urban area.

> "Foreign aid works best as a tool in the hands of the right local leaders – those trying to solve their own problems in their own nations and neighborhoods."
>
> – **Mr Christopher Samuel**

Professor Arup Mitra spoke about social capital, urban slums, and the strategies of survival of urban labour. He defined 'social capital' as those features of social, such as trust, norms, and networks that can improve the efficiency of society by facilitating coordinated actions. He added that it is networking that helps create linkages, which in turn forge rules, conventions, and norms governing the development process. He also explained how intra-occupational mobility is a significant phenomenon in comparison to the inter-occupational mobility. He then went on to explain the matrix representing the distribution of workers across various income size classes formed on the basis of present and past income. He showed that both upward and downward income mobility have taken place over time. He concluded by stating that about 70%–80% of cities are above the high well-being index.

Ms Swati Janu began by stating that 70% of houses in Delhi are self-made and do not exhibit proper orientation since not everyone can afford to hire an architect for designing their house. She also gave a short description on how bamboo was used for construction in rural areas. She went on to describe the idea behind ModSkool based on the belief that, as architects, one needs to step beyond making drawings and handing them out to contractors. She added that given the socio-economic and urban reality of the community, it is imperative to work directly with the people, to understand their needs, and come up with a collaborative building process that could also involve other like-minded professionals and students. She further said that the aim was to empower them by creating a sense of ownership, identity, and pride.
Ms Janu informed that the design of the bamboo walls of ModSkool came up in consultation with the community members who work with the material and that walls are temporary and can change over time through different weaving patterns.

> "By building with the community as opposed to building for them, the aim was to empower them by creating a sense of ownership, identity, and pride."
>
> – **Ms Swati Janu**

Mr Sarnam Singh presented Nalanda University as a net zero campus or a negative carbon emission campus.

Describing how energy is essential for day to day needs and is the engine for economic growth and social development, he stressed on the fact that no economy can manage to grow without ensuring the minimum access to its population. He stated that it is, therefore, important to design, develop, and deploy sustainable energy systems that provide affordable energy for the overall population of the country.

Dr Renu Khosla concluded the session by emphasizing the need for inclusive development for growth in all sectors of economy and that this would ensure that the sector's growth is viable and sustainable.

> "Inclusive growth is a concept that advances equitable opportunities for economic participants during economic growth with benefits incurred by every section of society."
> – **Mr Sarnam Singh**

Keynote Address by Professor Helen Lochhead Dean, Faculty of Built Environment, UNSW

Professor Helen Lochhead commenced her keynote address by expressing UNSW's pleasure in partnering with GRIHA Council. She went on to introduce the work of Ar. B V Doshi from India and Ar. Glenn Murcutt from Australia, both recipients of the Pritzker Architecture Prize—also referred to as the Nobel Prize of architecture—in 2018 and 2002, respectively. She mentioned how their wisdom and vision to sustainable designing are intrinsic to their practice of architecture.

In spite of the implicit difference in the architectural expressions of Ar. B V Doshi and Ar. Glenn Murcutt, there is a certain commonality with respect to the environment, resources, a culture of responsiveness to the climate and a preference to passive structure, context, and vernacular technologies. The ideas shared by both the architects are based on a great power of observation of the physical world and the places they inhabit.

She explained that the work of Ar. Murcutt is strongly rooted in climate responsiveness and his sensitivity towards weather patterns has resulted in a design sensibility that, besides suiting the needs of the occupants, is minimal in terms of energy and material consumption. She identified Ar. Doshi's distinct work ethos, being manifested in designs that go beyond functional, climatic, and environmental considerations. She also emphasized on his promotion in utilizing local materials, skills, and traditions to empower people to adapt and change spaces as per their needs.

Professor Lochhead described how the work of both the architects exhibits a deep sense of environmental responsibility, human-centric approach, preference to human well-being and comfort and quality of life; these qualities extend warmth, generosity, and livability to their projects. In the face of growing inequality, fueled with unsustainable and exculpating economic demand, a human-centric design philosophy is crucial to the built environment. The philosophy should be responsive to the needs of society, cultural landscape, industrial products, urban policy and planning at the city and territorial scales, and environmental challenges. This is inclusive of the design and construction of energy-efficient buildings that are able to meet future demands.

In her summing up, she stated that all students of architecture, landscape planning, construction, and project management should participate in an interdisciplinary programme to introduce collaborative problem solving. The UNSW Built Environment Programme will build a platform for such research that can respond to the needs of people globally. This was followed by playing of her interview with Ar. B V Doshi and Ar. Glenn Murcutt.

Thematic Track 5: Integrated Mobility

THEMATIC SPEAKER

AProf Vinayak Dixit, Head of the Research Centre for Integrated Transport Innovation (RCITI), University of New South Wales

MODERATOR

Ms Leena Nandan, Additional Secretary, Ministry of Road Transport & Highways

SPEAKERS

Dr Simone Zarpelon Leao, Senior Lecturer, City Analytics, University of New South Wales

Mr Sohinder Gill, Director General, Society of Manufacturers of Electric Vehicles

Ms Akshima Tejas Ghate, Principal, Rocky Mountain Institute

Dr Indradip Mitra, Senior Technical Advisor, GIZ

While delivering the thematic address, on 'Integrated Smart Mobility', Professor Vinayak Dixit spoke about smart integrated mobility systems as a tool to solve sustainability issues. He explained that the evolution of traffic control systems from 'intelligent' to 'smart' has led to enhanced efficiency, reduced wastage, and improved safety. The key drivers in this respect are ubiquitous connectivity, big data, and reliable models. He also highlighted the importance of infrastructure connectivity to create centralization and how big data has allowed understanding of people's travel patterns to plan more user-centric traffic and transport infrastructure. The models to understand data could result in optimization of transport networks. He emphasized that the future risk affecting transport network is climate change. It is, therefore, fundamental to understand the vulnerabilities of these links to plan for reliable transport systems that serve the needs of individuals in cases of disasters. Through one of his projects for the Government of India in Thane, he demonstrated optimization of traffic signals and improved safety by developing an adaptive traffic signal controller.

> "The evolution of traffic control systems from intelligent to smart has led to enhanced efficiency, reduced wastage and improved safety."
> – **AProf Vinayak Dixit**

Dr Simone Zarpelon Leao presented the role of big data and models to understand and effectively use the knowledge generated in planning mobility in cities. She enlightened the audience about the ongoing research work of the City Analytics Group part of the UNSW Built Environment team. Her team is looking at mobility specifically through active transportation and public transportation systems, amongst other areas of research. Dr Leao informed how people use mobile phone applications voluntarily or

due to other individual reasons which enable them to collect data for analysis. This data provides insights on user patterns which could be used in effective planning and decision making. However, the challenge involved is availability of extensively detailed data which may not be representative of the entire population set to base planning decisions. She emphasized on the need to collect the data as well as validate and add quality to it. Methodologies, such as advanced spatial statistics, agent-based modelling, etc., appropriate for understanding big data, are used to learn patterns and create scenarios. She briefed about extended research on big data that has helped to realize how people move around public transport and how this relates to active transport. She stressed on the strong opportunity in data sets to substantively improve mobility planning and management. Dr Leao concluded that translation and application of this knowledge with end user's standpoint to co-design models is the key to better understanding and effective planning.

Mr Sohinder Gill, in his address, provided a technology-centric perspective to mobility. Highlighting the pros and cons of sustainability in transportation, he discussed the scenario of Indian mobility with respect to technology and opined how society is not forthcoming towards adoption of new technologies and ideas. He emphasized that the solutions will have to be mindset driven in the society. Even though they are acclaimed to have the largest market share accounting to about 70%, including buses, cars, two-wheelers, etc., put together, the absolute sales numbers of vehicles are not encouraging. He highlighted that one of the major consumer-end acceptance challenge faced was the tendency to equate performance of an electric vehicle with that of a motorcycle. Even if an equivalent electric vehicle is designed in the future, it would not be affordable for the Indian consumers. He gave examples where technology has been successful in altering mindsets, such as the Metro and stressed that an amalgamation of solutions from policy makers, individuals, industry bodies, and corporates would be effective in technology adoption and implementation. It would be imperative to provide solutions that unite technology and attitude rather than getting into spiral of producing more vehicles on the road.

> "It is imperative to provide solutions that unite technology and mindset rather than getting into spiral of producing more vehicles on road."
> – **Mr Sohinder Gill**

Ms Akshima Tejas Ghate presented a perspective where the electric vehicles will be looked as an opportunity in the debate about carbon and energy. The adoption of right solutions in urban transport sector has been at a slow pace. Therefore, it is essential that addition of electric buses at a higher cost as opposed to diesel buses be witnessed as a corrective measure and an opportunity to introduce more public transport in cities. She briefed on a project involving evaluation of carbon footprint of the road transport sector. There are significant emissions due to the construction of highway infrastructure and operation on highways and the projections indicate that it would grow rapidly in the future. She stated how this data

driven and evidence-based information could provide insights to policy makers to take appropriate action. Solutions targeting the quick adoption of technological solutions to leapfrog in the transport sector are the need of the hour. The adoption of technology could be enhanced by coming up with quick pilots and develop the ability to take risks with new technologies though capacity building. She concluded by emphasizing on the need for incentivisation, creating right infrastructure by means of tools, such as GRIHA, and providing mobility as a service to the consumer.

> "Solution targeting quick adoption of technological solutions to leapfrog in the transport sector is the need of the hour."
> – **Ms Akshima Ghate**

Dr Indradip Mitra spoke about their current initiatives in the mobility and the energy transition in the transport sector. He informed that 60% of reduction in emissions can be achieved by adoption of electric mobility alone. He highlighted on the GIZ's Vision 2020 on e-mobility including national e-mobility plan, e-mobility Act, etc., and its implementation phase. He emphasized that the decarbonization pathway or carbon neutrality is achieved if the energy for the fleet is sourced from renewables or clean energy.

Thematic Track 6: Unwinding Circular Economy

THEMATIC SPEAKER

Ms Almitra Patel, Member, Supreme Court Committee for Solid Waste Management

MODERATOR

Mr Amit Dasgupta, India Country Director, UNSW

SPEAKERS

Dr Miles Park, Industrial Design, Design Research Collaboration, University of New South Wales

Mr Siddharth Hande, CEO, Kabadiwalla Connect

Mr Sumit Kumar Agarwal, CEO, Tanjun WonderBamboo

The session contemplated new ideas and discussed the lives of a few learned people who proactively practice and work towards the concept of circular economy in their own different ways. Eminent speakers shared their

journey towards sustainability, their struggles, successes, and lessons learned which led them on the path of adventure, peace, and knowledge.

Ms Almitra Patel initiated the dialogue by talking about the general difficulties and challenges faced by people in India and various other similar problems. She felt that a lack of construction and demolition rules is a dent in the system. She shed light on the urgent need for waste management and segregation practices with proper certification so that proper account of the production may take place. She also emphasized on percentage of the different waste in construction process and also about various methods of conserving and reducing the waste generated. She stressed on the importance of segregation and how it helps further in the process of recycling. She stressed on allocation of points in GRIHA's rating standard for project efforts to recycle waste.

> "If we believe that urbanization is growing then we have to recycle our waste water efficiently."
> – **Ms Almitra Patel**

Dr Miles Park pointed to the importance of understanding the type of waste that come out of household and commercial sectors, in particular e-waste, one of the fastest growing waste problems and the hazard it poses by its exposure in the open environment. He clarified the notion of smart cities and what they stand for and how easily these are misinterpreted. He then presented the importance of Internet of Things (IoT) and its linkage to smart cities, besides touching upon city-wide intelligence and understanding the flow of garbage.

> "If we can measure it, we can manage it."
> – **Dr Miles Park**

Mr Siddharth Hande spoke about circular economy and its relation to waste that can be used in upcycling and recycling and how such waste contributes to meet the ever-growing demand of resources.

> "If you work on a decentralized waste management system, you are automatically going to align with the concept of circular economy."
> – **Mr Siddharth Hande**

Mr Sumit Kumar Agarwal stressed on the fact that sustainable is indeed affordable and in this context, illustrated certain interesting examples. He also highlighted this by giving an example whether living in cities like Delhi with a constant threat to health is affordable or adopting a life which reduces such hazards is better. He spoke about his policy of

adopting the 'Four Zeros' in his life—a life of zero waste, zero impact, zero footprint, and zero maintenance. He spoke about sustainability and the economic benefits of using bamboo in construction and various other activities, adding how its by-products can be reused. He emphasized on the beneficial use of bamboo parts, emphasizing the importance of skill development to facilitate its use. He showcased a couple of hotels that were constructed using bamboo concrete compost and how well these buildings have been able to perform. He concluded by talking about the importance of the expansion of green cover in cities.

During the subsequent panel discussion, Ms Almitra spoke about waste management by pointing out the problems in the construction realm and the management factors that need to be considered so as to address these problems. She also stressed upon the importance of conscious recycling of rainwater and its conservation. Contemplating the lack of improvisation with changing times, she emphasized on the dire consequences of landfills outside cities and their incineration as a source of greenhouse gases, thus directly contributing to global warming.

In response to the question of depletion of resources and the possible ways to meet the increasing demand, Mr Miles cited the example of how farmers in Europe in the 1970s used to practice 'sustainability', at a time when the term had not even been coined. He added that the first step towards conservation and sustainability is, to reduce. He suggested that this is a lesson we should take if we are facing the challenge of depleting resources. He mentioned a few ideas to change the existing scenario in cities and explained how countries like India are effective towards reducing waste by reusing it.

Thematic Track 7: Transitioning to Clean Energy

THEMATIC SPEAKER

AProfessor Alistair Sproul, Head, School of the School of Photovoltaic and Renewable Energy Engineering, University of New South Wales

MODERATOR

Dr Ashvini Kumar, Senior Director, Renewable Energy Technologies, TERI

SPEAKERS

Mr Rajneesh Rana, General Manager (BD & Contracts), EESL

Mr Neeraj Kuldeep, Programme Associate, Council on Energy, Environment and Water (CEEW)

In his thematic address, **Professor Alistair Sproul** emphasized on the development and growth of solar PV and how it can be used at a utility scale. He gave a brief insight about the history of solar photovoltaic and how it has grown at a rate of 40% per annum over the last 30 years. He stated that if the PV continues to grow at this

pace, it would produce a long-lasting benefit to humanity and will help mitigate the challenges of climate change. Unlike rest of the world, Australia has started to grow the rooftop solar PV system as compared to the utility scale solar PV system. He highlighted that in many parts of Australia, the cost of electricity produced using solar PV is cheaper than producing electricity from conventional sources, such as coal, oil, and gas or nuclear. He expressed his disapproval to the use of subsidy for installation of solar PV and concluded by displaying an image of a house owned by Mr Elon

> "Solar PV will produce long lasting benefit to humanity if we decide to continue to grow it, we need to do that to meet the challenge of climate change."
>
> – **AProfessor Alistair Sproul**

Musk with rooftop solar PV, battery, electric vehicle, and efficient house as a future scenario.

Mr Neeraj Kuldeep began by giving a brief introduction of CEEW and the seven core areas of work of the organization. He mentioned the share of rooftop solar PV in India which is about 10% of the total solar PV and explained the current scenario of solar PV in the country and added that the rooftop system has not really picked pace. He explained the different business models that exist in India, stating that the growth of solar PV industry in the residential sector has been sluggish, thus suggesting the lack of awareness amongst the house owners, access to finance, etc., as potential reasons. Speaking about the solutions that could lead to the growth of the rooftop PV sector in India, he highlighted CEEW's work, in collaboration with BSES Yamuna, to develop the business model for rooftop solar PV.

Mr Rajneesh Rana briefed about the various energy efficiency programmes run by EESL (UJALA, street light programme, etc.) and explained about EESL's work in different sectors, such as building energy efficiency, agriculture pumps, LED, electric vehicles, etc. He discussed the solar programmes initiated by EESL with the help of DISCOMs which uses their extra unutilized land at the sub stations. Mr Rana went on to explain the programme under which the Bureau of Energy Efficiency (BEE) 5-star agriculture pumps were distributed to farmers and their impact on energy consumption. He mentioned about the programme in which EESL is planning to connect the agriculture feeder with the solar PV system. Further, he also spoke about the concept of solarisation with energy efficiency by connecting energy-efficient pumps with the same feeder. He highlighted the challenges in adoption of solar pumps or energy-efficient pumps by the farmers as most states in India provide electricity at no cost to farmers, a reason which would deter them from adopting energy efficiency measures. He then discussed a model where a DISCOM will install a solar PV system at the site of a capacity, that is, three times more than the requirement of the solar pump. He said that the extra electricity will be fed to the grid and stated that under this model, farmers will not have to invest any money and DISCOM will get recover their money by generating electricity. He emphasized on the decentralization of the solar PV system and setting up the small size solar PV plant near the load centre to reduce the losses via transmission.

> "Photovoltaic and wind now hold the key to develop low cost clean and green energy."
> – **AProfessor Alistair Sproul**

Dr Ashvini Kumar spoke about the integration of solar PV with the building design and government policies regarding the rooftop solar PV plant installation. He spoke about the National Solar Mission of the Government of India. He also mentioned about India's Nationally Determined Contributions (NDCs) and shared the current status of India. He concluded by stating about the various solar parks which are scheduled to be installed in the different parts of the country in the near future.

DAY-2

Thematic Track 9: Climate Change – The Tipping Point

MODERATOR

Dr Manish Shrivastava, Department of Energy and Environment

SPEAKERS

Mr Rakesh Kamal A B, Clean Energy Policy and Programs Consultant, The Climate Reality Project India

Associate Professor Melissa Hart, Graduate Director, ARC Centre of Excellence for Climate Extremes, University of New South Wales

Mr Khushal Matai, Department of Architecture, School of Planning and Architecture, New Delhi

Dr Komali Yenneti, Research Associate, Faculty of the Built Environment, University of New South Wales

Ms Raina Singh, Senior Fellow, Urban Resilience, National Institute of Urban Affairs

This session contemplated the strategies and research ideas across the globe related to warming of the planet and climate change. It was identified that planetary warming manifests itself in rainfall patterns, increasing occurrences of disasters, rapid retreat of glaciers, the increasing severity of droughts and floods, drying rivers, and so on. Eminent speakers from various backgrounds elaborated on the current status, initiatives, and challenges faced on the subject with a focus on the Indian scenario.

Dr Manish Shrivastava in his welcome address, stressed on the importance of deliberation and spreading awareness on the risks of climate change amongst the stakeholders.

In his address, **Mr Rakesh Kamal A B** discussed the need and will of humans to change in order to combat climate change-related problems. He emphasized the threat of increased carbon dioxide (CO_2) concentration, urban flash floods, changing rainfall patterns, increased heat waves, increased storms and hurricanes, that the world is witnessing and the prime consequence of melting polar ice caps leading to the disturbed chemistry of hydrological cycles. Illustrating with astonishing facts and figures, he remarked that climate change is a medical emergency and we must change our approaches, choices, and decisions to battle climate change.

Associate Professor Melissa Hart spoke about the extremes that the world is witnessing due to climate change and its impact on countries in the form of environmental and economic stress. At UNSW, her work has been primarily focussed on four key research programmes, namely extreme rainfall, drought, heat (atmospheric and marine) and cold waves, and climate variability. After elaborating on her research, she concluded that it is important to study the impact of cities on climate as well as climate on cities for mitigating climate change issues.

Mr Khushal Matai elaborated on his research related to the surface Urban Heat Island Effect (UHIE) caused by renewable energy technologies, that is solar photovoltaics (SPVs). He identified through his research, based at various locations in Delhi, how SPV re-radiates the heat which is incident on the panels, thus causing rise in temperature in the surroundings and further leading to surface UHIE in the urban fabric.

> "SPV technology is at the infantile stage, which is at the first generation; hence, it is imperative to look forward to the next generation of SPV technology such that it does not cause UHIE."
> – **Mr Khushal Matai**

In her discussion, **Dr Komali Yenneti** elaborated on the Smart City Mission of the government which focuses on the Internet of Things (IoT), innovation, technology, and so on, but lacks on the climate change front. She stated that the increased sale of glass and air conditioners can be seen as one of the prime cause of surface UHIE. She highlighted that the solution to this problem could be the use of green infrastructure (cool roofs, living walls,

roof gardens, and so on) and blue infrastructure (water) to bring a drop in the temperature. She concluded that data driven and well-assessed decisions help mitigate the climate change issues at city, state, and national levels along with the earlier mentioned solutions.

Ms Raina Singh emphasized that cities today need immediate action at international, national, and local levels. She stressed on the importance of policies, effective multi-level governance, basic education and awareness, and alignment with the city's priorities and national plans as the most important parameters to mitigate climate change issues. She underlined that city resilience has to be marked above the shockers and stressors of climate change. She also delved on the importance of the capacity building programme and data compilation initiated by the NIUA with various institutes which aims to reform the education curriculum as well as make the most out of the compiled data.

> "Mainstreaming resilience into policy framework and building local capacity is the key for building resilient cities."
> – **Ms Raina Singh**

Thematic Track 10: Sustainable Cooling Alternatives

THEMATIC SPEAKER

Mr Saurabh Kumar, Managing Director, Energy Efficiency Services Limited, Delhi

MODERATOR

Mr Markus Wypior, Deputy Cluster Coordinator GIZ IGEN

SPEAKERS

Dr Anir Upadhyay, Research Fellow, Faculty of the Built Environment, University of New South Wales

Mr Sunil Kher, Managing Director, Sevcon India Pvt Ltd, New Delhi

Mr Shadab Ahmed, National Manager - Defence & Government Segment, India & South Asia

This session contemplated on the issues and the challenges being faced in India for sustainable cooling alternatives, including the strategies adopted across the globe for different cooling alternatives. Eminent speakers from various backgrounds came together and deliberated upon their work in the field.

Mr Saurabh Kumar spoke about the challenges encountered in the Indian context for cooling alternatives. India is the only country with 10–15 mega cities and a population of more than 15 billion which is a huge magnitude in the global context. Referring to the National Cooling Action Plan (NCAP), he said that the cooling demand will require 150 GW of additional incremental capacity, whether it is derived from renewables and/or fossil fuels. Emphasizing India's commitment towards the Montreal Protocol which includes phase out plan for chlorofluorocarbons (CFCs) in the coming decade, he said that at the same time, we need to look at the massive surge for demand in cooling. He added how experts from different parts of the world can come together, deliberate, and figure out the best strategy for growth in the sector. The Energy Efficiency Services Ltd (EESL) looks into different categories, such as the consumer segment which is growing faster than the commercial and other sectors. For example, room air conditioners are witnessing a growth of around 15% in a year whereas, the country's gross domestic product (GDP) is rising over 7%. Keeping this in mind, the EESL has developed a programme for super-efficient air conditioners. However, a big policy push from institutions, such as the Bureau of Energy Efficiency (BEE) is required to enhance cooling alternatives. He also stated that there is a myth that if the air conditioners are efficient, there will be an increase

in cost. For example, Japan's energy efficiency of air conditioners has been increased by 200% with a 30% decrease in cost. He emphasized on a technical model to significantly improve the trajectory of efficiency, particularly for room air conditioners. The NABL report says if this trajectory moves to a super-efficient level, then the 150 giga watt (GW) projection can come down to 80 GW.

A lot of commercial area will be built with India's rapid growth, evident from the massive construction happening across the country. District cooling needs need to be incorporated into new infrastructure in light of the amount of natural gas coming in the Indian market for which the government has already auctioned 89 cities for gas distribution. There is plenty of domestic gas which has been discovered and the EESL has also signed a memorandum of understanding (MoU) with the Gas Authority of India Ltd and the city gas services in an attempt to push for tri gas generation as a service. Tri-generation was initiated by the BEE along with GIZ as a pilot project in the All India Institute of Medical Sciences (AIIMS). It functions essentially as a gas engine converting gas to electricity which provides energy for commercial buildings. Tri-generation can be adopted in hotels, hospitals, shopping malls, airports, and industries with large waste heat generation and as much as 50% reduction in the cost of energy. In addition, tri-generation technology uses lithium bromide as a coolant which has neither CFCs nor any global warming potential, thus leading to a huge opportunity in high-technology systems.

Mr Markus Wypior explained how air conditioners consume maximum amount of electricity and have a direct impact on the climate. The other aspects which can reduce the need of cooling are double-glazed windows which significantly reduce the need of cooling or removing the heat. In Germany, a 'passport system' has been initiated for energy efficiency of residential buildings. The passport, soon available in India, will showcase the energy efficiency of a building and the attached incentives which will help owners to improve on the same. According to him, the draft of ***Housing for All***, published in September 2017, is an attempt to outline the measures for the next 20

years, in order to bring down energy consumption in space cooling technologies and address the issues of refrigerants.

Dr Anir Upadhyay stressed on an architect's perspective in designing the primary needs that should be context oriented and the high performance such that it optimizes the life cycle. Of the many attributes, which an architect needs to look into, energy conservation is of prime importance. He emphasized on the 'Trias Energetica' principle which speaks about two major aspects—one is to prevent the use of energy and second is to use renewable energy sources as extensively as possible. In 'Sustainable Architecture', there is three-tier approach which needs to considered, namely heat projection through shading, heat rejection through insulation, and cross ventilation. This approach works for heat rejection and heat gain as well. He also stressed on the updation of climatic data with the ever-changing climatic conditions, which then need to be integrated in the designing of buildings and cities in entirety.

> "Architects design can help moderating climate variables to achieve indoor comfort without significant environmental impact."
> – **Dr Anir Upadhyay**

Mr Sunil Kher mentioned the development of India's Cooling Action Plan (ICAP) by Ministry of Environment, Forest and Climate Change, Government of India, and acknowledged it as a tremendous step towards achieving sustainability, comprising both comfort and economic growth.

He further elaborated on the functioning of the thermal energy storage (TES) and thermal storage in air conditioning. The way India is growing in terms of its GDP; the need for energy is going to be phenomenal. Enunciating how TES operates, he explained how it can be used to address the increasing energy requirement. The need for energy is going to be enormous while addressing different issues, such as global warming, ozone depletion, pollution, greenhouse gas emission, energy security, and so on, he added. Around 60%–70% of the total energy requirement of the building is derived from cooling. If the entire country is to be cooled with the aid of district cooling and if there is a growth in demand from 7500–9000 MW, the demand can be met while the existing infrastructure of power generation would be far from adequate.

Mr Shadab Ahmed focused on how cooling systems could be more efficient by choosing the right kind of insulation. He talked on different aspects, such as the role of insulation, types of insulation, criteria to consider for selecting insulation for cooling systems, and so on. Given a global perspective, he said that the market of cooling systems is growing rapidly, but the carbon emissions from these cooling systems contribute to 10% of greenhouse gases. Insulation, being an integral part of any cooling system, whether central air conditioning system or home air conditioners, can make the system efficient and conserve a significant amount of energy.

Thematic Track 11: Smart Cities and Sustainability

THEMATIC SPEAKER

Professor Christopher Pettit, Inaugural Chair of Urban Science, University of New South Wales

MODERATOR

Professor Jagan Shah, Director, National Institute of Urban Affairs, New Delhi

SPEAKERS

Ms Ashu Dehadani, Manager (Technical & Publication), GRIHA Council

Dr Sarbeswar Praharaj, Coordinator, Australia–India Smart Cities Knowledge Exchange Network

Ms Friederike Thonke, GIZ

In his inaugural address, **Professor Christopher Pettit** introduced the city analytics master degree course, and its structure, at the University of New South Wales. City analytics is a digital tool kit that incorporates design, technology, and data as an effective tool to handle the ever growing urban population. He stressed on the benefits of training the next generation to tackle rapid urbanization.

The city analytics lab, a first of its kind, is an integral part of the course. The rather engaging lab is featured by gears like, interactive digital terrain, city diverse tour, and encourages co-design for co-creation. He also mentioned the ongoing projects in the lab which comprise the following:

a. National Smart Cities Plan

b. Smart financing economic tools to maximize the investor's benefits

The course aims to provide grass root solutions to make data available on a dash board for geo designing future cities. He stated that digital planning tools should be considered as a vital instrument while drafting the smart cities agenda. Sustainable city design concepts, such as greening grey fields and the living and breathing plan will be executed only by the availability of good quality data and transparency in development.

He also shared the university's collaboration with various organizations for innovative mapping of cities. One of these being the 'value uplift' functionality which is a platform being developed for property evaluation modelling, to uplift the value in terms of its transportation and infrastructure accessibility. The PLUS (Phoenix London University Sydney) alliance was formed with the American city of Phoenix, as an initiative towards achieving the sustainable development goals (SDGs). The alliance has also created a PLUS data store, with semi-open access. He concluded by stating that 'UNSW is constantly thriving to be a smart campus to act as a living lab to practice co-design on campus'.

Professor Jagan Shah endorsed the education of the next generation to synthesize Big Data and maximize use of other digital platforms. He also insisted that urban analytics professionals have to adopt a bottoms-up approach and undertake rapid analyses.

Thereafter, he requested Professor Christopher Pettit to share data and knowledge on an open source platform and encourage partnership for resilient and sustainable cities.

Ms Ashu Dehadani walked the gathering through the perspective of a rating body in the process of establishing smart and sustainable cities. She initiated the conversation by stating that data is essential for evidence-based intervention or planning. GRIHA's journey began with a focus on individual units and moving towards larger development. She further elaborated the development of sustainability indices for affordable housing and the 'GRIHA for CITIES (Civic bodies governing Towns, Industries, Existing and new Settlements') rating to the audience. The rating has both qualitative and quantitative analysis of attributes of a sustainable city. The challenges of understanding the organic and unique nature of every city and bringing them on one platform for fair evaluation were also discussed. GRIHA has come up with a 'Bonus Section' in the cities rating to accommodate and evaluate the different attributes of a city. Another key factor in achieving sustainable cities is to have a timeline framework and to keep a check on how close they are to achieving the goal(s) at regular intervals, she added.

Being a research scholar on smart cities, **Dr Sarbeswar Praharaj** put forth his findings on the nature and data of smart cities. He stated that smart cities have a self-designated global work model wherein a range of agencies and educational bodies contribute. He also stressed on how the role of ranking can influence policy development. He further went on to detail the process to assess data and interpret the statistics. He presented a matrix of ranking 100 smart cities, under 9 broad dominance and 64 indicators highlighting the most influential indicators that differentiate the city from others. The inter-indicators, such as education, banking, and slum were also considered. He also decoded the two major factors that differentiate city development;

firstly a range of inclusiveness and social infrastructure for upbringing, and secondly, the geographical location and urban storm water management. He also categorized the cities under common clusters as follows:

1. Leading Cities (the cities that are ready to be classified as 'smart cities')
2. Edge Cities (geographical and infrastructure common cities)
3. Moving Cities (improving and rapidly changing cities)
4. Reluctant Cities (undeveloped in waste management, sanitation, and health)

> "We need to move above than just ranking cities and generalizing the idea of smart cities."
> – **Dr Sarbeswar Praharaj**

He concluded by emphasizing on how the data may be assessed to drive significant and well-informed decisions in the future.

Ms Friederike Thonke spoke about her organization's work and partnerships on human settlements. She informed the audience about the different smart cities being developed around the world addressing issues, such as climate responsiveness and integrated sustainable transport. She further briefed about fostering the south exchange and inclusive cities partnership programme. Smart cities have to impart soft skills to its citizen as it helps in tackling the challenge of transforming information into action plans. She also shared her experience in working with the 'Housing for All' scheme in India and the tricky challenges like land registration, ownership of the project in future, and so on. She concluded by reiterating that a holistic approach on climate, habitat, culture, and data helps in the nuances of smart cities strategies and to engage with communities. This was followed by a panel discussion on the empowerment of local communities to take effective decisions for the development of smart cities. In response, Dr Sarbeswar Praharaj explained how the notion of smart cities came from big information technology and multinational companies; this is however possible only through the involvement of local communities.

Ms Ashu Dehadani informed about the various programmes of the GRIHA Council, such as 'Paryavaran Rakshak' for community engagement and others for school children and civic body engagement to cater to this need. In her vote of thanks, **Ms Shabnam Bassi** acknowledged the advisors for their involvement and contribution in formulating, regulating, and implementing the GRIHA rating and reinforcing its technical credibility since the past 10 years.

Thematic Track 12: A Holistic Approach to Energy Efficient Buildings

MODERATOR

Ms Usha Batra, Additional Director General (Arch), CPWD, Central Public Works Department (CPWD), Government of India

SPEAKERS

Dr G C Datta Roy, Advisor, Development Environergy Services Ltd.

Mr Saurabh Diddi, Director, Bureau of Energy Efficiency

Mr Sourabh Kankar, Marketing Manager India, Gujarat Guardian Limited

Mr Sachin Kasar, Saint Gobain PPB

Mr Pavel Singh, Saint Gobain

This session deliberated on the new ideas and ways of managing and constructing energy efficient buildings. It focused on the ways to embrace energy efficiency into the building sector, the challenges faced and the technological solutions

Ms Usha Batra mooted the concept of energy efficient buildings and the associated problems, such as global warming and exploitation of limited natural resources, vividly experienced in the modern day, unlike a few decades ago. In keeping with the theme of the track, she spoke about the importance of building envelop and efficient design strategies. A few important aspects that one should remember while designing a building are the orientation, window-to-wall ratio, shading, and landscaping. She discussed at length how adoption of these simple measures can bring savings in the building's operation and maintenance. Accentuating the need for saving energy, she cited a few simple practices, such as switching off appliances and equipments when not in use, unplugging the devices when switched off, setting the optimum required temperature for air conditioners, and heating devices and so on. Furthermore, she stressed on the importance of shifting towards increased usage of renewable resources, especially solar and wind. She briefly touched upon the energy efficiency standards of the GRIHA rating system and mentioned a few buildings wherein measures, such as geothermal cooling and heating have been implemented successfully.

Mr Saurabh Diddi reinstated how the ancient buildings have been passively designed and cooled on their own, thereby avoiding the need for artificial cooling. He stressed on how air conditioners are going to be the biggest contributor in the ever increasing energy demand of the country. He walked the audience through the journey of the Bureau of Energy Efficiency (BEE), especially its contribution towards meeting the energy demands in a sustainable way, briefly touching upon how the Energy Conservation Building Code (ECBC) was conceived, its adoption throughout India and its relevance and effectiveness. He further explained the measures that have been covered in the code and how these contribute to the building as a whole and not just the building envelop. He proudly

mentioned the achievements of ECBC and the fact that it is the first in the world to integrate the renewable energy aspect. He gave insight into one of their projects and how, with the implementation of ECBC, a considerable amount of energy was saved, thus justifying that sustainable is indeed affordable. While introducing the new online portal of the ECBC, he explained the three different variants of ECBC compliance. He also mentioned the release of the new ECBC manual for residential buildings enunciating how it was conceived such that it may be easily understood. While concluding his presentation, he briefed about the new building star labeling system which will be rolled out soon and the future programmes wherein the BEE intends to work and deliver.

Mr G C Dutta, in his address, recalled the beginnings of the green building concept in the USA (now in its 25th year) and how the 10th GRIHA Summit run parallel. Elaborating on sustainability and energy conservation, he talked about the focus on monitoring of buildings that have been completed and presented the findings from the data gathered. He pointed out to the dearth of information available on buildings and their energy patterns in India as well as the continuous assessment of performance of green buildings. He then presented two different projects which his team had studied and pointed out that the Indian project had a far worse performance than the one located outside India. The rated building owners in India were not aware about the poor performance of their projects, thus highlighting the need for continuous monitoring and metering. He stated that his work with various government organizations such as Building Energy Department, Shanghai, helped him in addressing the issues of energy efficiency. In conclusion, he stressed the importance of data collection and interpretation to enhance the performance of buildings.

Mr Sourabh Kankar took the stage next to demonstrate various new technologies being adopted in the glass manufacturing industry and how such measures can be helpful in enhancing the designs of energy-efficient buildings. Citing examples of a few traditional buildings, he stressed on how simply and beautifully the measures for daylight ingress were integrated in the design and how efficiently the comfort conditions were taken care of. One can definitely draw inspiration from such examples for constructing new and contextual modern buildings. He went on to point out a few important properties of glass as a building material, such as visual porosity, thermal conductivity, lightness, acoustic, corrosion resistance, recyclability, and aesthetics. He concluded with some visual illustrations of their products and the kind of difference they make compared to the conventional products.

Mr Pavel Singh introduced another aspect of the industry, that is, insulation of indoor walls which is generally not considered by designers. He provided his inputs on how opting for insulated wall assemblies, over conventional walls, can help save the floor area and added that they these perform better and can be translated as one of the energy efficiency measures.

Mr Sachin Kasar introduced another product from the glass industry, 'Solar Gard' which enhances the properties of glass by providing insulation and restricting glare. He went on to answer questions regarding the life of these films, their effectiveness, etc., and presented some studies to demonstrate the performance of the buildings with solar films. Moreover, a few audiovisuals were screened to demonstrate the ease of installation of such products and ensure better performance of the buildings thus, adding to the energy savings.

Plenary Session 2 – Innovations at Work

MODERATOR

Mr Sanjay Seth, CEO, GRIHA Council

SPEAKERS

Ms Meenakshi Sharma, Founder, Use Me Works

Mr Shravan Shankar, Co-Founder, @Works and Co-Founder & Managing Partner, The Binary Workshop, Chennai

Mr Anurag Kashyap, Mentor-in-Chief, Gulmehar

Mr Anil Gokarn, Partner DSWM (Decentralised Solid Waste Management) ProEarth Ecosystem

Mr Vishwas Singh, Vice President, Shuttl

The session deliberated exemplary initiatives in the field of sustainability, thus bringing corresponding issues, challenges, and the success to the fore. The session was concluded on the note that, the vision of being sustainable needs to be achieved with new and innovative ideas which can be easily incorporated in peoples' daily lifestyle.

Mr Anil Gokarn leads from INORA, a Pune-based NGO and founder of ProEarth Ecosystems, a socially-focused business which provides end-to-end solutions in decentralized solid waste management for housing complexes, industries, and institutions in Pune discussed the quantum of solid waste generated in India and the fact that 50%–70% of this waste is organic and can be easily diverted from going to the landfill. He shared various technologies to treat organic waste depending upon the land availability, local material, scale, and cost. He added that to bring an attitude shift towards solid waste, various training and awareness sessions are conducted throughout the year which involve waste pickers, municipal corporations, housekeeping staff and so on. He said that they study innovative and different methodologies to manage and treat solid waste in day-to-day life, such that its detrimental impact on the environment is minimized. The business is currently working with 60 housing complexes in Pune which manages the waste of approx. 4,500 households. As a result, 3.5 tonnes of kitchen waste is stopped from reaching a dumpsite daily. He has also initiated a collection system for dried leaves and garden waste which diverts approximately 10 tonnes of garden waste from landfills into soil regeneration activities at the hills of Pune.

As the founder of Use Me Works, a one-stop solution for upcycling, **Ms Meenakshi Sharma** differentiated between 'upcycling' as the process wherein waste material is transformed into a new and better quality material whereas recycling involves degrading the quality of the material. She narrated her journey of upcycling products from waste cloth, collected from houses, cloth

markets, factories, and so on. The challenge during the journey was to educate people about upcycling and create acceptance of finished products made out of this waste. Numerous training and awareness sessions were conducted to make people responsible for the waste they generate and ensure its reuse. She pictorially presented various simple and innovative upcycling techniques during the course of her talk.

In his role of managing the operations of At Works, a startup providing thematic ecosystems for startups, freelancers, and small businesses to leverage their growth, **Mr Shravan Shankar** gave a preview into their areas of work. He described how the organization operates, collaborates, and defines services through infrastructure, events, and communities, curates thematic accelerator programmes backed by corporates, funds, and institutions for startups to enter markets and in the process scale and grow. He proudly mentioned that AtWorks's infrastructure technology stack was recognized by the Ellen MacArthur Foundation as a circular economy solution for India and highlighted how in India, a major part of the infrastructure is unutilized which creates the opportunity to retrofit spaces and creates affordability and flexibility for people. In conclusion, he said that they look at the abandoned spaces as responsive, autonomous, and economy engines.

Mr Anurag Kashyap has more than 25 years of experience in diverse fields, ranging from tennis coaching to selling pagers, internet, and mobile connections; from advising governments on public–private partnerships to designing and implementing CSR programmes; helping children with special needs and working with waste pickers and promoting social entrepreneurship. He narrated the small experiment which was conducted by Gulmehar, involving the waste pickers and flowers discarded from the flower markets in Ghazipur, Uttar Pradesh. The intent behind the experiment was utilization of the waste flowers into a beautifying accessory for season cards, calendars, and so on. He further added that they also envisaged additional revenue-generating opportunities for the waste pickers around this activity, leading to improvisation in their standard of living.

According to **Mr Vishwas Singh**, a technology-enabled, shared mobility solution like the Shuttl-App based bus service, is a win-win situation for both Indian cities and its citizens who as a travel choice desire a pain-free commute that also reduces congestion and the level of pollution. Discussing the bus mobility service in India which is fuel efficient, reduces carbon footprint, is space efficient, and hence one of the most efficient modes of public transportation, Mr Singh found an opportunity to develop a smart, attractive, safe, and convenient bus service. He felt that there was a need for these existing buses to evolve with time which motivated him to establish the 'Shuttl' service with the dual benefit of sustainable transportation and ensuring safety with technology.

Keynote Address by Scientia Professor Deo Prasad AO Director - CRC Low Carbon Living, UNSW

CHAIR

Mr Sanjay Seth, CEO, GRIHA Council

Professor Deo Prasad expressed the relevance of his work which is based on collaborations with the new federal government of Australia and the industry to meet the agenda of sustainable development within a built environment, which aligns with the theme of the 10th GRIHA Summit—'Fostering Partnerships for Sustainable Habitat'. According to him, his research group is deeply engaged in further driving the sustainability agenda where they conduct holistic research in new technologies and derive tools to measure outcomes for zero carbon buildings and beyond.

He mentioned various ongoing research programmes of Cooperative Research Centre (CRC) low carbon living centre, beginning with a programme which looks at the level of precincts—'a large development at a time'—involving landscape, transport, and buildings where the urban impact may be assessed. He mentioned another programme based on 'people or community' to ensure the anticipated outcome of sustainable development and to understand the consumer perspective. Considering scenarios in Australia, he suggested that there is a need to up-scale the small and medium enterprises to ensure effective delivery of high-performance buildings. Hence, the centre is actively working towards various outreach programmes, such as road shows, training of professionals, and so on.

Moreover, he said that the centre has also set up a target to reduce 10 million tonnes carbon by 2020 through their work which is 12% of the national goal set by Australia. Accordingly, relative investments have been conducted in a few of the ongoing research projects, such as building integrated photo-voltaic (BIPV), electricity generation through solar PVs for heating, cooling, electricity, solar analytics tool to analyse performance of solar PVs, and integrated carbon metrics, etc., at the University of New South Wales, Australia, towards meeting the targets. The centre has also developed a tool for community-based storage of electricity generated from solar PV which can be utilized peer to peer. Explaining further, he mentioned the ongoing research programmes for manufacturing various innovative products, such as geo-polymer products, products made out of glass as an alternative material for flooring, post-industrial products like fly ash to make bollards and so on, which will immensely contribute towards recycling of waste.

Another significant work undertaken by the centre was contribution towards formulating guidelines and framing policies at the national and international levels. The centre serves as a platform where government authorities and researchers come together and collaborate to come up with relevant policies and guidelines for future development based on extensive

research and analytical tools. He further mentioned that in the area of energy, building, and the environment, the centre has come up with energy assessment tools to rate buildings, which has been developed on post occupancy evaluation of 100 homes. The centre contributes towards technical development of building codes and defines stringency. Various tools have been developed for carbon mapping at the community and city levels to understand altered micro-climatic conditions which are beneficial for planners and policy makers to understand health and well-being improvements while executing planning measures.

He summed up his address stating that the centre acts as a knowledge exchange platform to give best possible advice to communities through various initiatives, publications, and outreach programmes, such as road shows, training programmes for universities, conducts collaborative activities to ensure that citizens, on a mass scale, become a part of the journey towards low carbon design and to have smart, resilient, sustainable, and healthy cities for the future.

SPEAKERS

Ar. Ravindra Punde, Co-founder, Design Cell

Ar. Ayush Chauhan, Co-founder, Quicksand

Ar. Amritha Ballal, Founding Partner, SpaceMatters

Ar. Annkur Khosla, Annkur Khosla Design Studio

According to **Professor Helen Lochhead**, user centric design is a boon. She spoke about how the issue is not about preference of either human or environmental needs but in fact putting them together since they are all equally important. She reinstated that an unhealthy environment impacts human health hence, it is essential to build healthy ecosystems. Addressing the competing agenda could offer a perspective to problems that will drive innovation. She emphasized on generating multiple benefits to offer more inclusive solutions. The three fundamentals to designing for impact are—asking questions to define real needs; conducting field work, research and analysis; and engaging end users as active design partners. She proposed that these fundamentals would enable designers to think holistically about solutions. She elaborated about the process to

Thematic Track 13: User Centric Design: Bane or Boon?

THEMATIC SPEAKER

Professor Helen Lochhead, Dean, Faculty of built environment, University of New South Wales

MODERATOR

Professor Manoj Mathur, School of Planning and Architecture, New Delhi

> "Dealing with multiple agendas forces one to think about multiple benefits that people could receive."
>
> – **Professor Helen Lochhead**

co-create, ideate, iterate, test, refine, and develop through case studies at both the urban and rural levels; these case studies demonstrate how this approach could be prototyped and scaled up.

Ar. Ayush Chauhan highlighted that user-centric design has been mistakenly vaulted as the panacea. He clarified that this is not at cross purposes with issues of sustainability, economic viability, and technical feasibility. It is also misunderstood as a tool that subverts these other aspects and does not obviate the need for multiple perspectives. He informed how his work in the policy domain reviews the relevance of design methods to conceptualize programmes for state governments and further emphasized that a user-centric design gives multiple stakeholders a common anchor, that is, the user and every stakeholder play their respective roles. He pointed that the biggest gap is access to the right tools for assessment of user needs. Therefore, the role of designers becomes imperative due to their capability to create tangible artifacts and observe users' interaction and behaviour. It also provides a level of engagement and intuitive sensing as opposed to active conversing to provide insights on user needs. He highlighted issues from one of the projects on community sanitation with its perspective to articulate needs of the user and view the competing agenda. He concluded by stating the importance of research in the ambit of user-centric design in a more vibrant and interactive way.

> "The role of designers become important due to their ability to create tangible artifacts and observe user's interaction and behavior with it."
> – Ar Ayush Chauhan

Ar. Annkur Khosla elaborated how the 'one design fit for all' approach is predominant in thinking while designing. A user-centric design is a more collaborative activity involving stakeholders who contribute to this aspect of decision making. She presented on the need

to integrate user feedback at both design and production stages to achieve sustainability. Handicraft and industrial processes have their own limitations; therefore it is also important for the user to develop an understanding of these processes. She briefed the audience about two schools of thought. The first one being localized production enhancing the life cycle of product that re-questions the industrialized and mechanized processes while the second focusses on the adoption of user feedback as a prescriptive model for integration in the design thinking where production could take place in real time.

Ar. Ravindra Punde stated that as projects become complex, designers grow perplexed about the end user. He informed the audience that often the client is not the only user in the multifaceted societal framework that one lives in. In the public realm, one of the several issues that needed to be dealt with is the divided society. He emphasized on how it is the responsibility of the state to create equal opportunity. In this context, he showcased one of his

projects for the Delhi Development Authority wherein they proposed creation of equal opportunities for people with changing unit forms based on plot sizes. This would encourage people to grow at their own will in this dynamic form rather than static forms of low income group, middle income group, and high income group units. Speaking about one of his projects in Amritsar, he explained how design could also become a process of regaining trust, obtaining dues, seeking justice, etc. He concluded by highlighting the importance of inculcating a different value system amongst the designers to bring out transformation.

Ar. Amritha Ballal spoke about a global scenario where people are dealing with inequity at crisis level, a second nature of people residing in India. She cited a study conducted by her students on Bus Rapid Transit (BRT) where they were asked to report their experiences. Remarkably, none of the students had actually boarded the bus to report their experiences; however, they had much to critique about the traffic, congestion, and commuting time. She highlighted how different rating and certification systems have led to 'greenwash' becoming certain kind of 'whitewash'. She also emphasized how representation becomes crucial while speaking about user centrism. Multiple agendas could be at cross-purposes; however, power dynamics also plays a role while addressing multiple agendas. She suggested that actual user representation is the key to change the perception on how a habitat is created and used.

Professor Manoj Mathur summarized the session stating that maximum designing recognizes the fact that it needs to be done for a user. More often than not, a user centric design is aimed for an imaginary user who does not exist, addressing imaginary needs and leading to issues of over designing and over production. He pointed that the choice is not binary between user benefits and environment. However, prioritization of issues becomes essential to focus on impact-centric solutions.

Thematic Track 14: Water Stress: Perplexing Possibilities

THEMATIC SPEAKER & MODERATOR

Professor Greg Leslie, Acting Director of the UNSW Global Water Institute; & Director of the UNESCO Centre for Membrane Science and Technology

SPEAKERS

Professor Arun Kansal, HoD and Professor, Department of Regional Water Studies, TERI University

Ms Tushara Shankar, GM/Head- CSR at United Breweries Ltd

Professor Hina Zia, Department of Architecture, Jamia Millia Islamia University

This session contemplated the issues and challenges being faced in India for water consumption and its availability. A need was felt for appropriate adaptation of water resource management in the built environment; with something as simple as updating the applicable codes/bye laws for the water requirement per person per capita. Eminent speakers from various backgrounds came together and discussed their work in this field.

Professor Greg Leslie spoke about a range of issues from the engineering perspective about managing the uncertainty/ security of the range of water supplies to social assumptions that were made on how to organize and plan water sustainability and how water scarcity affects industries. He framed two basic questions, the first dealing with the uncertainty of climate-dependent water resources, be it surface water or ground water, and the need to secure water supplies that are climate independent while dealing with the challenges of climate change, and the second are the variable sources of water for basic carbon intensity. Climate is affected by two factors—duration of high intensity rainfall getting longer and flip side of shorter but intense rainfall duration which stresses on flood management. In Australia, in a period of 5 years from 2005-2010, the desalination capacity went from 45

Giga liters/annum to 500 Giga liters/annum. As per the analysis of desalination held at the UNSW, the higher the salt content, more is the energy required to produce clean water.

Professor Hina Zia, in her address, posited if the apocalypse is for real. The peak water demand or the scarcity of water is seen mostly during the summer season. India, being a developing nation, with dense population faces huge stress on water issues with farmers being the key victims of scarcity of water. She shared various climatic anomalies, such as the droughts in Kerala in 2017 and floods in 2018 and the acute water scarcity in Shimla during the peak tourist season in 2018. In June 2018, important records on composite water management index released by the NITI Aayog stated that 21 Indian cities, including New Delhi and all the big metro cities, will run out of ground water which is quite close. Around 40% of the population will have no access to drinking water by 2030 which in turn will affect 100 million people. When combined with climate change indications, the Intergovernmental Panel on Climate Change (IPCC) Special Report on 1.5 °C clearly states that the thresholds have been reached globally and there is not enough time to even maintain a temperature rise less than 2 °C, adding that if we are unable to achieve the same, India will face huge implications in the form of floods, droughts, decreased food production, and exposing a greater proportion of vulnerable population to poverty and scarcity of food and livelihood.

The new ways of water-sensitive design, storm water management in particular, and devising large storage structures, have been inspired and derived from the past 100 years of existence. In our history, we always had a bottom up and not top down approach, whereas in past it was each individual's responsibility as well as society at large before it moved to the governance system. The root of the problem is that we have moved from a feudal to a 'wasteful' modern society adding that a shift from a traditional to a modern water economy is inevitable. While in a traditional economy, we consume 70% for agriculture and 30% for industries, households, and so on, the figures have been reversed in the modern economy. In conclusion, she suggested that there can be different approaches towards these problems, such as acceptance of the current problems, augmenting water resources, revision/updating of legal codes, reduction of water usage in all sectors as well as setting appropriate benchmarks.

In his address, **Professor Arun Kansal** presented four perplexing possibilities of water stress, of which the first is the difference between water demand and water need and why overlooking this difference actually results in bringing inefficiency in the urban water structure. The second is that society has undergone a tremendous change in the past 30 years insofar as lifestyles have changed albeit the pattern of water consumption has not been captured so far. The third is the increasing use of products at the domestic level in India with its own implications with respect to water as well as energy consumption. This in addition to the implicit conflict between water consumption and energy consumption at the domestic level. The

fourth is how the lack of evidences in policy making is a hindrance for uptake of any new innovations and penetration of innovations at a fast pace.

> "There is an inherent consumption of consumer responsibility, it is not only the producer responsibility but also consumer responsibility."
> – **Professor Arun Kansal**

In urban areas, two crucial facilities—water and energy supply—are provided by public utilities, however residents are not involved in the provisioning of these services. Therefore, responsible consumption of these sources is central to achieving the key policy goals. Professor Kansal added that equitable water access is related to heath, poverty alleviation, low carbon growth of cities, and reducing vulnerabilities to climate change. All these are interlinked and water is central to all these issues. He elaborated that it is also seen that people's behaviour towards conservation of resources is dictated by a large number of factors which in turn are related to the literacy rate, education, and level of awareness. In the energy sector, pricing plays a major role in changing peoples' behaviour and the perceptions of consumers. Moreover, people are not aware that the water requirement of cities projected by urban planners dictates water supply norms. In India, different agencies such as, the Central Public Health and Environment, Ministry of Urban Development, Government of India, and the Bureau of Indian Standards have come up with different supply norms and in addition there are different norms for urban and rural supplies. Lack of reliability of services and inadequate infrastructure facilities increase water consumption while use of gadgets reduces water consumption but increases electricity consumption; this is a huge factor which can decrease the overall water demand at the urban level by 40%, he said in his conclusion.

Ms Tushara Shankar mentioned how United Breweries Ltd (UBL) wishes to become a water neutral company by 2025 which poses itself as a huge goal for a beer company. A native of Bengaluru, identified as a city suffering from huge water stress, and representing a water dependent and water-intensive industry, she explained that in case of a water crisis, firms such as the UBL will not have provision of water since it is the most non-essential resource as per the government. She outlined the 4R strategy practiced in brews enumerated as reduce (leakages), reuse (for cleaning), recharge, and rainwater harvesting and in this light, mentioned that in 8 years, the company has reduced their water consumption from 7 L to 3 L per beer and hence, are on the road to becoming more water efficient.

Thematic Track 15: Health and Well-being in the Urban Environment

THEMATIC SPEAKER & MODERATOR

Dr Nicholas Osborne, Senior Lecturer, School of Public Health, Faculty of Medicine, University of New South Wales

SPEAKERS

Assoc. Professor Melissa Hart, Graduate Director, ARC Centre of Excellence for Climate Extremes, University of New South Wales

Professor Vivekanand Jha, Executive Director, The George Institute for Global Health, India

Dr Mohan K. Dongare, Scientist, National Chemical Laboratory, Pune

Mr Sanjeev Karpe, Founder Director of Konkan Bamboo & Cane Development Center

The session deliberated on the immediate effects of the urban environment on the mental and physical health of its occupants. The cause, effect, and co-benefits of urban planning in human well-being were brought out in various perspectives in the panel discussion by the diverse set of experts in the field of public health.

Dr Nicolas Osborne began the session by defining 'health' as per the WHO, "Health is not the absence of diseases". He also posited a question to the audience asking their opinion on the most common health effects of flooding—depression and mental illness and went on to establish the connection between the two. The increase of new diseases and health threats are accelerated by the rapidly changing urban environment. Based on the perspective of climate change and exponential growth of urban dwellers, he pointed out drawbacks, such as overcrowding, pollution, lack of adequate green space, road traffic, sanitation levels, unsafe drinking water, food production, unhealthy diets, and vehicular accidents. This revealed how the population density affects the risk of diseases. Being a faculty of medicine, he stated that "Almost a quarter of the diseases are by environmental exposure" and "70% of new disease are Zootonic [1]".

Additionally, he explained the ecology of health with few of its components, such as water, air, climate change, temperature, plant growth, and ocean productivity. With a picture of a tall structure at the Hong Kong harbour, he laid out the relationship between heat waves and their respective health effects. Further, he put forth the mitigating potential of design as part of the solution. An ecosystem approach should be adopted for greater benefits, as green space can reduce noise, urban flooding, urban heat island effect (UHIE), carbon

[1] a disease that can be transmitted from animals to people

"Your zip code predicts your health more than your genetic code."
– **Dr Nicholas Osborne**

dioxide (CO_2) emissions, and recognizing the value of nature. He further emphasized on co-benefiting urban interventions, such as cycling, public transport, social connections, etc. He also explained the triangle of urban environment and the corresponding balance amongst health, climate, and sustainability.

Professor Melissa Hart put forward the scenario of Australia with respect to climate change, air pollution, and health along with their goals and measures to mitigate the concerns. She detailed the cause of air pollution due to plant burning, wildfires, and bush fires with a graph indicating the fire days in a month, both in northern and southern hemisphere. These burn days, when compared to their respective meteorological data showed high PM2.5 levels. Based on evidence, she stated that "(Poor) air quality is life threatening". The data collected over the past years has revealed the historical changes in the heat waves and how heat waves relate to heart disease. She concluded her presentation by introducing a School Weather and Air Quality (SWAQ) tool, created for school children to understand the climate and environment better by undertaking a self-analysis.

Professor Vivekanand Jha discussed the catastrophic effects of money spent on health in a developing country like India and how this depletes the economic growth and manpower potential. China's evidence on how air pollution causes kidney diseases has proven how the effect of the built environment has gone beyond its physical

interaction with the body. He stated that the genesis of complex diseases has become more of a matrix than a simple linear structure, further moving on to question the structure of health care system in urban and rural locations. The health care delivery in urban slums is neglected and in a far more challenging state. All aspects of social environment needs are neglected in urban slums and there is no clear definition of rural and urban areas. He also pointed out the reason as a complete lack of cohesiveness amongst urban planners, practicing physicians, and health care professionals and concluded his deliberation with a few questions which need to be addressed, namely:

- How to promote healthy lifestyle for social cohesiveness?
- How to ensure quality housing and space for leisure?
- How are we going to tackle the challenges of road traffic accidents?
- How to build social capacity and provide equal access to health care?
- Can increased urban space encourage food production?

"Genesis of complex diseases has been turned to matrix, than a simple linear structure."
– **Professor Vivekanand Jha**

Dr Mohan K Dongare spoke about a new building material being developed to mitigate pollution in the environment. This nano-strand photo catalytic coating material reduces the emission of pollutants, such as PM2.5, nitrogen oxide, volatile organic compounds (VOCs), carbon monoxide, and SOX, at the same time, its reverse process of photosynthesis nullifies the pollutants in the environment. He also laid out the complete structural composition of polymeric titanium oxide and its application, explaining that the material consists of 99.71% water and only 0.29% solid. He concluded his presentation by encompassing the benefits of the material, including its anti-bacterial properties.

Mr Sanjeev Karpe, in his address, shed light on the significance of natural materials like bamboo to combat the severity of pollution due to its construction material production and application. He began his speech by indicating that India is the second largest producer of bamboo although we are not the leader in bamboo construction. He also endorsed the movement of the application of bamboo in construction other than as an economical strategy, suggesting that its versatility should be utilized and maximized. He also shared a few case studies of bamboo structures around India and how the International Network for Bamboo and Rattan Organisation (INBAR) and the KONBAC Bamboo has collaborated to erect the India's largest bamboo structure as a live example.

Dr Nicolas Osborne concluded the session by summarizing the various innovative and sustainable ways to combat the harmful environmental effects on human well-being.

Thematic Track 16: Market and Legal Perspectives

THEMATIC SPEAKER & MODERATOR

Dr. Maria Balatbat, Senior Lecturer; Joint Director (UNSW Business School), Centre for Energy and Environmental Markets, University of New South Wales

SPEAKERS

Mr Christopher McElwain, Faculty of Law, University of New South Wales

Ms Xinyi Geng, Researcher, UNSW Business School), University of New South Wales

Ms Manju Menon, Program Director (Environment Justice), Namati

Mr Sunil Agarwal, Associate Dean & Director - School of Real Estate (RICS) & Managing Director, Black Olive Ventures Pvt. Ltd.

Mr Pavel Singh, Saint Gobain PPB

In her welcome address, **Ms Maria Balatbat** spoke about the market and legal perspective from the industry point of view in the built environment, focussing on the trends in the financial domain. She stressed on the fact that achieving a more sustainable

society requires realignment of the built and natural environment, as the built environment consumes a lot of resources like energy and generates waste. She went on to speak about the severity of climate change and the steps taken to address the issue. She concluded her opening remarks by stressing on the sustainable development goals (SDGs) formed under the United Nations Framework Convention on Climate Change (UNFCCC) and the role of each of these SDGs in mitigating and adapting climate change-related risks.

> "Achieving a more sustainable society requires realignment of built and natural environment."
> – **Dr Maria Balatbat**

Ms Xinyi Geng in her address spoke about her research on international cooperation on climate change. She stressed on the fact that climate change is not an issue which an individual country can solve; rather it is a global issue and so, requires global attention and cooperation. Ms Geng presented the concern of climate change from a broader economic perspective to the audience, highlighting why individual efforts from countries are not sufficient in abating climate change. She spoke about the fact that all countries are affected by climate change but the impact of climate change is not evenly distributed globally. The countries most affected are the poorest countries of the world. She presented the fact that the Asian and African developing countries are the most affected, with China and India being at the forefront. She also highlighted the fact that the poor and developing countries are less capable of responding to the effects of climate changes and hence fall under the vulnerable category. She informed the audience that climate change alone can cause India 2.8% of its gross domestic product (GDP) and weaken the living standards of nearly half of the population. While concluding her presentation, she emphasized on the concept of global cooperation and its need for mitigating the risks associated with climate change.

> "Climate change is not an individual issue and requires global cooperation."
> – **Ms Xinyi Geng**

Mr Sunil Aggarwal spoke about the need for inclusive decision making while deliberating climate change negotiations. He stressed on the fact that while developing any policy, it should be made mandatory to involve all the relevant stakeholders in the process. He spoke about the market legislations in the

built environment from industry perspective highlighting the fact that for business the only thing which matters is how a particular product will fetch revenue. He highlighted the fact that policy initiatives should address the financial mechanisms for industries to willingly uptake the initiatives. He spoke about the importance of linking the financial benefits with sustainability mechanisms for the industry practices. He further said that collaborating with established industry partners and making them the champions of sustainability followed by developing the path for small industry groups to follow suit may go a long way. He also deliberated on the need for a strong regulatory push from the government targeting the right people and influencing the customers parallelly. He concluded his presentation, accentuating the need for collaborative decision making, focussing on financial mechanisms for industry in the arena of sustainable development.

> "Policy initiatives should follow the collaborative approach targeting the lowest in the pyramid for strong uptake."
> – **Mr Sunil Agarwal**

Ms Manju Menon discussed about the political regulatory in the field of environment regulations. She deliberated on the fact that economic goals and environment regulations go hand in hand and are interrelated with each other. She, in her presentation focused on the relationship between large-scale urban development projects and environment regulations. Presenting the case studies of two projects from south Delhi district, she addressed the issue of engaging stakeholders in the process of environment clearance and stressed on the importance of public hearing in the process of environmental clearance for all large development projects. Further, she discussed how under the umbrella of urbanization and housing needs, the environmental clearance process for housing projects are not scrutinized enough to meet the legal requirements and backed the information with case studies.

Mr Christopher McElwain spoke about the issue of food wastage globally and highlighted the fact that the problem of food wastage is as severe as the problem of climate change. He informed the participants that globally, human beings waste one-third of the food produced every year. Given that the percentage of food wastage is growing exponentially every year, he stressed on the fact that wasting food is not the only resource we waste but also the energy, water, soil, land, and money invested is wasted; the cost of this is estimated to be USD 2.6 trillion annually. He also presented the comparable figures of amount of food wasted in India and Australia annually and informed the participants that the wheat harvest waste in India equals to the entire wheat harvest of Australia. While concluding, he briefly presented the reasons of food wastage globally and highlighted possible solutions for it such as raising awareness, developing policies, etc.

The speakers in the session discussed about the financial and legal aspects from industry perspectives in the domain of climate change and sustainable development. The deliberations in the session revolved around the need for mutual agreement and cooperation in tackling climate change. The speakers also spoke on the need for linking monetary benefits with the sustainable development agenda to make the policy attractive for uptake from the industry point of view. The speakers stressed on the fact that climate change is underway and the current generation has already begun to witness the effects of climate change and highlighted the fact that the most vulnerable section of the society globally is the poorest section as they lack preparedness to respond to its effects.

Cultural Evening & Awards Night

Welcome remarks - **Dr Ajay Mathur**, President, GRIHA Council and Director General, The Energy and Resources Institute

Special remarks - **Mr Laurie Pearcey**, Pro-Vice-Chancellor (International), University of New South Wales

Special remarks – **Dr Alka Bhargav**, Joint Secretary & Mission Director, National Bamboo Mission

Special Remarks - **Ms Koyal Rana**, Femina Miss India 2014

Vote of Thanks: **Mr Sanjay Seth**, CEO, GRIHA Council

The awards function and cultural evening, organized as part of the 10th GRIHA Summit aimed to celebrate and reward all the projects which have pushed their boundaries and tirelessly worked to become more sustainable and green over a period of time.

Dr Ajay Mathur, in his welcome address, acknowledged the wonderful experience acquired as part of the 10th GRIHA Summit in terms of consciously thinking about the future and making the world a better place. He stated that the infrastructure of tomorrow will determine the range of sustainable options at our disposal. He emphasized how though the future holds huge opportunities, these are ultimately contingent on the choices , either consciously or unconsciously. He congratulated the UNSW team together with team GRIHA Council for co-creating the grand summit and making it a success.

In his special address, **Mr Laurie Pearcey** mentioned that the solutions for today's challenges can only be found by building strong partnerships and by the power of collaboration. He stated that TERI has been an exceptional partner and GRIHA Council will be a phenomenal titan in the future of the world's sustainability and that UNSW is delighted to contribute to the work of these organizations. He indicated that the problems that India and Australia have been facing




in terms of water, energy, food, climate change, and so on will be only solved through education and that both the countries have been immensely blessed with the resource of young people. Quoting Mahatma Gandhi, "Science without humanity is one of the world's greatest deadly sins", he reiterated that UNSW, TERI, and GRIHA Council will always stand tall for science with humanity.

Dr Alka Bhargav opened her remarks by congratulating everyone involved in the summit for making it a huge success. She highlighted that with the amendment in the Indian Forest Act, 1927 bamboo has now been identified as a grass and this has led to the restructuring of the National Bamboo Mission. Incentives in the mission for the farmers have also made it easier to grow bamboo and sell it whenever they want at reasonable prices. She emphasized on the fact that earlier bamboo was sourced in a limited manner only for the paper mills whereas now it would also be used by the construction industry on a large scale. She underlined that bamboo is a natural composite material which is now recognized as a 'greener' alternative to various building materials. She further added that the mission is also focusing on engineered bamboo being used as the material for construction of the houses in the Pradhan Mantri Aawas Yojana (PMAY). She also pointed out the zero waste property that comes with the increased usage of bamboo suggests that architects of the country have put their best knowledge in using bamboo in their designs beyond conventional huts. Efforts are being put to include bamboo-based engineering as a subject in polytechnic and engineering colleges post discussion with relevant ministries.

In her special remarks, **Ms Koyal Rana** desired a rating system that will rate the core of humans similar to the way GRIHA rates buildings. She acknowledged well-being to be of utmost importance and underlined the importance of yoga for individuals. Further, she urged that a sustainable future cannot be imagined

without giving a voice to women who along with the future generations can play an active role in enabling implementation of sustainable practices across the globe. She declared herself available for interacting and taking forward the cause of sustainability jointly with the GRIHA Council and TERI. She congratulated all the awardees for their wonderful work and encouraged them to continue the same.

In his vote of thanks, **Mr Sanjay Seth** acknowledged all the panelists for their presence and support towards the cause of the summit. He reiterated that the 10th GRIHA Summit was fortunate to have on board eminent sponsors and partners from all the major sectors such as the central and the state governments, state development agencies, academicians, architects, builders, developers, and so on. He expressed his gratitude towards the participants for making the event a bigger success. Lastly, he appreciated the untiring efforts and remarkable dedication that team GRIHA Council showed in order to put up the Summit. The latter part of the event witnessed presentation of exemplary performance awards to the winners in various categories, such as passive architecture design, sustainable building material, energy management, integrated water management, and so on. These awards are hosted by GRIHA Council every year during the summit to encourage excellence in delivering the micro aspects and goals of sustainability. The awards ceremony was followed by a cultural performance, Nrityakaya, by Rakesh Sai Babu, TRIKAYA, Rakesh and Priya Dance Company. This was a beautiful amalgamation of various dance forms which included Mayurbhanj chhau and Odissi (Odisha), Bharatanatyam (Tamil Nadu), Manipuri (Manipur), and Kathak (northern India). These scintillating dance performances represented India's rich cultural diversity and enthralled the audience.

DAY–3

Plenary Session 3: Connecting the Past with the Future

MODERATOR

Mr Ashok B Lall, Principal, Ashok B Lall Architects

SPEAKERS

Mr Sanjay Prakash, Principal Consultant, SHiFt

Ms Moulshri Joshi, Founding Partner, SpaceMatters

Professor K T Ravindran, Academic Advisor, RICS School of Built Environment, Amity University

The session on 'Connecting the Past with the Future' focussed on how re-imagining architecture can provide transformative solutions to the challenges of urbanization. The synthesis of traditional knowledge and wisdom with modern techniques of climate responsive design was presented as the panacea for developing holistic and sustainable living spaces. The architectural magnificence of the medieval city of Jodhpur was the highlight of the session, providing multiple lessons to the much-aspired green way of life.

In his capacity as moderator of the session, **Mr Ashok B Lall** laid down the approach for the discussion while questioning the polarities between tradition and modernity. According to him, growing population, increased material demand, and the global shift towards urbanization were

the imperatives of change that require a synthesizing approach between tradition and modernity. Elaborating on the three dimensions of this approach—cultural, environmental, and technical—he surmised how applying industrial principles to the field of craft, in the form of small tools and equipment, could significantly increase productivity. He explained why a high-rise, high-density city will be an 'anti-social city' due to the heat island effect, rise in temperature, pollution, congestion, and reduction in greenery. Low carbon cities ought to be low/medium rise with optimum density and small to medium grain morphology from economic, social, and environmental points of view. He supported the idea of using natural materials that can be converted into building materials with relatively smaller amount of inputs, in place of energy-intensive materials. The fulfillment of the above approach lies in moving into a novel modernity through subtle innovations.

"One must equally acknowledge the reality and necessity of change."
– **Mr Ashok B Lall**

Mr Sanjay Prakash enthralled the audience with his quest for working in the desert and making the desert work again. He introduced Jodhpur, the 'Blue City' of the Thar Desert with its mesmerizing beauty in the form of blue cranes, water reflecting the blue of the sky, and indigo used in white-washing the built environment. He explained the traditional water management system of the Mehrangarh Fort which ensured efficient use of every drop of water. He discussed how step-wells known as ***baolis*** weaved the social and cultural life of people around water. Baolis doubled-up as social spaces, in the form of theatrical stages, where artists presented their performances augmented by the reflections in water!

Ms Moulshri Joshi reflected on Mr Prakash's pursuit of recovering back stable ecology through the point of view of toxic landscapes. She shared how the the toxic landscape of Hiroshima was turned around after the nuclear disaster, and probed the audience if we could perform a similar feat at the industrial disaster site in Bhopal. Her organization, SpaceMatters, believes in cleaning toxic soil and water using native plants and in-situ technologies at the site of the Bhopal Gas Tragedy. The question, Ms Joshi highlighted, is whether we can slowly reclaim soil from the contaminated landscapes of sites of mega-disasters. She also stressed on innovative ways of using soil that cannot be reclaimed. She admired the lateral thinking displayed at the National Memorial for Peace and Justice, USA, that collected soils from lynching sites across the USA for exhibiting. She urged that recovering spoilt landscapes requires patience and a multi-disciplinary approach.

"We have to go back to the basics and understand how things used to work so well. Jodhpur, in the middle of the Thar Desert, has very high water table. People don't build basements there!"
– **Mr Sanjay Prakash**

Professor K T Ravindran continued the discussion by elaborating on new aspirations in the field of urban design. According to him, compact city form, mixed land use, optimum density, social cohesion, pedestrianization, public spaces, climate friendliness, and integrated living are the essential attributes of a sustainable city. He explained how better mobility is achieved in a compact city form. He underscored that streets are to be viewed as public spaces and social spaces. He made a sharp distinction between 'real public spaces' that provide maximum access to maximum people and 'ceremonial spaces' of the colonial period. Professor Ravindran indicated how energy efficiency, waste management, and water security were the key themes of the present day Green Buildings Movement. His idea of a conscientious society

is based on the belief that all sentient living beings live with compassion in an integrated living experience for children, elderly, differently-abled as well as animals.

> "Cities grow by recycling land; today's challenge is to recycle industrial land and to transform the past."
> – **Ms Moulshri Joshi**

Taking the session forward, the speakers deliberated on some of the urgent issues of urbanization grappling us nowadays, such as increasing migration to urban areas, traffic management, including parking and congestion, and the scalability of the kind of urban experience desired socially. Professor Ravindran pointed out that the question of migration needs to be evaluated from the perspective of livelihood. He added that vibrancy of the cities is due to small-scale entrepreneurs. According to Ms Joshi, the problem of traffic and parking management, along with preservation of trees, represents conflicting demands for use of space. Finally, the concept of 'Aparigraha' in the Jaina philosophy, which advocates dispossession, optimal consumption, and respect for commons, was agreed to be the spiritual guide for modern urbanization.

> "Of late, there has been a realization that increasing speed increases urban anxiety. We need to calm the city down."
> – **Professor K T Ravindran**

Thematic Track 17: Policy, Regulations and Enforcement

MODERATOR

Mr Markus Wypior, Deputy Cluster Coordinator GIZ IGEN

SPEAKERS

Mr Saurabh Diddi, Director, Bureau of Energy Efficiency

Ms Henriette Færgemann, Counselor Environment Energy & Climate Change at EU Delegation to India

Mr S P Garnaik, CGM (Tech), Energy Efficiency Services Limited (EESL)

Mr Stefan Horschler, Buofur Bauphysik

The session initiated with moderator Mr Markus stating that though people don't normally want to know how policies are made, it is sometimes good to look into the process and give advice on how to make it better. He opened the floor to the panellists to proceed with the discussions on how policies can be optimal mix of instruments in which some policies have to be regulated and some don't. He emphasised that consensus is very important in making regulations as it helps in enforcement.

Mr Saurabh Diddi elaborated on the various activities undertaken by the Bureau of Energy Efficiency (BEE) towards reducing as well as monitoring energy consumption patterns. He highlighted how the domestic and commercial sectors combined consume around 36% of electricity. He added that there has been a significant growth in the number of buildings in these two sectors which, when quantified, roughly equals 2 billion units (BU) of electricity in residential and 100 BU in commercial sectors in 2016. He explained that till date, the Energy Conservation Building Code (ECBC) only had authority over commercial buildings but BEE would soon launch ECBC for residential buildings with the aim of reducing air conditioning load by designing energy-efficient spaces. Mr Diddi informed the participants that the ECBC has already been mandated in 12 states and 1 union

territory; the BEE as a part of their plan to mandate in all states and union territories had issued notifications to all states for incorporating it into their bye laws by December 2018.

Further, Mr Diddi stated that the BEE under the Energy Management Information System (EMIS) will launch an online portal known as the 'Building Passport' which will monitor the energy consumption of buildings and also suggest ways to improve the rating level or energy efficiency. He added how eventually, BEE plans to have an evaluation tool to anonymously rank the rated buildings among its peers in the same category. He elucidated that the new online portal will also have an in-built simulation tool to create a base case from the proposed design case and compare the Energy Performance Index values for the two.

Ms Henriette Færgemann shared the work done by the European Union (EU) as part of the comprehensive policy framework between the EU and India on energy and climate change known as the Clean Energy Climate Partnership, inaugurated at the GRIHA summit in 2016. She mentioned that the EU has targeted 20% energy savings by 2020 further increased to 32.5% by 2030 which was put into the mandatory revision of 2023. She revealed that the previous EU directive and ECBC codes were quite similar, with additions such as a better long-term renovation strategy which requires a road map, regular inspection of heating and ventilation systems, and introducing building renovation prospects in the new directive to make the best possible contribution to the climate agenda. Ms Færgemann said that the EU in India had worked with the state governments of Maharashtra, Madhya Pradesh, Odisha, and Bihar to understand the requirements to notify and implement ECBC compliances in those states. She explained that once the mapping of the entire system is done and understanding how the decision-making process is driven; the amendment of the bye laws and building codes can be fitted to the requirement and situation, itself considered a long process.

Representing EESL, **Mr S P Garnaik** shared his experience and identified the possibility of saving around 30%–40% energy by incorporating certain interventions in the buildings in 2003. He emphasized that although policy making aligns the manufacturing

processes, the supply chain arrangement, and the compliance mechanism, it is not the only solution and market-based mechanism cannot be sidelined. He shared the successful example of how the price of 9W LED lights had come down by a huge margin. He stated that the primary energy requirement will almost be twice by 2027, if a baseline of 2017 is taken into account. Nearly 6k MW is required for meeting the load demand only in Delhi, of which 60%–65% is attributed to cooling demand. Mr Garnaik said that in India, the air conditioning market had been fuelled by the BEE star labelled appliances and added that there are certain policy drivers which should be implemented keeping in mind that the most important thing is to take efficient cooling initiatives in a time bound manner.

> "Policy making gives a top to bottom approach for people to follow things."
> – **Mr S P Garnaik**

Mr Stefan Horschler, through his video presentation, portrayed how policies were regulated and enforced to check the energy performance of buildings and energy requirements in Germany. He gave a breakup of energy consumption in different sectors and how most of it utilizes fossil fuels. According to him, the main concern of new policies is decreasing the energy demand of buildings and optimizes the use of renewable energy. He took the participants through a checklist of how building energy demand can be kept in control using building envelope and solar shading and concluded by sharing how Germany has two kinds of energy standards—public and private—where private laws aim at even lower targets than public laws.

> "There are two things people don't normally want to know how they are made. One is sausages and the other is law and regulations."
> – **Mr Markus Wypior**

Thematic Track 18: Building Financing & Business Models

MODERATOR

Mr Saurabh Kumar, Managing Director, Energy Efficiency Services Ltd

SPEAKERS

Ms Sandra Soares Da Silva, Head of Energy Cell, KfW

Mr Monu Ratra, ED & CEO, IIFL, Home Finance Ltd

Mr R V Deshpande, DGM, Builder Finance, State Bank of India

Ms Apurva Chaturvedi, Senior Clean Energy Specialist, USAID India

Ms Sandra Soares Da Silva initiated the session by

introducing KfW and sharing its objectives, such as supporting international financing and development corporations in other countries (such as India) to achieve energy efficiency and reduce carbon emissions. She further added that two flagship programmes are being undertaken by KfW which focus on renewable energy and improve energy efficiency in buildings under the mandates outlined by the Government of Germany. She mentioned that the Government of Germany has developed large programmes towards achieving energy efficiency in the building sector which contributes to 1/3rd of primary energy consumption, and thereby will achieve carbon dioxide (CO_2) emission reduction goals of Germany. She explained the financing mechanism for residential buildings, under which funding is provided from its design stage till the implementation of all energy efficiency measures, as outlined by KfW.

Summing up, she stated that commercial programmes or incentives are effective and successful tools to ensure energy efficiency in residential buildings to implement measures, which involve high cost, such as insulation to improve building envelope or high-performance glass; else it would be difficult to invest in buildings.

> "If people have financial incentives it's possible to have energy efficient development."
> – **Ms Sandra Soares Da Silva**

Mr Monu Ratra presented the various financing programmes developed to address upcoming housing needs, inclusive of affordable housing requirements. He further stated that there are numerous challenges in the affordable housing sector in India, conveying that no incentives are available for developers who work for affordable housing and if incentives are

available at all, there is lack of awareness for the same in the retail market. He suggested that there is a need to modulate standards based on local conditions for affordable housing to bring down the cost of construction in India and its prior need to spread more awareness amongst developers. He mentioned how the IIFL Home Finance Ltd have come up with a platform—a one-day training programme, 'Kutumb'—to bring together stakeholders in association with National Housing Programme and professionals for showcasing their various financial programmes (SVARAJ, PMAY [Pradhan Mantri Awas Yojana], fast track loan approval), to ensure awareness.

According to him, educating people, developing financial programmes for green buildings, and greater accessibility to these programmes supported by technology will certainly ensure a 'greener' footprint in India.

Mr R V Deshpande began the session by shedding light on the range of finance programmes being handled by the State Bank of India (SBI) that is, providing finance to everyone, from individual homebuyers to big establishments, at the lowest rate of interest. He mentioned that the commercial building owners and multinational companies frequently demand for green buildings and follow the Energy Conservation Building Codes, as compared to companies or owners dealing with residential sector where the demand for green building is relatively lower. He shared how SBI is also promoting the use of solar energy systems by providing funding at lower rate, included as part of home loan. He added that the SBI is also providing finance for small and medium enterprises along with home buys in association with KfW. At SBI, he mentioned that the origination looks at the fulfillment of all types of approvals (as applicable) while financing any project.

> "31% of population in cities is going to get increased to 50% in 2030 and likewise increase in urban households in India."
>
> – **Mr R V Deshpande**

Additionally, he mentioned that as a small step towards low carbon emission, SBI has formulated a few in house policies, such as reduced use of paper, ATMs with installation of solar photovoltaic system, etc. He concluded by reiterating on the need of awareness and promotion of the green building concept and energy efficient development so that consumers will demand for these, thus ensuring sustainable development.

Finally, **Ms Apurva Chaturvedi** laid emphasis on the need to increase awareness for the implementation of energy efficiency codes and green building concepts within buildings, for which various financial aids are available in the upcoming market. She elaborated how USAID has contributed towards evolving the 'green' concept from the very nascent stage to the near net zero or net zero building concept. She added that USAID is providing technical assistance and support towards formulating the Energy Conservation Building Code (ECBC) to the Bureau of Energy Efficiency and Ministry of New and Renewable Energy, Government of India, since 2007. She explained various financial models supported by USAID towards achieving energy efficiency in equipments, further mentioning success stories, such as the UJALA programme driven by the concept of ESCO model by EESL towards the same goal. She mentioned an upcoming programme by EESL to retrofit existing air conditioners with super-efficient ones in the near future. In conclusion, she mentioned three key areas of the bilateral initiative, known as Market Integration and Transformation for Energy Efficiency or MAITREE, in a true sense USAID–India friendship programme, which looks after technical assistance in ECBC, sustainable cooling technology, consumer engagements and capacity building programmes to achieve energy-efficient buildings in the future. Finally, the moderator stating the importance of collaborations and partnerships towards having a low carbon footprint in India, finally brought the thematic session to a closure. He also mentioned that incentives for greener development will certainly accelerate the initiatives further.

Keynote Address 3: Scientia Professor Veena Sahajwalla Dean, Faculty of Built Environment, UNSW Sydney and Director, Centre for Sustainable Materials Research and Technology, UNSW

ARC Laureate **Professor Veena Sahajwalla** is revolutionising recycling science to enable global industries to safely utilize toxic and complex wastes as low-cost alternatives to virgin raw materials and fossil fuels. As founding director of UNSW's Centre for Sustainable Materials Research and Technology, she, with her team, works closely with industry partners to deliver the new science, processes, and technologies that will drive the redirection of many of the world's most challenging waste streams away from landfills and back into production. Thus, she works towards simultaneously reducing costs to alleviate pressure on the environment.

Professor Sahajwalla launched the world's first micro factory that can transform electronic waste into reusable material. She accentuated on the need to understand the quantum of energy one spends on transporting materials and/or products from long distances and the efficiencies achieved, compared to products manufactured locally. This was primarily her motivation to develop this concept of micro-factory, where the belief is to create best outcomes for energy efficiency from locally available materials and waste being the most common form of locally available resource, found everywhere in the world. Presenting the Indian scenario, she said that the local collection system exists in various formal and informal sectors where the collected waste is seen as a useful commodity. The challenge lies in how the waste can be converted into a value added product. The only way to deliver a long-term sustainable solution is to manufacture functional products and be economically viable at the same time. She explained some examples in building application, such as wall and ceiling panels, flooring, acoustic panels, glass stones, prefabricated building elements, dividers or screens, bench tops, furniture, and so on.

In her presentation, she described electronic waste as a wide range of end-of-life electric and electronic equipment considered obsolete by users. It is one of the fastest growing waste streams, increasing by 3%–5% each year. Micro-factories are built considering e-waste like smart phones and laptops that generate a high amount of residual waste in the form of computer circuit boards, alloys like copper and tin, along with glass and plastic that can be converted into ceramics and plastic filaments for 3D printing. Life Cycle Analysis (LCA) studies on these filament production processes indicates 28% reduction in CO_2 emissions while using e-waste plastic as feedstock in comparison to virgin plastic.

She added that instead of viewing waste as a problem, it should be seen as an incredible opportunity. In this context, he added that micro-factories are the drivers to manufacture green materials from waste at the local level. These manufactured materials can be used for high end applications. There are various small modules

of the micro-factory and it can fit anywhere in the world. Additionally, the e-waste is fragmented and all the different components are pulled apart. By applying different but precisely controlled temperatures in a small furnace, not just the extraction of elements can be undertaken but different alloys can also be made for which metals need not be extracted from the ground. These micro-factories can help convert the burden of the environment into an economic opportunity. So recycling of waste need not be restricted in a manner of 'plastic-to plastic' or 'glass-to-glass'; instead every material can be a valuable raw material. She added that it is imperative to review these in order to reconceive them to manufacture totally different types of products.

She also mentioned that the traditional 3Rs—reduce, reuse, and recycle—cannot cope up with the complexity of the volume of waste generated and hence a fourth R—'reform'—is needed to reimagine and innovate the approach to waste management. Her work involves converting end-of-life materials into value-added green materials. She also invented an environmentally-friendly technology for recycling end-of-life rubber tyres to replace coal in steelmaking. They were successful in diverting more than 2 million tyres from landfills and achieving a prominent reduction in greenhouse gas emissions. The tyres do not just reduce the use of coal but also bring down carbon emissions by introducing hydrogen into the steelmaking furnace. This is how 'green steel' technology was introduced and commercialized worldwide. Her vision is to convert waste into value added materials which can be used in applications and at the same time extends to promotion and support of viable local economies and jobs. Along with her passion for seeing waste as a resource, she emphasized on the fact that not just environmental sustainability, but economic sustainability can also be addressed as this will help create local jobs and uplift the economy of a country.

Professor Sahajwalla concluded the session with a note on the ability to look at waste not just as an environmental burden but rather see it coupled with manufacturing and put the same into practical applications that can be realized at a small scale. Stressing on use of local waste resources, she suggested the need for empowering people to be part of a global supply chain if indeed that's what is desirable. On the other hand, small-scale manufacturing can come to life on the back of waste resources, to fulfill the goal of delivering sustainability in a way that is affordable and doable at a local scale.

Thematic Track 19: Emerging Building Technologies

MODERATOR

Mr Pramod Adlakha, Managing Director, Adlakha Associates Pvt. Ltd

SPEAKERS

Mr S Vikash Ranjan, Programme Manager – EEB, IGEN-GIZ

Ms Camille Sifferlen, Certified Passive House Designer, Trainer and Building Certifier, Passive House Institute

Mr Harish Borah, Consultant, ADW Developments

Mr Shailesh Ranjan, Head – Business Planning & Operations, Asahi India Glass Ltd

Mr Pramod Adlakha moderated the session and deliberated on the emerging trends in architectural research and practice. He described how today innovative building technologies and materials and environmentally-conscious design and multidisciplinary collaborations, are influencing design processes. This has caused convergence of design, technology, and research within architectural practices, where this synergistic relationship is transforming the traditional nature of architectural research and design. In architectural research, the practice-oriented research programmes are gaining immense popularity and in this process, leading architectural firms play an integral part. The co-benefit is that the research conducted as part of this exercise enhances the architectural design and conversely, architectural design value adds the research, since it is driven by the requirements of the consumer. Further, he presented some of the case studies of residences, hotel buildings, commercial as well as industrial buildings, and hospitals.

Mr Shailesh Ranjan elaborated the 4Gs of glass technology, that is acoustic, energy, thermal, and wind load of green glass technology. When people think of glass, they tend to think of simple applications, such as windows and cookware; scientists have however, manipulated glass at the molecular level to take on countless capabilities based on their qualities—glass does not bend, glass is fragile, and all glass quality is the same. He also emphasized that for a standard building, windows contribute approximately 41% of the total heat transfer. The use of glass in smartly designed buildings with shades and inclination reduces the direct heat ingress. He further added that smart glazing refers to electrically switchable glass or glazing which changes light and heat transmission properties when voltage is applied. Glass should not be assumed for its performance; products with calculated low U-value and SHGC are the best and are a universal solution. Ideally, direct radiation falling on the windows should be minimized; for shaded windows products with lower U-values perform better; for unshaded windows receiving high amount of solar radiation, products with low Solar Heat Gain Coefficient (SHGC) would perform better. Hence glazing should be selected after proper study of climate, orientation, and thoroughly considering the design of the building.

"Glass is a very beautiful product – use it, don't abuse it. We need to use the right product at the right place."
– **Mr Shailesh Ranjan**

Mr Vikash Ranjan focussed on new technologies and techniques in construction to make it cost effective. Emerging building technologies depend on 4 factors— material, construction, cooling, control & automation. He also illustrated few properties of materials, such as low embodied energy, energy efficiency, reusable, recyclable, bio degradable, pollution preventing, and self- healing and self-cleaning. Emphasizing on selection of glazing, both by performance and cost, he said that upon finalizing the aesthetic of the glazing, a comprehensive analysis of the product(s), when integrated with the building systems, should be conducted to arrive at the optimal glazing parameters without overdesigning or under-designing the glazing system.

Ms Camille Sifferlen illustrated the passive house building criteria, which is heating demand with the insulation on external walls, windows for proper ventilation, and ensuring comfortable/ideal temperature inside buildings. The temperature is contingent on the climatic conditions; cooling demand; primary energy demand; and air tightness. She also illustrated various tools, such as ventilation units. Further she presented case studies of several buildings in China, Germany, Sri Lanka, and Europe.

Mr Harish Borah presented life cycle costing techniques and emphasized on systematic consideration of all relevant costs and revenues associated with the ownership of a product/asset throughout its life cycle. He also said that a systematic compilation and evaluation of the potential environmental impacts of a product/asset system throughout its life cycle should be considered while conducting life cycle analysis (LCA). The benefit of using life cycle thinking (LCT) approach implies that negative impacts are minimized while avoiding the transfer of these impacts from one life cycle stage to another. When applied to product design, production processes and decision-making, LCT is a meaningful strategy for crafting and implementing effective sustainability strategies. The LCT concept is based on the Life Cycle Management approach wherein LCA is a key pillar in understanding the environmental impacts related to the various systems and thus, helps to identify opportunities towards enhancing overall product sustainability.

"Ultimately user's voice is consumer's voice."
– **Mr Harish Borah**

Thematic Track 20: Advancements in Building Optimization

MODERATOR

Mr Anurag Bajpai, Director, GreenTree Building Energy Pvt Ltd

SPEAKERS

Mr Rohit Chasta, Senior Engineer, Energy Efficiency, International Operations, Schneider Electric

Mr Dhiraj Wadhwa, Director – Integrated Solutions & Key Accounts, United Technologies - Climate, Controls & Security

Mr Deepak Shapeti, Director, Ignis IT and Rupak Group

As moderator, **Mr Anurag Bajpai** presented a brief overview of the theme and highlighted the importance of building optimization to ensure the ideal utilization of natural resources.

In his address, **Mr Rohit Chasta** detailed the current rate of urbanization and the trends in building power consumption which are likely to increase. According to him, by 2040, the current building energy consumption will grow by 80% and with the increase in demand the modes of supply of electricity will also undergo a change. There is a move away from a centralized distribution system to a decentralized one. Hence, it is important at this stage to ensure energy

efficiency in both the existing as well as new building stocks, he added. While the task at hand is challenging, it also presents us with an opportunity to promote sustainable development. To attain these goals, therefore it is essential to achieve the convergence of information technology and operational technology. Mobility of technology, data repository on cloud systems, sensor technology, cyber security, and smart analysis will fuel progress. He emphasized on the fact that operational control and information technology, both serve different essential functions of a building system. Since neither can be substituted by the other, their convergence is essential. An eco-structure approach connecting all equipment through feedback loops will drastically enhance the performance of buildings. While concluding his presentation, he said that if digitization of data is achieved, energy consumption in the building sector can be reduced by 10% in the next two decades.

> "Gone are the days of linear centralized electricity distribution. It is time for localized resources and distributed power generation."
> – Mr Rohit Chasta

Mr Dhiraj Wadhwa initiated by describing how building technology has evolved from an array of universally designed products to tailor-made solutions for each project. The current trends of increased urbanization

and energy consumption have brought security, connectivity, and environmental sensitivity to the forefront of building technology. He said that there is a rise in awareness of energy efficiency even though the primary motives for developers is to reduce cost and for users is to achieve comfort conditions. He added that while the past few decades have seen individual equipment becoming more efficient, the same trend cannot be observed for overall building energy consumption. He underlined that to attain energy efficiency and optimization in buildings, it is integral to assess the energy savings and consumption patterns of all services. Energy consumption trends show that air-conditioning consumes 40% of the total operational energy of a building. While convergence of different technology can be seen all around, the building sector has still not adopted the strategy in entirety. Hence, the current responsibility of assessing performance lies with the facility managers and professional auditors. He stressed on the fact that currently, facilities measure and record a large amount of data from equipment but the correct use and analysis of the data is not well planned. Manual inspection is usually superficial and concentrates on the 'visible' parameters, such as log books and maintenance schedules. A large amount of 'invisible' data, such as variable occupancy and unsynchronized working of equipment, goes unnoticed. Hence, he reiterated that it is important that intelligent operational technology, such as the plant optimizer, be included such that equipment can sense the data and optimize accordingly. The plant optimizer not only records data but also provides intelligent analytics. The performance curve of such intelligent equipment grows with time. It includes the added benefit of recording real time data such that anyone can access it using a simple online dashboard. The use of the optimizer system has been shown to reduce the energy consumption of HVAC systems by 20% to 40%. In the case of Taj Hotel in New Delhi, the plant optimizer, in conjunction with simple mechanical retrofits, enabled the facility to save over a million units of electricity in a period of 9 months. The potential of the optimizer can be extended to other services in an integrated building management system.

> "The pace of rise in awareness does not match up to the pace of advancement of technology, policy and regulations."
> – **Mr Dhiraj Wadhwa**

Mr Deepak Shahpeti elaborated on the use of augmented reality (AR), thus ushering in a new era of technology. He discussed the multi-pronged use of AR in the pre-construction stage where it is currently being used to design collaboratively, thus saving the time and money spent on physical modelling and diagnostic runs. He suggested that training of professionals for installation of equipments can become quicker and cheaper with this technology as the training is no longer limited to space and time.

During the operation of facilities, the tool can enable quicker diagnostic and troubleshooting such that professionals no longer need to be present at the site to address malfunctions. While the capital cost for setting up the AR facility is considerable, the operational cost is negligible and savings are immense. He also discussed that during the implementation of highly sensitive AR systems, it is important to assess the existing weak points in the system and identify the energy optimization potential. Each system is tailor made to fit the need of the clients and tested in phases before being rolled out to all parts of the site.

In conclusion, the session highlighted the need to converge different existing technologies to achieve a system where no equipment functions in isolation. This can be achieved through different methods but needs to be checked through regular data collection, monitoring, calibration, and spot audits. There is a need to change the perspective of the markets on operational cost since it is significantly higher than the capital investment. While technology, policies, and regulations get better with time, awareness about energy and resource efficiency in India is still low. Current retrofit technologies can enable our existing building stock to become more efficient but future development needs to be planned carefully in order to achieve a sustainable future for all.

VALEDICTORY

In his vote of thanks, Dr Winfried Damm, bringing the proceedings of the 10th GRIHA Summit to a close, acknowledged the presence of everyone who contributed to making the event a success, both in the capacity of a participant and an organizer. Dr Damm, started by thanking everyone, who attended the event and further went on to appreciate Mr Saurabh Diddi, Director, Bureau of Energy Efficiency and his team; Mr Sanjay Seth, Chief Executive Officer, GRIHA Council and Senior Director, Sustainable Habitat Programme, TERI and his team; and Mr S Vikash Ranjan, Programme Manager – EEB, IGEN- GIZ, for their efforts. Further, he appreciated the mandate of the summit in terms of engaging in thought provoking, stimulating discussions amongst policymakers and those in the building industry, showcasing the latest in the field of green buildings, and providing a platform for knowledge sharing.

Dr Winfried Damm, Head of Indo-German Energy Programme, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH


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