



JOURNAL OF THE INDIAN INSTITUTE OF ARCHITECTS
PEER REVIEWED JOURNAL OF IIA ISSN-0019-4913
NOVEMBER 2024 VOLUME 89 ISSUE 11 RS.100



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Printed & Published/Editor by Ar Lalichan Zacharias on behalf of The Indian Institute of Architects.

Designed by **India Printing Works**

Printed by **Arihant Digiprint**

Shed No.1, Ground Floor, CTS No.15, 16, 20, 21 & 37, Italian Compound, Dindoshi Village, Ittbhatti, Goregaon East, Mumbai-400063

Published at The Indian Institute of Architects, Prospect Chambers Annexe, 5th Floor, Dr. D.N. Road, Fort, Mumbai-400001.

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JIIA IS A REFEREED JOURNAL
ISSN 0019-4913

REGISTERED UNDER SOCIETIES
REGISTRATION ACT XXI OF 1860.

JOURNAL OF THE INDIAN INSTITUTE
OF ARCHITECTS
VOL. 89 - ISSUE 11 - NOVEMBER 2024

www.indianinstituteofarchitects.com

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IIA OFFICE BEARERS

Dear IIA Members,

Here's wishing all a very happy Diwali !!

IIA held its first-ever Women's International Conference PINKPRINT at Odisha. This showcased and celebrated the five components of women's empowerment: sense of self-worth, right to have and determine choices, right to have access to opportunities and resources, right to have power to control their own lives and the right to have ability to influence social change for themselves and for others.

All these abilities are there in all women and more so in women architects, only sometimes, and for some, it needs to be boosted.

We have seen the changes in women architects: They have broken barriers and redefined the way India looks at Women Architects and Architecture. There are an endless number of examples: Ar. Brinda Somaya, Ar. Abha Narain Lamba, Ar. Sheila Sri Prakash, Ar. Shimul Javeri Kadri, Ar. Anupama Kundoo, Ar. Samira Rathod, Ar. Aishwarya Tipnis, Ar. Chitra Vishwanath, Ar. Sonali Rastogi, and many others, right from Urmila Eulie Chowdhury, who was Asia's first qualified female architect.

Women don't just build homes, as society ordains them to, they build houses too, unfortunately, unsurprisingly, however history largely remembers the men and forefathers of our modern civilization, the foremothers stay forgotten.

I remember, when I joined architecture in 1971 there were only 3 female students in a class of 50, and this ratio remained constant for many years. But from the late 20th century and early decades of the 21st century, the ratio was reversed, there were fewer boys and a large number of in almost all architecture colleges.

In the profession too, it is only now that the ratio has become almost equal. There are nearly 43% women architects. But the domination by male architects is still overwhelming.

Having female team members ensures distinct advantages to the process of forming the built environment, with their creativity, innovation and community representation. By themselves, or with their male counterparts, they balance the team, with their inherent leadership qualities. Challenges faced by women in the field are usually work-life balance. Like many other professions, architecture too, demands long hours and high levels of dedication. However, societal expectations often place undue burden on women to simultaneously manage their professional responsibilities along with household chores and caring for their families. This can create tremendous pressure on female architects as they try to juggle demanding work schedules while also meeting personal obligations at home.

We need both men and women in this industry to help each other be our best selves, and that requires focused efforts from firms along with changes in working policies. While these challenges may seem daunting, it is essential not to overlook the immense talent and resilience displayed by many women architects who have overcome these obstacles and become successful.

We at IIA, were among the first few institutions in the country who started using the term "Chairperson" instead of "Chairman" to symbolize our stand for gender equality.

We look forward to the day when all architects, regardless of gender will stand together as capable professionals and strong human beings.

The SRC held at Wayanad, Kerala on 29-30 November was a fitting end to the month, where many eminent architects shared their expertise with those gathered, among them, Pritzker Award winner Ar. Alejandro Aravena from Chile.

Ar. Vilas Vasant Avachat
President, IIA

EDITOR'S NOTE

This year Deepavali spread happiness in the month of November, and so continued the shower of blessings for all my dear Fellow Members of the Indian Institute of Architects. This month comes with important national events and festivities and offerings to the world as well. We celebrated *Govardhan puja* on 2 November along with the very famous festival of Kerala, *Parumala Perunnal*. To honour the unique relationship between siblings, *Bhai Dooj* was celebrated on 3 November. *Chhath puja* is an ancient festival observed with great joy and dedication in north India to show gratitude and wishes for good health, prosperity and a long life. Four Bharatiya states were formed on 1 November - Karnataka, Haryana Jharkhand and Uttarakhand. 11 November was observed as *National Education Day* to commemorate the birth anniversary of India's first Education Minister, Maulana Abul Kalam Azad. On 10 November *World Public Transport Day* is observed to raise awareness about the importance of public transportation in creating sustainable cities and improving the quality of life as a global initiative along with November 19 as *World Toilet Day*. This day is primarily about stimulating people to address the global sanitation crisis and achieve Sustainable Development Goal (SDG) 6, which promises sanitation for all by 2030. Every year on 14 November, India celebrates *Bal Divas* or *Children's Day* for sensitising people about children's rights, care, and education. This day commemorates the birth anniversary of India's first Prime Minister, Jawaharlal Nehru. On 26 November, Bharat observes *Samwidhan Divas* or *Constitution Day* when India's Constituent Assembly adopted the Indian Constitution.

We have an interesting November issue representing the rich culture of Odisha and the contribution of women architects in shaping the present and future of the state of Odisha aptly depicted in the cover theme. IIA Odisha Chapter hosted the very successful event of *Pinkprint*, the first International Conference for women architects. It showcased women's talents from the international arena and their participation in shaping society.

Another successful Southern Regional Conference has been hosted by IIA Kerala Chapter in the beautiful city of Wayanad with a great line of speakers, which marked a gratified end to the penultimate month of 2024.

This year, filled with so many events organized by IIA Chapters, Centres and Sub-Centres, shows immense enthusiasm to help the fraternity under the able vision of our President and IIA Office Bearers.

Another event, *Purvoday*, the Eastern Regional Conference (ERC) has been planned by IIA Jharkhand Chapter in the city of Ranchi on 20-21 December. Also, the most-awaited event *IIA National Awards for Excellence in Architecture 2023* was launched at the 10th IIA National Council Meeting at Odisha. We urge all IIA members to participate in all these events and continue your support which you have shown this entire while.

The most exciting achievement of IIA is winning the bid to host, for the first time, the prestigious *International Union of Architects (UIA) Forum* in India. We received this confirmation in the UIA Forum concluded at Kuala Lumpur, Malaysia this month. This event will be hosted at Mumbai in 2027. It is very important for each and every IIA member to participate in the preparation of this event to ensure its grand success, from now itself, and showcase our leadership in architecture worldwide. Together we can do great things..!!

An appeal to all IIA members to contribute to JIIA with articles, projects, research papers and most importantly, in terms of sponsorship and funding. Thank you for your continued support and readership.

Prof. Vinit Mirkar
Editor, JIIA



Ar. Vinit Mirkar

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COVER THEME

Building Her Legacy



The cover design for the PINKPRINT event, a groundbreaking International Conference of Women Architects held in Bhubaneswar and Puri, Odisha captures the vibrant intersection of tradition, innovation and the pioneering spirit of women in architecture. At the centre of the image is a poised woman architect, a symbolic figure representing the global community of female architects. Her confident posture, complemented by the white helmet in her hand, reflects both professionalism and the determination to break barriers in a traditionally male-dominated field. Her attire subtly blends modernity with traditional elements, highlighting the graceful fusion of global expertise and local cultural identity.

In the background, the majestic temples of Bhubaneswar and Puri dominate, embodying the rich architectural heritage of Odisha. These temples are not just monuments of the past but stand as timeless symbols of intricate craftsmanship and architectural prowess. Their presence in the design acknowledges the deep-rooted cultural and historical significance of Odisha, which served as a fitting backdrop for this international gathering of women architects.

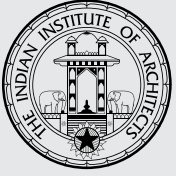
The inclusion of the *chakra*, an iconic element associated with Odisha, connects the past to the future, representing a cycle of innovation and continuity in architectural discourse. It serves as a metaphor for the ever-evolving nature of architecture, where new ideas and traditional wisdom intersect, much like the international perspectives brought together at the Conference.

A prominent pink lily blooms amidst the architectural elements, symbolizing beauty, creativity and femininity. The choice of a pink hue not only aligns with the theme of PINKPRINT but also pays homage to the strength and grace of women who are reshaping the architectural landscape worldwide. This flower signifies the nurturing yet resilient nature of women in architecture, capable of thriving and leaving a mark in any environment. Three solar panels are integrated into the scene, showcasing the commitment to sustainable and innovative architectural practices. They emphasize the modern and forward-looking aspect of the event, reflecting the global shift towards eco-friendly designs that respect both cultural heritage and environmental considerations. These panels are a nod to the future, where technology and tradition coexist harmoniously in the world of architecture.

The overall colour scheme dominated by shades of pink, white and black creates a sense of unity and balance. The pink tones are warm and inviting, reflecting the hospitality of Odisha, while the monochromatic elements add a layer of sophistication, underscoring the professional achievements of women architects. The clean lines and detailed patterns echo the precision and artistry inherent in architecture, symbolizing the meticulous and creative nature of the field. In essence, this cover design is more than just a visual representation, it is a narrative that tells the story of the PINKPRINT event. It celebrates the convergence of global expertise with Odishan culture, the empowerment of women in a professional sphere, and the seamless blending of past, present, and future in architectural discourse. This landmark conference, held amidst Odisha's historic landmarks, stands as a testament to the transformative contributions of women architects who are shaping the built environment worldwide.



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JIIA Call for Papers, Articles, Projects

The Journal of the Indian Institute of Architects invites original and unpublished contributions from members **ONLY** (academicians, practitioners and students) under the following FIVE categories. Submission in each category is strictly only through the respective google forms.

In order to be accepted for publication, all material sent in these categories should have the following components:

1. MS Word document file with text only. Please do not format it in anyway. The numbered captions for all the images will also be in this document.
2. Folder with all images (minimum 300 dpi), numbered according to the captions given in your text file
3. Photograph of the author/s (minimum 300 dpi).
4. Author biodata – Maximum 50 words.
5. PDF (optional)– showing the intended layout. This pdf should include text and all images, with numbered captions.

Category 1 : Articles

google form link: <https://forms.gle/7pDFva1HDH4hfUyj8>

Essays, interviews, articles (1500- 2500 words), book reviews (600 and 750 words), travelogues, sketches and photo-essays in the areas of architecture, planning, urbanism, pedagogy, heritage, technology, ecology, theory and criticism, visual design, practice or any other relevant subject pertaining to the built environment. (Details of the format will be available on the JIIA website).

- For a design project, please include the 'Fact File' with the following details : Project Name, Location, Plot area, Total built up, Structural consultants, Project completion. Also please give the photo captions and credits. Please ensure that the image is referred to within the text. For eg, "As seen in Figure 1...". This is essential for the layout.
- For design projects, plans and sections of the project are desirable along with the photographs.
- Book reviews should be only of books by Indian authors. please include the "Fact File" with the following details: book title, author name, publisher, year of publication, ISBN, language the book is written in, genre (technical/ fiction/ etc.), no of pages, dimensions (in cm), type (Kindle/ paperback/ hardback), available at (amazon.in/ flipkart.com/ others).
- Please send a write-up of about 200-300 words along with sketches and photo-essays.

Category 2 : Student Work

google form link: <https://forms.gle/hyhsCoK6QPe6qDJu8>

Summaries of dissertations (2000-3000 words) at the level of B.Arch. & M.Arch., and theses at the Ph.D. level. The Guide for that work will be mentioned as the Co-author. (Format will be available on the JIIA website).

Category 3 : Contributions from Chapter Correspondents

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(a) *Chapter News*: This includes various interesting activities from the Centres of your Chapters (maxm. 500 words for the news from the *entire* Chapter).

(b) News of conferences by the academic institutes in your respective Chapters.

(c) *Obituaries* : Obituaries of IIA members should consist of the photograph of the departed soul, the dates of birth and death and a short 50-word note.

Category 4 : Research Papers

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Research papers (2000-5000 words) in the prescribed format. The research may be based on their ongoing or completed research. (Format is available on the JIIA website). All contributions in this category will be double blind peer-reviewed before being accepted for publication by academic experts of repute.

Category 5 : Cover Design

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Students from affiliated colleges are invited to design the cover page theme. This should be a graphic based on some aspect of Indian Knowledge Systems. The submission will include the graphic file (jpeg or corel draw); a theme note (with a title) of about 500 words explaining the concept of the graphic.

Please note that the image you send will be adjusted as per the layout requirements of the JIIA Cover.

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3. Any queries to be addressed to : jiiateditorial@gmail.com.
4. When you correspond with us, please give your email id (that you regularly use) and your cell no. (preferably with WhatsApp).
5. It is compulsory to mention your IIA regn. No. Submissions will **NOT** be accepted from non-members.
6. The review process takes anywhere between 4-6 weeks. Since it may not be possible to respond to all authors who send in their work, we will definitely revert if and when your work is accepted.
7. JIIA does not charge any fees for publication of any professional or academic work.
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9. All authors are requested to refer to further detailed information available on the JIIA website.

This research paper was presented at the IIA ANVESHAN Research Conference held at MCAP, Thiruvananthapuram, Kerala during 29-31 August 2024, under Stream II: The Significant Present

Role of Urban Metabolism in Sustainable City Planning

A Case Study Approach

By Ar. Gayathri V.

Abstract

Urban areas face significant sustainability challenges, including accommodating rapid population growth, projected to add 2.5 billion people by 2050. This growth increases demand for housing and services, often leading to severe traffic congestion and higher pollution levels. Additionally, cities, which consume over 75% of global energy and produce more than 70% of greenhouse gas emissions, must transition to sustainable energy solutions to mitigate climate change impacts while addressing social inequalities that leave vulnerable populations disproportionately affected. To address these challenges, recent perspectives on sustainable urban planning call for a deeper understanding of cities as complex and emergent socio-ecological systems. One such concept is urban metabolism (UM) which has expanded from its biological meaning to capture the metabolic processes by which cities transform materials and energy in order to sustain their functions. This paper examines the role of urban metabolism in sustainable city planning using detailed case studies of three cities to determine how urban metabolism principles are integrated into urban planning practices and their effectiveness in promoting sustainable development. The methodology involves an in-depth analysis of resource flows, waste management systems and sustainability initiatives in each city. Data was collected employing a combination of existing studies and document analysis, providing a solid foundation for understanding the relationship between urban

metabolism and city planning. Key findings show that successfully incorporating urban metabolism into planning processes can result in significant increases in resource efficiency, waste reduction and overall urban sustainability. The study highlights best practices and innovative strategies from the case studies while offering practical recommendations to urban planners and contributes to the deeper discourse on urban sustainability by emphasizing the critical role of urban metabolism in sustainable city planning, as well as paving the way for future research in this field.

Keywords: urban metabolism, sustainable urban planning, sustainability, resource efficiency

1. Introduction to Urban metabolism

Urban metabolism is a conceptual framework for understanding how resources and energy flow through cities and how they affect the environment. This concept employs the analogy of biological metabolism to describe how cities consume and transform resources, as well as how these processes affect natural and human systems. The study of urban metabolism has risen in prominence in recent decades, as cities face increasing challenges in terms of sustainability, resource efficiency and environmental impact. The notion of urban metabolism originated in the 1960s, when ecological scientists applied metabolic principles to urban systems (Wolman, 1965).

Abel Wolman (1965) proposed the concept of cities as metabolic systems, in which the 'inputs'- water, energy and materials- are converted into 'outputs'- waste and emissions. This early research underlined the significance of quantifying urban resource flows in order to better understand and control the effects of urbanization. In recent years, urban metabolism research has advanced to include increasingly complex approaches and technologies. Recent research, such as that conducted by Kennedy et al (2007) and Bai (2014) has used advanced data analytics and modelling tools to map and analyse resource flows in cities. These studies emphasize the complexities of urban systems and the interplay of numerous components, including energy usage, material use and waste generation.

1.1 Key Components of Urban Metabolism

In the drive to understand and improve urban sustainability, the notion of urban metabolism provides a critical framework for evaluating the interactions between cities and their surroundings. At its foundation, urban metabolism compares cities to living organisms, focusing on the flow and transformation of materials required for urban function. In order to comprehend urban metabolism, three important components must be investigated: resource inflows, transformation processes and outflows and waste. The first component is resource inflows, which include the necessary inputs for urban living, such as water, energy, food and raw materials. These resources are the lifeblood of cities, enabling the operation of diverse urban systems and meeting the everyday needs of their residents. The second category contains transformation processes, which represent the various ways in which these resources are consumed, processed and used. This comprises activities like manufacturing, transportation and household consumption, which convert resources into the goods, services and energy needed for urban living. The third category is outflows and waste, which refers to byproducts and emissions caused by resource consumption and transformation. This comprises solid waste, wastewater and air pollution, which represent significant challenges for city management and environmental sustainability.

Understanding these components is critical to efficient urban planning and management. Planners and legislators can discover inefficiencies, reduce waste and develop environmental mitigation methods by examining how resources flow into, through and out of cities. This complete strategy not only improves resource efficiency but also encourages sustainable development, resulting in more resilient and livable urban environments.

1.2 Importance of Urban Metabolism in Sustainable City Planning

Understanding urban metabolism is important for sustainable city development as it improves resource efficiency, waste management and reduces environmental impact. Cities that analyze resource flows can detect inefficiencies, optimize resource utilization and eliminate waste, resulting in lower operational costs and longer-term resource availability. Effective waste management strategies, such as recycling and reuse, help to reduce landfill burdens while also conserving natural resources, contributing to the circular economy. Insights into urban metabolism further help cities identify important sources of emissions and pollutants, allowing for the development of policies for emission control and ecosystem conservation, thus preserving biodiversity and decreasing environmental consequences. Urban metabolism has major economic and social benefits. Improved resource efficiency and waste management save costs while stimulating economic growth by promoting green industries and technologies. Effective resource and waste management improves quality of life by lowering pollution, assuring access to clean water and air and creating green spaces. Furthermore, urban metabolism improves city resilience to climate change by fostering resilient infrastructure and sustainable behaviours, guaranteeing a consistent supply of key resources and strengthening urban systems to withstand shocks and stresses, all of which contribute to long-term sustainability.

2. Aim and Objectives

The aim of this research is to investigate the sustainability impact of incorporating urban metabolism (UM) concepts into urban development, specifically how this might improve resource efficiency, waste management and overall urban sustainability. The objectives are to evaluate the application of UM concepts in three case study cities, analyze resource flows and waste management systems, assess the effectiveness of UM integration in achieving sustainable outcomes, identify challenges in adopting the principles of UM and highlight best practices while making recommendations.

The study focuses on three case study cities that represent different urban contexts. It explores the use of UM principles in urban design and evaluates their influence on sustainability, resource efficiency and waste management. The study's limitations include the availability and quality of data from the case study cities, which may impact the findings' generalizability. Furthermore, changes in local

legislation, resources and stakeholder engagement may influence the implementation and effectiveness of UM principles, making it difficult to arrive at broad conclusions that apply to all urban contexts.

3. Methodology and Research Design

The research adopts a comparative case study design to analyze the application of urban metabolism (UM) principles in Curitiba, Singapore and Mumbai. The methodology involves qualitative and quantitative data collection and analysis to evaluate the sustainability outcomes, resource efficiency and waste management practices in these cities.

3.1 Case Study Selection

Curitiba, Singapore and Mumbai were selected as case studies based on their distinct approaches to urban planning and sustainability:

- i) *Curitiba*: Known for its innovative urban planning and public transportation systems.
- ii) *Singapore*: Recognized for its integrated planning, water management strategies and smart city initiatives.
- iii) *Mumbai*: Represents a rapidly urbanizing city with significant challenges in housing, infrastructure and waste management.

3.2 Data Collection

Data collection has been from :

- i) *Literature Review*: Review existing literature on urban metabolism, sustainable urban planning and case-specific studies.
- ii) *Official Reports*: Analyze urban planning documents, sustainability reports and statistical data from government agencies and international organizations.
- iii) *Databases*: Utilize databases such as World Bank, UN Habitat and city-specific portals for demographic, economic and environmental data.

3.3 Data Analysis

Data analysis has been through the following:

- i) *Content Analysis*: Examine policy documents and reports to assess the integration and impact of UM principles in urban planning.
- ii) *Descriptive Statistics*: Calculate descriptive statistics to summarize demographic, economic and environmental data for each city.
- iii) *Comparative Analysis*: Conduct a comparative analysis of key indicators (e.g., resource inflows, transformation processes, outflows and waste) to evaluate differences and similarities in UM applications and their impacts.

3.4 Key Parameters for Evaluation

The evaluation focuses on three main parameters:

- i) *Resource Inflows*: Water, energy, food and raw materials entering the city.
- ii) *Transformation Processes*: Consumption, transformation and utilization of resources in manufacturing, transportation and residential areas.
- iii) *Outflows and Waste*: Waste products and emissions generated, including solid waste, wastewater and air pollution.

3.5 Impact Assessment

Assess the impact of UM principles on the following aspects:

- i) *Resource Efficiency*: Optimization and conservation of resources.
- ii) *Waste Management*: Reduction, recycling and reuse of waste materials.
- iii) *Sustainability Outcomes*: Environmental quality, economic benefits, social well-being and urban resilience.

3.6 Recommendations

Based on the findings, propose generalized recommendations for planning interventions to improve sustainability through the application of UM principles have been stated.

4. Case study Overview

Curitiba, Singapore and Mumbai were chosen to investigate the role of urban metabolism in sustainable city design due to their distinct urban challenges and achievements, each of which exemplifies a different facet of how urban metabolism may be used to enhance sustainability.

Curitiba, Brazil is known for its innovative approaches to urban development and sustainability. Curitiba, with a population of approximately two million and a land area of 435 sq.km is a leader in incorporating urban metabolism concepts into its urban fabric. The city is well-known for its Bus Rapid Transit (BRT) system, which transports more than two million passengers each day and has become a global model for efficient public transportation. Curitiba's recycling program is among the most successful in Latin America, recycling over 70% of its waste. The city's green areas cover 52% of its total area, including 28 parks and several green corridors designed to manage storm-water and avoid heat islands (Guzman, et al, 2020). This comprehensive approach demonstrates how Curitiba uses urban metabolism.

Singapore is known for its innovative and extensive urban metabolism programs. Singapore, with 5.7 million people and a land area of 728.6 sq.km, demonstrates high-density urban sustainability. The city-state has implemented the Four National Taps water management policy, which includes importing water, local catchment, desalination and recycled water (NEWater). Singapore's solar energy initiatives have resulted in the installation of more than 2 gigawatts (GW) of solar electricity, with the goal of reaching 4 GW by 2030. The city's Zero Waste Master plan aims to reduce garbage shipped to landfills by 30% by 2030, with help from the Tuas View Incineration Plant, which turns up to 3,000 tons of waste per day into power (Derrible, et al, 2021).

Mumbai, India, with a population of about 21 million and an area of 603 sq.km, is a contrasting example of urban metabolism in a rapidly expanding and heavily crowded environment. The city is dealing with a number of challenges, including severe traffic congestion, high pollution levels and significant social disparities. Mumbai's local train network, one of the world's largest, transports around 7.5 million passengers every day (Mandal & Byrd, 2011). Mumbai's waste management rules aim to enhance waste segregation and processing, with ongoing efforts to increase recycling rates and build waste-to-energy plants.

The comprehensive Mumbai Climate Action Plan includes climate resilience strategies such as improved flood management infrastructure to reduce the impact of heavy monsoon rains. Despite these efforts, Mumbai's infrastructure is limited and further development is required. In brief, Curitiba, Singapore and Mumbai offer distinct perspectives on urban metabolism and sustainable planning. Curitiba's emphasis on integrated public transportation and recycling establishes a benchmark for resource efficiency. Singapore's high-tech and comprehensive policy exemplifies the potential of current technologies and regulations for managing urban metabolism in high-density areas. Mumbai's experiences highlight the challenges of implementing urban metabolism principles in a rapidly developing and socioeconomically diverse environment. These case studies provide a comprehensive overview of how diverse metropolitan areas might approach sustainability using novel and adaptive urban metabolism strategies. (See Table 1).

5. Case study analysis

The analysis highlights how each city applies urban metabolism principles to manage resource inflows,

transformation processes and outflows and waste, demonstrating varied approaches and challenges in achieving urban sustainability.

5.1 Resource Inflows

- i) Singapore: Efficient management of water through the Four National Taps, heavy reliance on imported energy and innovative approaches to food security through urban farming.
- ii) Curitiba: Emphasis on water conservation, promotion of renewable energy and support for local agriculture.
- iii) Mumbai: Dependence on external water sources and imported energy, with ongoing efforts to enhance efficiency and sustainability in resource inflows.

5.2 Transformation Processes

- i) Singapore: Advanced industrial activities and a highly developed public transportation system, with a focus on residential energy and water efficiency.
- ii) Curitiba: Diverse economy with an innovative BRT system and strong emphasis on energy conservation in residential areas.
- iii) Mumbai: Major financial center with expanding transportation infrastructure, but facing challenges in meeting the growing demands for energy and water.

5.3 Outflows and Waste

- i) Singapore: Comprehensive waste management with a focus on recycling and waste-to-energy, stringent air pollution control measures and extensive sustainability initiatives.
- ii) Curitiba: High recycling rates through the Green Exchange Program, measures to reduce emissions and a focus on sustainable urban mobility.
- iii) Mumbai: Developing waste segregation and recycling programs, efforts to improve air quality and initiatives to expand green spaces and enhance urban sustainability.

Table 2 shows a comparative review of various UM-related characteristics that contribute to sustainability.

From the above study, urban metabolism approaches have a substantial impact on sustainability, resource efficiency and waste management in Curitiba, Singapore and Mumbai which are shown below in Table 3.

Table 1: Overview of selected case studies for study
Source: Author

Category	Singapore	Curitiba	Mumbai
Geographic Location	Island city-state in Southeast Asia, 728 sq.km	Southern Brazil, 435 sq.km	Coastal city in western India, 603 sq.km
Population	5.7 million (2023), 8,000+ per sq km	1.9 million (2023), 4,400 per sq km	20 million (2023), 33,000+ per sq km
Economic Profile	Highly developed, strong financial sector, advanced manufacturing, growing tech industry	Developing economy, strong in services, commerce, industry	Major financial center, diverse economy, strong services and industrial sectors
Public Transportation	Integrated system: buses, MRT, LRT	Pioneered BRT system	Expanding metro and local trains
Green Spaces	Extensive parks, nature reserves, green infrastructure	Numerous parks, green corridors, botanical gardens	Limited green spaces, developing parks
Waste Management	Advanced waste-to-energy, efficient recycling	High waste recovery, Green Exchange Program	Waste segregation, composting, recycling initiatives
Water Management	Four National Taps: recycling, desalination, local catchment, imported water	Efficient resource management, sustainable use	Reliance on external sources, water recycling initiatives
Smart City Initiatives	Smart Nation initiative	Urban innovation programs	Part of India's Smart Cities Mission
Sustainability Goals	Sustainable Singapore Blueprint, Singapore Green Plan 2030	Guided by IPPUC, focus on transportation, green spaces, waste management	Managed by MMRDA, addressing informal settlements, traffic congestion
Climate	Tropical rainforest, 25°C -31°C, regular rainfall	Subtropical highland, mild summers, cool winters	Tropical, 25°C - 32°C, monsoon season

Table 2: A comparative review of various UM-related characteristics that contribute to sustainability
Source: Author

Category	Curitiba	Singapore	Mumbai
Public Transportation	BRT System Pioneered the Bus Rapid Transit (BRT) system. Reduces reliance on private vehicles, decreases fuel consumption and lowers emissions.	Integrated Public Transit Comprehensive and efficient public transportation system, including buses, MRT and LRT. Reduces reliance on private vehicles and lowers emissions.	Metro and Local Trains Expansion of metro and local train networks aims to reduce traffic congestion, lower emissions and decrease fuel consumption.
Green Spaces	Extensive Green Spaces Integration of numerous parks, green corridors and botanical gardens. Enhances biodiversity, reduces urban heat island effects, and improves quality of life.	Green Infrastructure Extensive network of parks, nature reserves and green infrastructure. Enhances biodiversity and reduces urban heat island effects.	Limited Green Spaces Efforts to develop parks and recreational areas amid high urban density. Green initiatives are underway to enhance biodiversity and reduce heat effects.
Waste Management	Green Exchange Program Incentivizes recycling by exchanging recyclable waste for fresh produce. High rates of recycling and waste recovery, reducing landfill burden.	Waste-to-Energy Advanced waste-to-energy facilities convert waste into energy, reducing landfill use and generating electricity. Efficient recycling processes are in place.	Waste Segregation Initiatives for waste segregation at source, composting and development of recycling facilities Efforts to reduce landfill use and promote resource recovery.

Water Management	Resource Management Emphasis on efficient resource management due to limited local natural resources. Focus on sustainable water and energy use.	Four National Taps Strategy Ensures sustainable water supply through recycling (NEWater), desalination, local catchment and imported water. Efficient and resilient water management.	Resource Dependency Heavy reliance on external sources for water. Initiatives for water recycling and efficient resource use are being implemented to address resource scarcity.
Smart City Initiatives	Urban Innovation Programs focusing on environmental education, recycling and sustainable development. Continuous innovation in urban management and sustainability practices.	Smart Nation Initiative Leveraging data and technology to improve urban management, enhance quality of life and support sustainable development.	Smart Cities Mission Part of India's Smart Cities Mission, aiming to improve urban infrastructure, technology integration and sustainable development.
Sustainable Planning	Innovative Urban Planning Pioneered by the Institute for Research and Urban Planning of Curitiba (IPPUC). Focus on public transportation, green spaces and waste management for sustainable outcomes.	Integrated Urban Planning Guided by the Concept Plan and Master Plan, with sustainability goals outlined in the Sustainable Singapore Blueprint and Singapore Green Plan 2030.	Challenges in Urban Planning Managed by the Mumbai Metropolitan Region Development Authority (MMRDA), facing challenges with informal settlements, traffic congestion and infrastructure deficits.

Table 3: Impact on Sustainability Outcomes, Resource Efficiency and Waste Management

Source: Author

City	Impact on Resource Efficiency	Impact on Waste Management	Impact on Sustainability Outcomes
Curitiba	Fuel Efficiency Optimized fuel usage through efficient public transportation (BRT system).	Recycling High rates of recycling reduce landfill burden and conserve resources.	Quality of Life Enhanced through green spaces, improved air quality and innovative urban management.
Singapore	Resource Use Comprehensive water management (Four National Taps) and waste-to-energy processes enhance resource efficiency.	Landfill Use Reduction of landfill waste through efficient recycling and waste-to-energy conversion.	Environmental Quality Improved air and water quality, increased green spaces, robust infrastructure for resilience.
Mumbai	Fuel Consumption Reduced through improved public transportation (metro and local trains).	Landfill Burden Reduced through waste segregation and recycling initiatives, promoting resource recovery.	Urban Challenges Addressing high population density and economic disparity, ongoing efforts to enhance sustainability

6. Planning Interventions for Improving Sustainability through Urban Metabolism

To tackle the various challenges of urban sustainability, communities must implement comprehensive and integrated plans that prioritize resource efficiency and protection of the environment. Cities globally can implement effective solutions customized to their particular scenarios by learning from successful urban metabolism practices like Curitiba, Singapore and Mumbai. Based on

best practices and innovative methods from these various city environments, the recommendations following outline major areas of focus for increasing sustainability outcomes resource management and waste reduction (See Table 4).

- i) *Public Transportation*: Expand and improve public transportation systems to reduce reliance on private vehicles, decrease fuel consumption and lower emissions. Cities should prioritize integrated and efficient public transit networks,

Table 4: Recommendations for Planning Interventions

Source: Author

Intervention	Description	Example from Cities
Public Transportation	Expand and improve public transit systems to reduce reliance on private vehicles, decrease fuel consumption and lower emissions.	Curitiba's BRT system, Singapore's comprehensive public transportation.
Green Spaces	Increase the number and accessibility of parks and green areas to enhance biodiversity, reduce urban heat and improve quality of life.	Curitiba's green corridors, Singapore's extensive network of parks.
Waste Management	Implement waste segregation, recycling and waste-to-energy initiatives to minimize landfill use and promote resource recovery.	Singapore's waste-to-energy facilities, Curitiba's Green Exchange Program.
Water Management	Develop strategies for water recycling, desalination and efficient use of local water resources to ensure sustainable supply.	Singapore's Four National Taps strategy.
Smart City Initiatives	Leverage technology and data to improve urban management, enhance quality of life and support sustainable development.	Singapore's Smart Nation initiative.
Sustainable Urban Planning	Focus on long-term planning with sustainable land use, energy efficiency and resilience as central goals.	Singapore's Concept Plan and Master Plan, Curitiba's IPPUC initiatives.

similar to Curitiba's BRT system and Singapore's comprehensive public transportation system.

- ii) *Green Spaces*: Increase the number and accessibility of green spaces to enhance biodiversity, reduce urban heat island effects and improve the overall quality of life. Urban planners should integrate parks, green corridors and recreational areas into urban designs.
- iii) *Waste Management*: Implement and enhance waste segregation, recycling and waste-to-energy initiatives to minimize landfill use and promote resource recovery. Cities should adopt Singapore's advanced waste-to-energy technology and Curitiba's innovative waste management programs.
- iv) *Water Management*: Develop comprehensive water management strategies, including recycling, desalination and efficient use of local water resources, to ensure a stable and sustainable water supply. Cities can learn from Singapore's Four National Taps strategy.
- v) *Smart City Initiatives*: Leverage technology and data to improve urban management, enhance quality of life and support sustainable development. Cities should invest in smart city technologies and initiatives to optimize resource use and enhance urban resilience.
- vi) *Sustainable Urban Planning*: Emphasize long-term urban planning focused on sustainable land use, energy efficiency and resilience.

Planners should incorporate sustainability goals into master plans, similar to the approaches of Singapore and Curitiba.

By adopting these planning interventions, cities can effectively apply urban metabolism principles to improve sustainability outcomes, enhance resource efficiency and optimize waste management.

7. Conclusion

The integration of urban metabolism (UM) principles into city planning has proven to be an effective technique for increasing urban sustainability. The comparative case studies of Curitiba, Singapore and Mumbai show that implementing UM techniques greatly increases resource efficiency, waste management and overall urban sustainability. Each city demonstrates distinct uses of UM principles customized to their respective settings, ranging from Curitiba's innovative waste management systems and Singapore's high-density, mixed-use development to Mumbai's adaptive reuse and decentralized waste systems. These instances demonstrate the usefulness of UM in addressing urban issues and supporting sustainable development. Despite these advancements, there are still challenges in completely integrating UM concepts into policy frameworks, improving data gathering and effectively engaging stakeholders. Future research should focus on developing uniform measures for evaluating UM, examining the long-term impacts of UM-driven initiatives and applying successful tactics to other urban environments. This study adds to the larger

discussion about sustainable urban development by underlining UM's vital role and making practical recommendations for urban planners and politicians. Future research can use these insights to strengthen UM concepts and applications, advancing the objective of making cities more resilient and efficient.

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RESEARCH PAPER

This research paper was presented at the IIA ANVESHAN Research Conference held at MCAP, Thiruvananthapuram, Kerala during 29-31 August 2024, under Stream I: Celebrated Past

Analysing Sensory Dimensions of Kerala Temple Architecture through the lens of Rasa Theory

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Abstract

This paper revisits the analysis of Kerala temple architecture through the lens of Rasa Theory, a classical Indian aesthetic framework and explores its sensory implications. Rasa Theory, from Bharata Muni's *Natyashastra*, identifies nine Rasas or emotional states—*Shringara* (love), *Hasya* (laughter), *Karuna* (compassion), *Raudra* (anger), *Veera* (courage), *Bhayanaka* (fear), *Bibhatsa* (disgust), *Adbhuta* (wonder) and *Shanta* (peace) that is evoked through artistic expression. The emotions thus experienced are comparable to those lived experiences created by various architectural features and spaces within buildings. Today, buildings are designed and analysed using multiple layers of parameters such as functionality, ergonomics, anthropometrics, universal usage, accessibility, human comfort, and aesthetics to name a few. The layer of aesthetics, however, is not just the beauty of the eyes but the essence of the experience of the user of the building. Aesthetics extends beyond visual appeal to include the overall sensory and emotional experience. The essence of experience emphasises how a space feels to its occupants, engaging all the senses and evoking emotions to create a memorable impact. The architecture of Kerala temples built on the principles of *Tantrashastra* are classic examples of architecture that evoke such emotional states. This lived experience can be correlated to the theory of aesthetics or the Rasa Theory. The lived experience refers to the subjective and personal experience of individuals interacting with a space. By examining specific case studies of Kerala temple architecture,

the research highlights the relevance of Rasa Theory by identifying elements in Kerala temples that correspond to the different Rasas. This involves an interpretive analysis of spatial arrangements, materials, forms, and symbolic elements, focusing on their sensory impacts such as sight, sound, touch, smell and taste.

The Rasa theory when applied and analysed through the first principles of architecture - being the result of this paper- helps in designing spaces that engage multiple senses and to generate another dimension to contemporary architecture.

Keywords: Kerala temple architecture, Rasa Theory, Phenomenology, Lived experience.

1. Introduction

There are many methods of analysing architecture, such as examining functionality, ergonomics, aesthetics and cultural significance. As part of my thesis, I have been analysing ancient Hindu Kerala temples to understand their phenomenological influence on the user. To gain deeper insights, I studied the treatises that have governed the design and construction of these temples. The devotee visiting the temple experiences an overload of sensory stimuli. Some of the more explicit stimuli are – the sound of bells, the fragrance of incense, the sight of intricate carvings, the touch of cool stone and the taste of *prasadam* (sacred offerings). This sensory immersion is designed to gradually guide the devotee inward, culminating in the *darshan* at the *garbha griha*, the innermost sanctum. Here, in the

presence of the deity, the external sensory overload gives way to an intense inner focus and spiritual reflection.

Considering the above, we can assume that the temple is an emotion-creating device. The connection between sensory stimuli, human emotions and experience is central to this process. The orchestrated sensory experiences evoke a range of emotions, from awe and reverence to peace and introspection, allowing the devotee to transcend the mundane and connect with the divine. Temple architecture creates a profound emotional journey for the user, similar to the experience of a spectator at a dance or drama recital. Just as a well-crafted performance uses music, movement and expression to evoke emotions, the architecture of a temple employs spatial design, sensory stimuli and symbolic elements to engage the devotee's senses and emotions. From the moment one steps into the temple complex, all doorways, steps, ornate walls, wooden ceilings and physical features of the temple are meticulously designed to stimulate the senses and evoke specific emotions. This sensory engagement guides the user through a series of emotional states, mirroring the journey of a spectator moved by a dramatic performance. The architecture itself becomes the emotion-stimulating act, transforming the physical space into a medium for emotional and spiritual experience.

To fully understand and appreciate the emotions and experiences evoked by temple architecture, it is essential to analyse, compare, and evaluate these sensory and emotional responses. The closest association for such an analysis can be found in the principles of dramatics as detailed in the *Natya Sastra* by Bharata Muni. This ancient text outlines the tenets of dramatics through aesthetics, focusing on how different emotions, or Rasas, are evoked in the audience. Similarly, the Rasa theory can be applied to temple architecture, where the structure and design elements serve to evoke various Rasas in the devotees. By employing the yardstick of the *Natya Sastra*, we can systematically analyse how different aspects of temple architecture – from spatial layout to sensory stimuli – elicit specific emotional responses. This approach allows for a deeper understanding of the temple as an emotion-creating device, offering a structured framework to evaluate the holistic experience it provides. The Rasa theory thus serves as a valuable reference for examining the multifaceted emotional impact of temple architecture, providing insights into how sacred spaces can be designed to enhance sensory and emotional journeys.

2. Aim and Objectives

The aim of this paper is to analyse Kerala temple architecture through the lens of the Rasa Theory. The multiple experiences created by the spaces and structure of the temple can be compared to the dynamics of performances that affect and induce emotions in the audience or spectators. By drawing this comparison, we can better understand how architectural elements evoke specific emotional responses, much like a well-executed drama or dance recital.

This comparison leads to the analysis where the temple architecture is seen as an orchestrated performance designed to stimulate the senses and evoke profound emotional and sensory experiences. The results of this analysis can then be used as a yardstick to measure and design spaces that convey meaning to the user intuitively and powerfully. By applying the principles of Rasa Theory, architects and designers can create spaces that are more responsive to human emotions and experiences. In essence, this approach enables the creation of architecture that goes beyond mere functionality and aesthetics. It fosters environments that actively engage the user's emotions, making the experience of the space more meaningful and transformative. Through this comparative analysis, the study aims to demonstrate that Kerala temple architecture can be seen as an intricate performance of space, designed to engage the senses and evoke profound emotional responses, thereby enhancing the sensory experience of the devotee/user.

By comparing Rasa principles and architecture within the Kerala temple, a hypothesis is generated. The hypothesis posits that different areas of the temple can be associated with certain emotions or bhavas as explained by the Rasa Theory. This association aligns with the concept of the temple as an emotion-evoking space, a notion supported by early literature on Kerala temples. Each section of the temple, from the outer precincts to the innermost sanctum, is designed to evoke specific emotional responses. By applying Rasa Theory to the analysis of these spaces, the study aims to reveal how architectural elements are strategically employed to stimulate the senses and elicit profound emotional and spiritual experiences, mirroring the dynamics of a dramatic performance. This alignment suggests that Kerala temple architecture is intentionally crafted to function as an emotional and sensory experience, deeply rooted in ancient aesthetic principles.

The study focuses on Kerala temple architecture that adheres to the principles of *Tantrasastra*.

Among these temples, variations occur depending on whether the temple belongs to the *Vaishnavite*, *Saivite* or *Shaktheya* traditions. Additionally, subjects within each tradition have their own unique worship methods and procedures, leading to further variations in temple architecture and rituals.

For the purpose of this paper, the scope is narrowed to Saivite temples in central Kerala, specifically those that share similar architectural features. The primary focus will be on the Eranakulathappan Siva Temple, one of the most famous and architecturally significant Siva temples in the region. This temple will serve as the main case study to illustrate the application of Rasa Theory in analysing the emotional and sensory experiences evoked by its architectural elements. The movement of a person from the gate way/ *gopuram* through the various spaces up to the *Garbha Griha* is analysed for this study.

However, this focus presents certain limitations. The findings and conclusions drawn from this study may not be directly applicable to temples of other sects or those following different worship practices. Furthermore, the unique features and historical contexts of other Kerala temples, even within the Saivite tradition, might lead to different emotional and sensory experiences. Therefore, while this study provides insights into the relationship between temple architecture and Rasa Theory, its scope is limited to a specific subset of temples and may not capture the full diversity of Kerala temple architecture.

3. Literature Review

Rasa Theory is a classical Indian aesthetic framework primarily applied to the arts, including literature, drama, music and dance. Originating from the ancient Sanskrit text “*Natyashastra*” attributed to Bharata Muni, Rasa Theory aims to explain the nature and impact of aesthetic experiences on audiences. The term “*Rasa*” literally means “essence” or “flavour,” and in this context, it refers to the emotional flavours or moods evoked by a work of art (Das, n.d.).

3.1 The Nine Rasas

According to Bharata Muni, there are nine principal Rasas, each corresponding to a specific emotional state:

- a. **Shringara (Love or Romance):** This Rasa evokes feelings of love, beauty and sensuality. It is often depicted through themes of romantic love and attraction.
- b. **Hasya (Laughter):** This Rasa is associated with humour and joy. It is characterised by light-heartedness, amusement and playful activities.

- c. **Karuna (Compassion or Pathos):** This Rasa elicits feelings of empathy, sorrow and compassion. It is often related to themes of tragedy, suffering and sympathy.
- d. **Raudra (Anger):** This Rasa conveys feelings of fury, rage and wrath. It is depicted through scenes of conflict, aggression and intensity.
- e. **Veera (Courage or Heroism):** This Rasa represents bravery, valour and heroism. It is associated with themes of strength, determination and noble actions.
- f. **Bhayanaka (Fear):** This Rasa induces feelings of terror, anxiety and dread. It is often portrayed through elements of danger, suspense and the unknown.
- g. **Bibhatsa (Disgust):** This Rasa evokes feelings of disgust, revulsion and aversion. It is related to themes that are repulsive or morally offensive.
- h. **Adbhuta (Wonder):** This Rasa elicits feelings of amazement, curiosity and marvel. It is characterised by themes of magic, mystery and the extraordinary.
- i. **Shanta (Peace or Tranquillity):** This Rasa conveys a sense of calm, serenity and contentment. It is often depicted through themes of spiritual peace, harmony and contemplation.

3.2 Application of Rasa Theory in Literature and Drama:

Rasa Theory is used to analyse and create works that evoke specific emotions in the audience. A well-crafted play or poem will skillfully blend various Rasas to provide a rich and moving experience.

3.3 In Music and Dance:

Performances are designed to evoke the Rasas through melody, rhythm, facial expressions and gestures. Classical Indian dance forms like Bharatanatyam and Kathak use this theory extensively.

3.4 In Visual Arts:

Paintings and sculptures aim to evoke specific emotional responses by capturing the essence of the Rasas through visual elements like colour, form and composition.

3.5 In Architecture:

Although traditionally applied to performing and visual arts, Rasa Theory can also be used to analyse and design architectural spaces that evoke certain emotions and sensory experiences. By considering the nine Rasas, architects can create environments that resonate emotionally with their inhabitants.

3.6 Importance of Rasa Theory

Rasa Theory provides a deep understanding of the emotional impact of art and architecture. By focusing on the emotional states that different elements evoke, artists and designers can create works that are not only aesthetically pleasing but also emotionally engaging and memorable. This ancient framework remains relevant today, offering timeless insights into the creation and appreciation of art in all its forms.

Very limited literature has been produced on the subject of architecture and Rasas. Historically, Rasas have been associated with the arts of dramatics, dance and poetry. Understanding the aesthetics of these art forms uses the principles of Rasa Theory directly, and hence, has been well analysed and documented. Western philosophy too has tried to relate aesthetic emotion and architecture. Emotions in architecture have existed since time immemorial, both in Western thought and Indian philosophy.

Papers have been written by Hernan and Mastandrea in 2009 and Droog and de Vries in 2009 on emotions in architecture from a Western perspective. Hernan and Mastandrea (Hernan and Mastandrea, 2009) have identified four types of aesthetic emotions: Positive/Negative, I like/I don't like, Relaxing/Arousing, and Interesting/Not Interesting. Droog and de Vries (Droog and de Vries, 2009) identified four different types: Boredom, Amusement, Unpleasant Surprise, and Fascination (Das, n.d.). However, the Indian aesthetic theory states that there are nine types of emotions in their *Navarasa* Theory, which is a refinement and a far more elaborate expression (see Table 1).

Another relevant paper is by Deepika Shetty, who discusses the application of Indian Aesthetic Theory to developing new architectural forms. The development of perfect form has been a highly debated and exciting theme in architectural discourse. Instead of seeking a universal solution and absolute truth, it is more relevant to consider multiple options and localised flavours and modes of creating architectural forms. With this belief, Shetty's paper explores the aesthetic theory of Rasa Shastra in Indian art, which incorporates a philosophy of both universality and individuality and offers diverse interpretations. This framework helps visualise and create space and form. The paper then develops concepts of space organisation techniques to translate the theory into concrete diagrams and finally applies these concepts to creating and visualising architectural forms. This approach

highlights how traditional aesthetic theories can inform contemporary architectural practice, offering a rich, culturally grounded perspective on design.

This underscores the significance of Rasa Theory and the contents of this paper as a tool not only for understanding existing architectural forms but also for inspiring innovative designs that resonate with cultural and emotional depth.

4. Methodology

The methodology adopted in this study involves a two-pronged analysis of literature and first-hand experiences. The initial phase of the literature analysis focuses on seminal studies of spaces and architectural features that stimulate the human senses, thereby creating experiences that ultimately guide behaviour. This involves understanding how specific elements of architecture - such as spatial layout, materials, light, and sound engage the senses and influence the emotional and psychological state of the user.

The second phase of the literature analysis delves into the Rasa Theory, with a particular emphasis on the concept of Anubhava, which refers to the lived experience of the Rasika (spectator). This part of the study seeks to understand what causes these emotional experiences and how they are achieved in the context of performances as detailed by Bharata Muni in the *Natya Sastra*.

By comparing the data from these two areas - the sensory and experiential aspects of architecture and the emotional responses detailed in the Rasa Theory, this study generates a hypothesis. This hypothesis explores how the architectural features of Kerala temples evoke specific Rasas, creating a rich, emotional journey for the devotees, similar to the experiences of a spectator at a dramatic performance.

Phenomenological inquiry is arguably the most well-known and established strand of qualitative research utilised in architectural studies. This approach derives from the phenomenological tradition of German philosophers such as Edmund Husserl and Martin Heidegger and more recent adaptations in the social sciences. Among these adaptations, sociologist Alfred Schutz attempted to develop a "phenomenological sociology" that bridges traditional sociology and Husserl's philosophical phenomenology. According to Schwandt, the goal of phenomenological inquiry is to seek an understanding of "the complex world of lived experience from the point of view of those who live it".

Table 1: Rasa Elements in Temple Architecture

Source: Author

	NAME OF RASA	THE EMOTION	OTHER FEELINGS	ARCHITECTURAL FEATURE	AREA
1	The Shringara Rasa	The Erotic	Love, Fondness, Yearning, Tenderness Passion, Enchantment, Infatuation, Adulation, Idolatry, Narcissism, Bewitchment, Seduction, Enrapture	Carvings on pillars capital and brackets, mural paintings, ornamental architectural works, decorative basement, small scaled spaces	Chittambalam, space in front of Garbhagriha
2	The Bhayankara Rasa	The Terrifying	Fear, Lack of confidence, Anxiety, Apprehension, Intimidating	Dark mysterious spaces, small scale with low eaves, sharp shadows and contrasting light and shades	Thidappally, Oottupura and Balikkal pura
3	The Adbhuta Rasa	The Awesome	Surprise Disclosure, Blow, Astonishment	Tall, large proportioned structure/space, large tall doorways, elephant entry	Large space around the Nalambalam
4	The Karuna Rasa	The Compassionate	Sadness, Pathos Concern, Considerate, Sorrow, Misery, Grief	Food serving areas, spaces caring for animals	Periphery of the Nalambalam where the elephants are resting.
5	The Hasya Rasa	The Comic Laughter, Humour	Laughter, Humour, Wit, Hilarity, happiness	Peaceful areas, decoration for festivities, gaiety	Temple ponds, large Chuttambalam
6	The Veera Rasa	The Heroic, Valour	Courage, Bravery, Gallantry	Tall structures, destination, focal points seen from a distance, sense of fulfilment	Gopuram/ Kavadam tall pillars at the Ana kottil
7	The Vibhatsa Rasa	The Disgusting	Aversion, Dislike, Loathing, Repugnance	Spaces where dirt accumulates, smelly places	
8	The Raudra Rasa	The Wrathful	Anger, Vengeance, Arrogance Fury, Temper, Ire, Frenzy	Images of Narasimha or angry Deities, Narasimha	At the Garbha griha (depending on the deity)
9	The Shanti Rasa	The Peaceful	Calm, Serene, Quiet, Tranquil, Composed	Overall temple experience. Low eaves and earthy colour tones due to the choice of earthy colours	External long wall of the temple and the Kavadam of the gopuram that have become places to make a person feel calm and peaceful.

From the perspective of the architectural field, phenomenological inquiry is particularly attractive because it posits that consciousness is directed toward an “object”, with the reality of this object being inextricably linked to one’s consciousness. This premise naturally includes the physical environment, making phenomenology highly relevant to architectural research. Unlike other qualitative approaches that primarily focus on human interactions independently of their physical context, phenomenology emphasises the interconnectedness of individuals’ experiences and the built environment. This makes it an invaluable tool for exploring how architectural spaces are experienced and perceived, thus providing deeper insights into the relationship between architecture and human emotions, behaviors and experiences - the underlying principle of Rasa Theory.

Within the environmental design fields, David Seamon, editor of the longstanding newsletter *Environmental & Architectural Phenomenology*, has identified three ongoing strands of phenomenological research over the past five decades: hermeneutical, first-person and existential.

4.1 Hermeneutical Inquiry:

This category includes many classic phenomenological texts that have significantly influenced architecture and related disciplines. Notable works in this category are Christian Norberg-Schulz’s *Genius Loci*, Thiis-Evensen’s *Architectypes in Architecture* and Edward Relph’s *Place and Placelessness*. Within hermeneutic inquiry, Gaston Bachelard’s *The Poetics of Space* (1958) stands out as a seminal work. Bachelard uses textual analysis of poignant vignettes from literature and poetry to create an interpretive analysis of dwelling. This approach primarily relies on argumentation and textual analyses to explore architectural phenomena.

4.2 First-Person Phenomenological Inquiry:

In first-person phenomenological inquiry, the researcher uses their own firsthand experience of the phenomenon as a basis for examining its specific characteristics and qualities. A classic example of this type of inquiry is Francis Violich’s comparative analysis of place experience in five Dalmatian towns. Violich employed various tactics, including mapping, sketching and journal entries, to identify the key spatial features that contributed to each town’s character. He concluded his analysis with a composite set of qualities that contribute to a sense of place. This strand emphasises the researcher’s direct engagement with and personal interpretation of the architectural environment.

4.3 Existential Inquiry:

Though not elaborated in the provided context, existential phenomenology typically explores how human existence is intertwined with the environment. It often addresses how lived experiences and existential themes, such as being, space and time, manifest in architectural contexts.

These three strands collectively demonstrate the depth and diversity of phenomenological inquiry in environmental design. Hermeneutical inquiry offers interpretive and textual analyses of architectural phenomena, first-person inquiry provides insights based on the researcher’s direct experiences and existential inquiry explores the fundamental human-environment relationship. This comprehensive approach enriches our understanding of how architectural spaces are experienced, perceived, and interpreted, providing valuable frameworks for analysing the emotional and sensory impact of built environments.

For design practice, these studies are invaluable in generating initial ideas and deepening the understanding of place experiences. However, they need to be supplemented with broader, more inclusive research methods that consider diverse perspectives and use cases to create spaces that effectively serve all use. Existential-phenomenological research is particularly relevant to design practice because it prioritises the lived experiences of people within specific contexts. By attentively listening to and analysing these experiences, designers can uncover deeper insights into how spaces are perceived and used. This method allows for a nuanced understanding of the emotional and psychological impacts of architectural features, thereby informing more empathetic and user-centered design decisions. The experience of architectural built space can be effectively placed within the existential phenomenology category. This approach aligns with a conceptual framework informed by well-known precedents in the phenomenology literature, such as the works of psychologist Erwin Straus and geographer Yi-Fu Tuan. These scholars emphasise the importance of haptic sensibilities - the perceptions gained through movement, touch, and other bodily experiences.

This focus on haptic sensibilities and personal narratives provides a deeper understanding of the embodied experience of space. It highlights how architectural elements influence and are influenced by human movement, touch, and other sensory interactions. By attending to these nuanced, subjective experiences, researchers and designers can uncover meaningful themes and insights that inform

the creation of more responsive and empathetic architectural spaces. A range of phenomenological research derived from cultural studies and human sciences provides a complementary foundation for research in architecture and design. This interdisciplinary approach enriches our understanding of architectural experiences by integrating insights from various fields, such as anthropology, sociology and psychology. These disciplines contribute to a more comprehensive view of how cultural and social contexts influence the perception and use of architectural spaces.

My study-in-progress also proposes to validate the hypotheses propounded by the results of the phenomenological study. This validation will be achieved through a set of interviews with individuals who are visitors to the temples. These interviews will encourage participants to introspect and relate their lived experiences within the temple spaces. To facilitate this, participants will first complete a simple questionnaire. This questionnaire is designed to help them understand the research questions and to stimulate their thinking about their experiences. By providing this context, participants can more effectively investigate and express their opinions and narrate their lived experiences in a meaningful way. The interviews will be conducted directly, allowing for a deep and personal exploration of each participant's experiences. This method ensures that the data collected is rich and detailed, providing valuable insights into how the architectural features of the temples influence visitors' emotions and behaviours. Through this approach, the study aims to validate the initial hypotheses and further our understanding of the relationship between temple architecture, sensory stimuli and human emotions as conceptualised within the framework of Rasa Theory.

5. Data Analysis and Findings

With the above data and information from secondary sources as well as primary first- person individual experiences, I would like to enumerate the basic points:

- i) **Investigation of Traditional Kerala Temple Architecture:** The investigation begins by understanding and documenting the traditional Kerala temple architecture, particularly focusing on the temples of Central Kerala that have not been influenced by the Dravidian style from the states of Tamil Nadu and Karnataka.
- ii) **Sequential Analysis of Temple Parts:** The parts of the temples are analysed in a sequential manner, starting from the entry and progressing up to the *Garbha Griha* (sanctum sanctorum).

- iii) **Simplification of the Process:** To simplify the process and explanation, the spaces within this route are analysed with respect to some of the basic architectural features that govern the quality of the space.

- iv) **Architectural Features Considered:** The spaces are analysed in terms of their proportion and scale, light and shadow effects, predominant materials, including basic nature such as colour and texture, presence of sculpture and their proximity to each other.

This structured approach ensures a comprehensive understanding of how different architectural elements contribute to the overall sensory and emotional experience of the temple visitors. By focusing on these key aspects, the study aims to elucidate the intricate relationship between architectural design and human perception, particularly through the lens of Rasa Theory. This analysis not only highlights the unique characteristics of Kerala temple architecture but also provides insights into the broader application of aesthetic principles in architectural practice.

5.1 Encapsulating Findings

The temple premises can be separated into five different parts for analysis:

- i) **Entrance Gopuram or Kavadam:** This is usually a two or three-storied structure. The significant aspect is its scale. The door is large enough to accommodate the caparisoned elephant during festival processions but also has smaller doors within the larger ones for daily use. Together, these create a dominant scale that gives the visitor a sense of achievement. The sight of the decorated or muted entrance doorway, stepping into another realm away from the hustle and bustle of mundane life, brings a sense of achievement, almost as if reaching the doors of heaven. Anticipation is another important emotion as one reaches the temple doorway. Curiosity is evoked by the partial view to the inside and the faint sounds of drumbeats or songs played are also factors that evoke the Rasa of *Veeram* (heroism) and *Adbhuta* (wonder). The multitude of emotions portrayed within a single Rasa is only glossed over for the sake of this paper. The scale of the entrance invokes feelings of courage, victory and awe.

- ii) **Space Between the First and Second Prahara:** This extended space becomes a spacious green sandy area with a tall pillared canopy. This space serves as a congregational area for temple festivals. The *Ootupura*, or dining halls where free food is served for all, occupies a predominant position. The connotations regarding the space,

along with the scale of the same, the soft texture of the sand under bare feet and the smell of the food served at the *Ootupura* evoke a sense of *Adbhuta* (awe, wonder) and *Karuna* (compassion). It is in this space that the stage is set during temple festivals where many types of dances, drama and music are performed. The Shiva temples under discussion allow for a variety of traditional art forms to be performed. While most of them are serious and classical art forms, some arts specific to Kerala, such as *Ottam Thullal*, are extremely hilarious and use comedy to convey important religious and dharmic stories to the audience. Thus, the emotion of *Hasya* (humour, wit) is also woven into the performance hall called the *Koothambalam*. It should be noted that the connotations, previous experiences and legends associated with a space or place significantly influence the emotions generated in the space, with architecture being a main component.

iii) Balikkal Mandapam: The *Balikkal Mandapam*, a relatively small-scaled space accessed through high steps and a small doorway, requires one to bend low to avoid hitting their head on the door frame. The side walls of this enclosed space are comprised of wooden slats woven into curved timber frames decorated with swan heads and similar motifs. Side seats for pilgrims to sit are provided in this space. As this area leads to the inner sanctum, the final area where devotees are permitted, there is a palpable sense of anticipation and devotion. As a child, this area of semi-darkness and cool air can instil a sense of fear, a small space that becomes crowded when the temple doors are closed during a pooja, creating a sense of *Bhayanakam* (fear). Conversely, seniors and those familiar with the space find solace and comfort in the thought of being one step closer to the *Darshan* (viewing) of their Lord. The cool air filtering through the wooden slats, the decorated ceiling panels and pictures of various forms of the deity inside evoke a feeling of *Bhakti* (devotion), which may be associated with one of the *Sringara Rasas*. This intricate balance of architectural design, sensory stimuli and emotional response exemplifies how temple spaces are carefully crafted to enhance the spiritual journey of the devotee, making each step a part of a transformative experience.

iv) Nalambalam and the Transition to the Garbha Griha: Once the inner doors of the temple are open, devotees are allowed to move into the *Nalambalam*, or the courtyard, where the *Garbha Griha* (sanctum sanctorum) is located. The movement through the narrow passage leading to the courtyard, while the view of the deity is in plain sight, can be likened to an adventure. The passage is lit with the contrasting

brightness of the open-to-sky *Nalambalam*, while the two sides of the passage, or *edanazhi*, remain dark and quite intimidating for young devotees. The raised *Thinna*, or platform, along with the musical instruments stored there and the extra vessels for puja preparations, brings about a sense of activity but mostly feels like a storage area. There is a mysterious quality to it, as costumes and decorations from past temple festivals are stored in these areas. This mysterious and somewhat intimidating atmosphere transitions as the devotee moves closer to the deity. The initial sense of *Bhayanakam* (fear) gives way to feelings of *Bhakti* (devotion) and *Sringaram* (beauty and love). The transition from fear to devotion and love is carefully orchestrated through the architectural design and the sensory stimuli of the temple space. The dark, narrow passages open up to the bright courtyard, symbolising a journey from the unknown to enlightenment and divine presence. The anticipation and mystery gradually transform into a profound spiritual experience as devotees approach the *Garbha Griha*, culminating in a sense of unity with the divine.

v) At the Garbha Griha: The primary function of a temple visit is the darshan of the deity, to see and be seen by the divine presence. At the *Garbha Griha*, the narrow space between the *Namaskara Mandapam* and the *Garbha Griha*, combined with the low eaves of the overhanging roof, rafters and beams at eye level, compels devotees to bow down and bend to see the idol within the small doorway of the shrine. This enforced posture of submission, along with the heightened devotion towards the deity, intensifies the experience and evokes many bhavas (emotions) of the *Sringara Rasa*. The cultural associations and connotations imbibed through the traditions, stories and habituated routines of the land further elevate the level of *Anubhava* (experience) at this sacred location. Straining one's neck for darshan, folding hands and bending the head in submission are body postures that accentuate the *Sringara Rasa*. Architecturally, this space is designed to facilitate one-to-one worship rather than a congregational experience. The diminutive scale, monochromatic walls, trellises and minimal ornamentation focus the devotee's attention solely on the deity enshrined. These combinations of physical, mental, cultural and architectural aspects evoke a heightened sense of *Sringara Rasa*. This category is chosen because of the complex play of emotions at this juncture. Different deities evoke various emotions based on their conceptualisation and associated stories. For example, if the deity is Krishna in the form of a child, the emotion of love and care is evoked. If the deity is Goddess Saraswathi, associated with learning, the

emotions of respect and the power to grant boons are prominent. In this particular study, the various forms of Siva are observed - worshipped as a *Linga*, *Shastha*, *Vettaikkorumakan*, *Mahadeva* and many other forms. Each form can be associated with a particular bhava that is invested in that form, which is well supported by the temple's architecture. The design elements and spatial arrangements of the temple enhance and amplify these emotional experiences, making the darshan a profound and deeply personal encounter with the divine (see Fig. 1).



Figure 1: Schematic cross section of a temple indicating areas invoking various Rasas

Source: Author

6. Conclusions and Recommendations

This study explores the sensory aspects of Kerala's Shiva temple architecture, focusing on how design elements evoke specific Rasas or aesthetic emotions. From the grand entrance gopuram to the intimate *Garbha Griha*, each architectural feature is crafted to stimulate a range of emotions - anticipation, awe, devotion and fear. By examining these sensory experiences through the lens of Rasa Theory, we discover that these elements serve not just as places of worship but as immersive environments that deeply engage devotees' senses and emotions. Phenomenological research, enriched by cultural studies and human sciences, provides a comprehensive foundation for understanding architectural experiences. Integrating insights from anthropology, sociology and psychology, this interdisciplinary approach reveals how cultural values shape and are shaped by the built environment. By considering how people interact with and interpret their surroundings, designers can create more nuanced, culturally sensitive and emotionally resonant architectural spaces.

This ongoing research aims to validate these hypotheses through interviews with temple visitors, gathering insights into their lived experiences. This approach seeks to refine our understanding of how temple architecture influences emotions, ultimately informing and improving architectural design practices. Further research will build on these findings, providing a framework for creating spaces that are not only functional and aesthetically pleasing but also deeply meaningful and responsive to the complex experiences of their occupants.

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This research paper was presented at the IIA ANVESHAN Research Conference held at MCAP, Thiruvananthapuram, Kerala during 29-31 August 2024, under Stream 2: The Significant Present

Circular Economy in the Built Environment:

Revitalisation of Unused Old Buildings in Urban Spaces Sustainable Approaches to Reusing and Repurposing Urban Structures

By Ar. Akshay R. Menon

Abstract

The paradigm of the Circular Economy encourages continuous resource use through recycling, reusing and reducing waste and hence provides a sustainable turnaround strategy for urban development. This paper seeks to outline the application of CE principles in the revitalisation of underutilised old buildings, considering environmental, economic and social challenges brought forth by traditional linear approaches. It covers successful case studies from the Battersea Power Station in London, Central Market in Barcelona, High Line in New York City, Gowanus Loft in New York City and The Edge in Amsterdam. The examples stand for the adaptive reuse of historic and abandoned buildings, conserving resources and reducing wastes, thereby stimulating urban regeneration. The Battersea Power Station has been an industrial heritage converted into a much-modern mixed-use development. Central Market realises important themes of material reclamation, historic preservation and sustainability. The High Line integrates energy-efficient technologies with the rehabilitation of urban space. It is also symbolic of state-of-the-art energy management in The Edge. The Gowanus Loft would be a model to be used to manifest economic benefits by material re-use and support to local businesses. Regulatory barriers, financial constraints and stakeholder resistance are the challenges realised through the research. Policies should be updated but these are only some of the recommendations that financial incentives and effective engagement with stakeholders call for from policymakers, urban planners and developers. This

paper concludes that although practices for CE offer both environmental, economic and social benefits of importance, their successful implementation calls for the surmounting of various challenges and integration of best practices.

Keywords: Circular Economy, Built Environment, Building Revitalisation, Urban Sustainability, Buildings' Re-purposing

1. Introduction

Circular Economy is the new paradigm for systemic change in the way resources and related waste are managed - the built environment not being an exception. The circular economy encourages sharing, leasing, reusing, repairing, refurbishing and recycling - policies opposite to the traditional model of linear economy. This approach has prime importance to the inefficiencies and environmental degradation caused by unused old buildings in urban settings. This is related to the fact that rapid urbanisation is accompanied by a large number of buildings that are either not used or underused yet have a high historical and architectural value. This refurbishment or redevelopment of such buildings reduces the generation of wastes and promotes the conservation of resources, hence improving urban sustainability.

It is the built environment circular economy which goes beyond material recycling by being an integrated approach for design, construction, renovation and eventually deconstruction. This applies to the whole life cycle of buildings. This model reduces waste, optimises resources and generates

value with new design and business models. Giving a second life to old buildings evades the necessity of new construction and hence makes the urban environment more sustainable. This paper illustrates how applying circular economy principles can contribute to meeting the challenge of sustainability, climate change and resource depletion for urban regeneration, economic development and social cohesion.

1.1 Aim and Objectives

Principally, this research investigates the practical application of circular economy principles for the revitalisation of unused old buildings in urban settings. Drawing from examples of successful case studies, this research analyses strategies that would afford an in-depth understanding of the potential and challenges encountered in developing circular economy practices in building revitalisation projects.

Specific objectives of this research are as follows:

- i) Study the successful case studies: Examine different projects related to building revitalisation where circular economy principles have been applied successfully. Among the notable examples for this study shall be the Battersea Power Station in London, the High Line in New York City and the Central Market in Barcelona. Such case studies shall be assessed for success factors, novelty of approaches and emerging lessons.
- ii) Identification of effective strategies and practices: This should be done through the analysis of strategies and methodologies that have been adopted in such projects, reviewing what worked best in integrating circular economy principles within building revitalisation. This objective is focused on a more in-depth understanding of which techniques, technologies and design approaches have been utilised successfully to make the principles of a circular economy work during building renovation and repurposing.
- iii) Assess Environmental, Social and Economic Impacts: Consider the results of such revitalisation projects based on the environmental benefits, economic viability and social contribution they make. The aim is to describe holistically the effects of circular economy practices in building revitalisation, linking resource efficiency, waste reduction, job creation, community engagement and cultural preservation.
- iv) Recommend: Develop specific actionable recommendations to enhance the practice of circular economy principles in the building

revitalisation process by policymakers, urban planners and practitioners. These may be targeted at overcoming the key challenges identified in research and propose strategies for surmounting barriers to the wider adoption of circular economy practice in the built environment.

In realising these objectives, the research endeavor is geared toward increasing the knowledge base on sustainable urban development with actionable insights that will help stakeholders in building revitalisation projects. It is thus expected that this study's findings will enrich the array of decision-making policies at the level of the government, strategies for urban planning at the bureaucratic level and catalyse innovations in dealing with sustainability challenges of urban areas under the prism of circular economy principles.

2. Literature Review

2.1 Circular Economy Fundamentals

The paradigm of the circular economy has attracted enormous interest in the recent past as a way of sustainability against the traditional model of a linear economy. In other words, the concept of a circular economy is oriented toward trying to retain as much as possible of the resources' value within the economic cycle and reduce generating waste by making optimum use of resources. Geissdoerfer et al. (2017) define the circular economy as "a regenerative system in which resource input and waste, emission and energy leakage are minimised by slowing, closing and narrowing material and energy loops".

Against the background of built environment, circular economy dwells on a set of the following principles:

- i) Resource Efficiency: The concept is to work with materials and energy in the most resource-efficient way along a building's life cycle. Designing products and buildings that allow reuse and re-cycling at end-of life is important. Indeed, according to Bocken et al. (2016) modular construction techniques enable the easy disassembly of building components to support reuse. Resource efficiency also covers operational resource use - like energy and water - and avoids primary resource use through the use of renewable resources and efficient systems.
- ii) Waste reduction: Reduction of waste is one of the fundamental principles of the circular economy. This can be practiced in building refurbishment through strategies such as

designing for deconstruction. This would make the process of separating the materials and recycling them at the end of the life cycle of the building much more efficient. Dixon et al. (2014) identify that designing for deconstruction is very important for effective recycling and material recovery. Additionally, waste reduction involves the reuse of existing materials and structures wherever possible, reducing the need for new resources.

- iii) **Sustainable Design:** This tenet would give a dual-edge of durability, adaptability, and modularity while designing or renovating a building. Sustainable design would facilitate making buildings flexible and readily adaptable to new uses later in life, thus making the structure extend its lifecycle and reduce the need for new construction. Jensen et al. (2015) quoted that adaptable design is significant in increasing the life expectancy of the building and hence increasing sustainability.

These very basic principles of the circular economy offer some framework for making a more sustainable and resource-efficient approach to building revitalisation. If applied well, these principles could greatly reduce the environmental impacts through the built environment, while structuring economic and social value.

2.2 Building Revitalisation

Adaptive reuse, also building revitalisation, is an important aspect of a circular economy within the built environment. It involves transforming the already existing constructions to extend their life cycle, which alleviates the environmental impacts caused by the process. As Bullen and Love (2010) opined, there are several key benefits for the adaptive re-use of old buildings:

- i) **Historical Preservation:** One can retain part of the architectural heritage by reviving old buildings while changing the type of building functions to be suited for the current needs. This will preserve the cultural and historical values attached to the city spaces, hence add character and identity to cities. According to Arfa et al. (2022), mostly, adaptive reuse projects involve the preservation of historical values while at the same time modernising the building with current functions, therefore connecting between past and present.
- ii) **Resource Conservation:** Building Revitalisation, by the very nature of the word 'revitalisation', conserves resources through the use of already

existing structures and not their demolition, followed by constructing new ones. Often, this includes reclaimed materials from the original building and new materials incorporating the element of sustainability. Geissdoerfer et al. (2017) noted that with the inclusion of salvaged material and sustainable design practice in renovation projects, huge reductions in environmental impact from buildings could be realised.

- iii) **Community Benefits:** Restored buildings can beautify urban environments and stimulate community life. By recycling older abandoned buildings, it is possible for cities to create new public spaces that offer an improvement to local facilities and, therefore, add to the liveliness of urban life more generally. Kimmelman (2014) states that development projects that involve communities and respond to their needs have the potential for developing positive social impacts, which raise the quality of life for both residents and visitors.

Building revitalisation is close to circular economy principles because it extends the practical life of already existing constructions, reduces waste and generates value from unexploited resources. This approach contributes not only to environmental sustainability but also to the economic and social sustainability of urban areas.

2.3 Case Studies

Several case studies are reviewed to show the application of the principles of circular economy in building revitalization.

2.3.1 Battersea Power Station, London

The redevelopment of this iconic industrial facility offers a very good example of circular economy in urban regeneration. Some of the key features within this project include:

- i) **Structural Preservation:** The project retains the original framework of the power station, which speaks of history but has it adapted to new uses. This retains the architecture of the building while being able to retain modern functionality.
- ii) **Sustainable Design:** The redesign also integrated efficient systems and green technologies, which would help minimise the impact of the building on the environment. Some of these assets include energy-efficient lighting, renewable sources of energy and green roofs, thus showcasing how old historic buildings can be retrofitted to suit modern demands related to sustainability.

- iii) **Community Engagement:** The development has established mixed-use spaces that provide public amenities and enhance communities. Residential, commercial and recreational spaces complement the redevelopment further regenerating its surroundings and providing a feel of community as described by Jenkins (2019).

2.3.2 High Line, New York City

The project takes an old railway track and turns it into a public park, which gives a nice example of innovative reuse and circular economy principles for infrastructure. Among them are -

- i) **Infrastructure Repurposing:** The High Line project transforms an elevated railway abandoned and turns it into a green space, reinvigorating an area that was otherwise forgotten. It is a great example of how obsolete infrastructure can be transformed into useful public amenities for the betterment of cities.
- ii) **Sustainable Design:** It incorporates native plants and energy-efficient lighting to lessen its effect on the environment. The design achieves very sustainable landscaping with water conservation measures and low energy lighting, that will demonstrate how green spaces in an urban set up can be delightful to the eye and at the same time environmentally responsible.
- iii) **Community Impact:** The High Line now represents one of the spots that raises the quality of life within the city and benefits the local economy. The project spurred economic growth in surrounding areas and provided the community with a unique type of public space both for community gatherings and cultural events (Bocken et al., 2016).

2.3.3 Central Market, Barcelona:

This historic market building renovation makes an extensive reuse of original materials and applies sustainable design practice to showcase circular economy principles within a culturally significant structure. Some of the notable features are:

- i) **Material Reuse:** The project recovered original building materials and integrated them to conserve the historical integrity of the building. This includes reclaimed bricks, tiles and fixtures from the original market structure to ensure reduced waste and retained character (Arfa et al., 2022).
- ii) **Historic Preservation:** The restoration process will maintain some of the main features that

were important in defining its historic period but, at the same time, include some features of modern design. In this way, cultural heritage is preserved while satisfying the needs of a space in use today, making it significant in history yet relevant in its function (Dixon et al., 2014).

- iii) **Environmental Sustainability:** This project ensured that energy-efficient systems and construction methods could serve as models to reduce the impact of buildings on the environment. Some important features include energy-efficient HVAC systems, water-saving fixtures and sustainable construction materials. It all goes to prove the possibility of adapting historic buildings to meet the modern high standards of sustainability.

These case studies illustrate how circular economy principles are working in building revitalisation within very different contexts and at different scales. They provide examples of how circular economy approaches could be applied to very different kinds of projects: large industrial redevelopments, public infrastructure and historical buildings.

2.4 Methodologies and Outcomes

The different methodologies oriented to measuring the environmental, economic and social impacts are included in the evaluation of building revitalisation projects with respect to circular economy principles. Two important ones among them are:

2.4.1 Life Cycle Assessment (LCA)

LCA is a holistic methodology that estimates the environmental impact of building materials and processes during its lifetime. In building revitalisation, LCA identifies less consumption of resources and generation of wastes through the calculation of environmental impact, which associates materials and construction methods with practices for operation. Geissdoerfer et al. (2017) remark that LCA is able to provide deep insight into the long-term environmental benefits brought about by circular economy practices in building projects. The following are key features of LCA for building revitalisation:

- i) **Material Impact Analysis:** The environmental footprint of reclaimed versus new materials.
- ii) **Energy Efficiency Appraisal:** Comparing the energy performance of buildings that are revitalised against new construction.
- iii) **Waste Reduction Indicators:** Accounting for the reduction in waste achieved through material reuse and recycling.

2.4.2 Cost-Benefit Analysis

CBA is the framework with which to compare costs against benefits for circular economy practices in building revitalisation projects. This will further help in assessing their financial viability. Jensen et al. (2015) show the role of CBA in proving the economic feasibility of sustainable building practices. Some of the main elements in using CBA in such aspects include:

- i) **Initial Investment Comparison:** It provides a comparison of the initial investment of circular economy practices against traditional renovation methods.
- ii) **Long-term Savings Projection:** Operational cost saving due to enhanced energy efficiency and resource usage
- iii) **Economic Impact Assessment:** Looking into the larger economic benefits such as job creation and property value increase

These methodologies above provide a standardised approach for evaluating the results from the application of circular economy practices within building revamping. Through such tools, stakeholders could make effective decisions about the feasibility and impact of circular economy strategies applied to the built environment.

3. Methodology

This methodology of the research will lead to an in-depth understanding of how the principles of the circular economy are being used in building revitalisation projects. In the present research, a qualitative method is chosen. This will help in understanding the subtleties of the application of circular economy in practice, performed within varied urban settings.

3.1 Case Study Selection

Another important element in the research methodology was the choice of case studies. Criteria for selecting projects to obtain a diversified and representative sample of building revitalisation projects were:

- i) **Evidence of Circular Economy Principles:** Projects were identified where the adaption of circular economy principles, like material reuse, energy efficiency measures and adaptive design strategies could be evidenced clearly.
- ii) **Relevance to Urban Contexts:** Case studies were chosen to typify urban environments of varying degrees of urbanity, from city centers to post-industrial areas, to examine the applicability of

principles related to a circular economy within different contexts.

- iii) **Diversity of Examples:** Buildings of several kinds and sizes were included to be able to generalise the main challenges and opportunities of various revitalisation projects. This diversity includes residential, commercial, cultural and mixed-use developments.
- iv) **Geographic Spread:** Case studies were selected from different locations to accommodate differences in regulatory environments, cultural settings and climatic conditions.

3.2 Data Collection

A multi-faceted data collection approach was used, which included the following activities, in order to draw out an integrated data set for each case study:

- i) **Literature Review:** Extensive reviews of academic papers, industry reports and project documentation for establishing a theoretical underpinning and preliminary data on case studies selected for this study.
- ii) **Interview Study:** This involved watching and reading interviews of key stakeholders in charge of revitalisation projects, such as architects, developers, policymakers, and community representatives. Those interviews shed light on decision-making processes, challenges encountered and lessons learned from the implementation.
- iii) **Site Visits:** Since site visits were not possible it was not feasible to directly observe and document the physical outcome of the revitalisation projects. Through vlogs and video documentation, the researchers were able to understand how circular economy principles had been integrated into the built environment.

3.3 Data Analysis

Data analysis involved a combination of qualitative techniques targeted at establishing patterns, themes and insights for the collected data:

- i) **Thematic Analysis:** This involved a process that unraveled the themes duplicated across case studies—like common challenges, successful strategies and other key factors influencing the implementation of a circular economy.
- ii) **Comparative Analysis:** Cross-case analysis was conducted for the comparison and contrasting of different revitalisation projects in terms of approaches, outcomes and contextual factors. This analysis helped in pointing out best practices and lessons to be used across several urban contexts.

The methodology adopted in this work is oriented toward a holistic understanding of applying circular economy principles in the context of building revitalisation. Therefore, it is expected to provide robust findings in terms of providing action-oriented insights for practitioners and policymakers in the field of sustainable urban development.

4. Data Analysis and Findings

The analysis of the selected case studies has generated various significant findings related to the implication of circular economy principles in building revitalisation projects. The findings are presented under three sections: environmental, economic and social impacts, followed by the challenges encountered.

4.1 Environmental Impacts

Circular economy principles have led to significant environmental improvements in the reviewed case studies:

- i) **Resource Conservation:** The adaptive reuse of such structures meant that consumption of new materials could drastically be reduced. For example, in the Battersea Power Station project in London, much of the major iconic chimneys and a substantial part of the original brickwork was able to be salvaged. On the other hand, the Central Market in Barcelona used a great deal of reclaimed material from the original structure.
- ii) **Waste reduction:** The projects showed innovative methods of reclamation and reuse of materials. Central Market renovation recorded original materials for reinstallation, thereby storing them for waste reduction at landfills. The Gowanus Loft in New York City received further materials from demolition locales within the community, therefore further reducing its waste.
- iii) **Advanced energy management systems** ensured energy effectiveness and minimised the operational environmental impact. The building has been reckoned to be one of the world's most sustainable office buildings and is situated in Amsterdam. It is operational with the use of solar panels, thermal energy storage and use of the smart grid for wise energy usage. It also comprises a new energy center that will supply efficient power, heating and cooling to the entire Battersea Power Station development.
- iv) **Water Conservation:** The irrigation system in New York's High Line advanced the means of collecting and recycling rainwater to irrigate

plants. Water-saving fixtures and rainwater harvesting systems at Bollard's Central Market used less amount of water than was used by traditional markets.

- v) **Biodiversity Enhancement:** The High Line project increased urban biodiversity by transforming a derelict railway into a green corridor that opened a new habitat for various plant and animal species right between the heart of New York City.

4.2 Economic Impacts

Economic feasibility and benefits from circular economy approaches were identified across the case studies:

- i) **Cost Savings:** While the investment price point compared to conventional buildings was often higher at the outset for most of the issues discussed, there are indeed long-term operational cost savings across all of these projects. The Edge, for example, features much lower energy bills than a comparable, conventionally operated office building simply because it employs an advanced energy management system.
- ii) **Value creation of the Gowanus Loft project** was demonstrated through how material reuse could support local businesses. Sourcing materials and engaging craftspeople from the locale of its site, the project incited the local economy and created a totally unique, high-value property.
- iii) **Urban Regeneration:** The High Line, New York City, was one such project that created economic activity in the surrounding areas. The project came to the topped point of increasing property values, business and boosting tourism in the neighborhood. On such a basis, the development of Battersea Power Station acted as a catalyst for the regeneration of its previously termed industrial area.
- iv) **Job Creation:** The revitalisation projects created numerous jobs, not only during the renovation phase but also in the operational phase. Renovation of Barcelona's Central Market gave jobs not only on the construction phase but also new opportunities for vendors and small businesses locally to function within the renovated market space.
- v) **Tourism and the Cultural Economy:** Most of the developments, particularly the ones involving historical buildings, for example, Battersea Power Station and Central Market, turned out to be significant tourist sites and helped in the development of the local cultural economy.

4.3 Social Impacts

The process of embracing the principles of the circular economy at the time of the renovation of the buildings resulted in the following positive social impacts:

- i) **Community Engagement:** The Battersea Power Station Project created mixed-use areas that can bring community interaction. The public squares, shops, restaurants and cultural spaces now offer a place for community gatherings and events.
- ii) **Cultural Preservation:** The renovation in the Central Market still maintained its history but gave way to the modern needs to keep alive the local traditions and community identity.
- iii) **Quality of Life Improvement:** The High Line was a project that restored old infrastructure to a public facility, providing opportunities for recreation, rest and reconnection with nature within an urban area of dense population.
- iv) **Educational Opportunities:** Several projects included educational components. The Battersea Power Station development has involved historical displays dealing with the site's past use for industrial purposes. In the case of the High Line, educational programs involve urban ecology and the principles of sustainable design.
- v) **Social Inclusion:** Projects like the Central Market of Barcelona worked to ensure revitalised spaces stay accessible and pertinent to members of diverse communities by keeping vendor spaces affordable and integrating community feedback into design processes.
- vi) **Health and Well-being:** Green spaces and pedestrian-friendly design, as in the High Line and areas around Battersea Power Station, also benefit public health via physical activity engagement and raised air quality.

4.4 Challenges and Barriers

Notwithstanding these wide-ranging benefits, there were a number of challenges to the application of the principles of the circular economy in building revitalisation:

- i) Outdated building codes and zoning regulations, very few of which had been crafted with circular economy thinking in mind, were common obstacles to many projects.
- ii) Circular economy approaches typically have higher up-front costs compared with conventional approaches, which also created

difficulties in securing funding with so little precedent for projects whose profile did not easily attract fundraising talent. The technical challenge of retrofitting modern systems, including circular economy ones, into historic structures is enormous and requires the most innovative of engineering solutions.

- iii) **Stakeholders' Resistance:** Sometimes the stakeholders' were reluctant to apply circular economy strategies as they were quite skeptical about its benefits. With some, we needed a lot of teaching and persuasion.
- iv) **Supply Chain Issues:** The difficulty of sourcing recovered materials and suppliers familiar with the operation of the circular economy often makes it difficult to find suppliers in some instances and, hence, develop new relationships in the supply chain.

5. Results and Discussion

Building revitalisation in a circular economy basis: Impressive environmental, economic and social profits can be realised for the cases of adaptive reuse strategies in saving resources and decreasing volumes of waste.

5.1 Key Findings

- i) Adaptive re-use of historic and derelict buildings is a resource-conserving, waste-reducing process that advances urban regeneration. All the case studies would demonstrate this, particularly the Battersea Power Station and Central Market projects which revitalised derelict structures as dynamic, multi-use spaces.
- ii) The experiences from successful projects such as Battersea Power Station show opportunities for transforming industrial heritage sites into contemporary mixed-use developments. Besides the conservation of the iconic structure, the project enabled the creation of a new urban quarter, which combines residential, commercial and cultural functions.
- iii) Creative infrastructure reuse, like the High Line, has managed to make and create value in public open space and increase economic activities. The High Line has become one of the best examples of how to reuse an abandoned railway and it has become popular with a lot of emulated cases in the world. This project also shows what 'infrastructure recycling' in the urban environment looks like.
- iv) The advanced technologies at The Edge provide a significant contribution to a much more energy-efficient approach towards old

buildings. Smart systems and renewable energy sources, in addition to sustainable efficient design principles, can reduce the environmental impacts that buildings can bring to a minimum.

- v) A project like the Gowanus Loft makes the economic advantages of material reuse and support for local business members clear. It is a practice that allows for the minimisation of waste while developing truly unique spaces that could demand high prices in the real estate market.
- vi) Circular economy principles, when applied to building revitalisation, have the potential to make a large contribution to urban sustainability objectives and related goals for resource depletion, waste and climate change.
- vii) For all this success, however, challenges were clearly set out - in regulatory barriers, financial constraints and stakeholder resistances that point to supportive policies, to innovated ways of financing and to engaging in responsible ways with stakeholders, as necessary conditions to foster the wider application of circular economy principles in building revitalisation.
- viii) Case studies also show that the circular economy, if implemented properly, should be holistic, covering the whole life cycle of the buildings and their components. This means not only physical renovation but also continuous operation and, in the future, also gradual adaptation.
- ix) Research also notes the necessity for context-specific solutions. Although universal application of general principles can be prescribed in the circular economy, context-specific implementation needs to be adapted to the climatic and cultural settings, not forgetting the regulatory one.
- x) Economic analysis of such projects would reveal that, although up-front costs may be high, long-term benefits surpass these initial investments. This therefore contributes to the need for new financial arrangements that take into account these long-term savings as well as the wider social benefits.
- xi) Socially, the individual cases show that building revitalisation projects could be an important form of cultural heritage preservation by making spaces useful for modern needs. It seems to be a keystone in the creation of spaces that, at the same time, are functional and meaningful to communities.

These environmental benefits are very significant in the context of the global needs of mitigating

climate change and consumption of resources. The extension of the life and the mean application of renovation in existing structures will ensure improved environmental performance and thus provide a model for sustainable urban development not depending on brand new extensive constructions.

6. Conclusions and Recommendations

The cases studied in this research prove the principles of circular economy to be applicable and useful in the urban setting in the domain of building revitalisation. It shows such practices can contribute to solving environmental problems, boosting economic growth and improving social welfare.

Policy recommendations to policymakers, urban planners and developers:

- i) Revise regulations that would work in ways to make working in a circular economy approach to building revitalisation easier and more incentivising. This might include changes to the building code to facilitate adaptive reuse, for example, accelerated approval processes for projects that specify desired criteria of the circular economy and policies highlighting the use of reclaimed material sources.
- ii) Develop financial incentives and new financial models that make real circular economy initiatives in the built environment possible. This might also include tax incentives for adaptive reuse projects, grants that include advanced energy-saving technologies or public-private partnerships to finance larger revitalisation efforts.
- iii) Develop support for projects of the circular economy by building a multi-stakeholder engagement process, including early and continued consultation of local communities and users on goals, impacts and plans of the project regarding the revitalisation of spaces for access and benefit by all the members of diverse communities.
- iv) Enabling knowledge exchange and best practice among industry actors can ramp up circular economy principles in their operations. This includes sharing case studies, professional development workshops and anchoring the concepts of a circular economy within architectural and engineering education.
- v) Embed concepts regarding the circular economy into urban development and planning strategies so that cities can become more sustainable and resilient. This may include priority actions for the revitalisation of premises which have

been abandoned or underutilised, district-level circular economy strategies and targets for city sustainability goals on adaptive reuse.

An important area of environmental, economic and social benefits has been determined for the building renewal through circular economy actions. Implementation would entail the integration of best practices and the alleviation of some challenges across diverse urban contexts. Stakeholders can accelerate the transition to more sustainable, resilient and lively urban environments by adopting the following recommendations.

Together, the potential for the principles of the circular economy to drive a sea of change in the way we approach our built environment is massive. While cities all around the world try to cope with challenges emanating from urbanisation, climate change and resource depletion, practices of the circular economy can turn already existing buildings into a very strong tool in creating sustainable and livable urban futures. Learning from the successes and pitfalls of pioneer projects, such as the case studies in this research, we can strive to develop a built environment that can serve our needs now while conserving resources and opportunities for future generations.

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This research paper was presented at the IIA ANVESHAN Research Conference held at MCAP, Thiruvananthapuram, Kerala during 29-31 August 2024, under Stream III: The Projected Future

Evolving Researchers

Attitude and Aptitude for The New Age 'Research-ism'

By Ar. Anil V Bhingarde

A) PRELUDE

1. Introduction

Reimagining and rejuvenating the art and science of R&D activities is possible only through a well-informed and knowledgeable cadre of researchers, who in turn enable evolving data useful for the success of project proposals and programmes towards the well-being of communities, a kind of cult called 'research-ism' by probing minds in the service of our vast population, which is a resource itself.

1.1 Evolve Researchers and Empiricists

The new-age thinkers should aspire to seek renaissance in thought processes in academics, enabling socio-cultural and economic well-being with industrial-technological innovations, developmental mechanisms and holistic progressions which will evolve on the basis of wholesome educational processes and cultivating knowledge systems. Information highways fused with comprehensive approach and in systemic modes, along with design-thinking is the prerequisite for successful trajectories. All these can be corroborated with the mythical and ethical, the spiritual and the rational, and at times jingoistic too, amidst an array of religious cults that is 'Bharat'.

1.2 Data and Relevance

Charting R&D missions to fuse with the training activities in STEAM (science, technology, engineering, arts and management) disciplines need tremendous impetus due to artificial intelligence (AI) thought processes, as a conceptual base albeit with due

caution and well-informed choices. It is possible that the AI-hype created by technological giants and the 'tech biggies' will prove to be wrong in the long future to come. Skills and competencies in the digital world are certainly essential for greater trajectories in all work-related functions in the long term, commensurate with efficient learning and teaching synergies in disciplines across universities and regions of India.

1.3 Opinion Makers

For developing societies, it will be a great march forward from invariably 'superficial intelligence', a quest for coaching outside formal domains at present, which imply a drastic revamping of the learning and teaching phenomena in the near future. This, in turn, will expedite a healthy work culture amongst the growing masses, and those struggling to be skilled. The mindset necessary to solve problems supported by multidisciplinary thought processes of humanities, design thinking and entrepreneurship is desired.

The overall focus ought to be on generating skilled manpower to steer the developmental scenario for the strong population resource. It necessitates cultivating academics to a new level of enlightenment and to nourish and enliven the fragile social fabric and fractured society through creative researching and data management with integrity, reliability, and accountability. It should lead to building social capital and services for a better quality of rural as well as urban environs, scattered across five geographical zones (east, west, south, north and

central zones) and an array of administrative states imbued with specific socio-cultural-ethnic identity. These conventional entities in these zones can be compared with regional emblematic stretches which are scattered to evolve realistic co-relationships about planning scenarios. At the nodal level, local colleges of architecture and habitat planning have to play a key role while establishing data base and monitoring local development process.

Apart from the general understanding about India of five geographical zones, there is another overview about classification on ethnic social-cultural basis and the scale of material progress:

- *On two frontiers*: in the mountains along the border-lands and in the dense forests of central India
- *Rural and predominantly agricultural India*: In especially the coastal belts of India. It is to be remembered that the life style of a century ago was that of rich feudalistic farmers.
- *Life patterns in 2- and 3-tier cities*: This is similar to lifestyles in major cities 50-60 years ago.
- *Life patterns prevailing in first tier towns and large metros of India*.
- *Indians in globalised time zones*: Their's is a truly global 21st century sensibility.

These five Indian worlds may not directly relate to each other but interact in varying degrees. They may be strangers to one another- which also explains why politicians from these different places may not agree on all matters. So how can governance or education take place? Or even plan and design?

Can a class of 'master trainers-mentors-ideologues-researchers' of national preoccupation and significance be evolved to spread the culture of agility and precision towards surveys, proposals and monitoring ?

1.4 Choice of Personnel and Outlays

Comprehensive reimagining enables tapping data which can re-define the Indian story. The size and diversity of the country means that planners have to develop a well-refined template for data collection with proportionate increase in resources. Lack of perspective may prove detrimental to evolving developmental progressions. Thus a diverse portrayal of India can emerge that covers complex traditions, habits and systems of beliefs, which are an integral part of live realities of people who happen to start a vital and real social identity. It may even be possible to derive a new value-driven choice-based architecture.

2. Literature Review

2.1 Mentors

The essence of 'research-ship' role, with searching mind tends to create a sense of awareness and usefulness, based on 'need or want', towards evolving propose-monitor-communicate. It is all about demystifying research by mentors, opinion-makers, preachers and also current work-ethics in the age-old hallowed institutes of research. Writers and scientists have helped improve decisions about health, wealth and happiness according to the sciences and biases of our choices. This may even have created great upheavals at times, in economic terms and in processes of academics and research. Enduring 'push and prod' provokes intelligent communicators to write and interact vehemently while hammering at burning societal matters and concerns.

The value of any writer hinges on being relevant and focussed upon healing the past, mending the present and creating a better future. Thus, evolving the pulse of communities for ensuring survival depends upon reforming individual preferences and traits. It encompasses adequate liveability patterns with a sense of austerity and long term endurance in the competitive world! Researchers probe comprehensively to evolve the 'need or want' aspect of any proposal. Socio-economic choices emerge from current polity-socio-religious currents, which are accentuated periodically through activism and advocacy and lead to natural progression.

The saintly figures, Prof. Patrick Geddes - a social scientist, The Mother - a spiritual leader, Ar. Laurie Baker and Prof. Ar. Christopher Benninger- Architect, in recent times scripted a path for a developing nation like Bharat by scripting grassroots approaches to fuse with developmental processes. The National Research Foundation, as facilitator towards research Initiatives by thinking and contemplation is a recent introduction to already well known institutes like the Indian Statistical Institute in Kolkata, the Gokhale Institute of Economic Research in Pune and the Centre for Development Studies at Trivandrum.

In the recent past, this nation was endowed with a futurist, environmentalist and expert in international development, Late Rashmi Mayur, Mumbai- a world citizen, crusader for the sacred earth, an icon and a legend.

Mahalanobis' '*Idea of Data*' shows that data are not just numbers, they speak volumes. He was founder of the Indian Statistical Institute and the National Sample Survey Organisation and pioneering its

role in nationwide data collection for development planning. It is imperative that serious efforts be made to demystify research functions and outcomes by intelligent planners, backed by healthy research and development activities, the only prerequisites being healthy education systems.

2.2 Books

Opinions are influenced by objective and subjective realities and the active role of influencers. Varied views may be taken by researchers at different stages.

Future Shock by A. Toffler a writer and journalist focuses on a social study about an industrially developed prosperous society. People overwhelmed by change because of the way in which we adopt or fail to adapt to the future. It discusses current issues like the 'death of permanence', 'transience', 'novelty', 'diversity' and importantly 'strategies for survival'. Some stimulating points of current relevance are :

- Information: the origins of over-choice
- Future shock: the psycho-logical dimension
- Education: in the future tense
- Strategy of social futurism

Small is Beautiful by E.F. Schumacher is a seminal work for guiding our path. The author explores the idea of sustainable development and challenges the conventional wisdom of unlimited economic growth. It is an apt critique of our understanding of economic and efficiency of current methods. The author advocated more practical and appropriate technology that was smaller in scope over conglomerates and economy which served no one. This book, scripted by a statistician and economist, attempts to explore the idea of sustainable development.

Humanscape by duo – S. Kaplan and R. Kaplan is an attempt to analyse the human psyche:

- Humans as processors of information while narrating: evolution, perceiving, knowing, caring, and knowledge-rationality
- Experience of environment: preferred environments, stress and failure of reference, Coping strategies- choice and control, coping strategies- interpretation and making participation possible!

The Indian Mosaic Edited by Manoj Kumar Jena revolves around ways of being Indian with essays on religion, gender and culture. A diverse portrait of India emerges that covers the various complex traditions, habits and systems of belief that are

integral part of the realities of lives of people who happen to share a national identity.

Thinking, Fast and Slow: The Science of our Biases and Choices by Daniel Kahneman, a Nobel laureate and a psychologist, explores modern classic on the instant versus deliberate thought, the basics of reality checks to update and thereby enrich theory-based analysis, aspirations for better lives in spite of our failures to think deliberately. Kahneman's advice would be to avoid mental short-cuts and think slowly. Thus there are two ways of making choices: the first one is fast, emotional and intuitive, and the other way is slow, deliberative and logical. By examining both these ways, author unveils extraordinary capacities and the bases of thinking fast and various other aspects of the human mind.

A Nudge by R. H. Thaler and Sunstein dwells on improving decisions about health, wealth and happiness, explored by a behavioural scientist and economist who has designed the cognitive processes:

- the automatic system: uncontrolled, effortless, associative, fast, unconscious and Skilled
- the reflective system: controlled, effortful, deductive, slow, self-aware and rule-following

This explains how one can be ingenious at some tasks and clueless at others, and how can people be simultaneously so smart and so dumb.

2.3 Print Media and Researchers

On the eve of the recent annual national finance budget, a series of thought-provoking articles appeared in print media. One of them presented with an appropriate thematic graphical illustration and titled 'How to pack for the journey to 2047: Realising the great Indian Dream' stood out the most. The assortment of articles include subjects like budget-2024, managing demographic transition, energy transition, financial plumbing, reimagining the Indian state, and making industry future-ready.

B) INTERLUDE

3. METHODOLOGY

3.1 Overview of 'Choice Architecture'

Healthy biases influence the ways and means of evolving perspectives of community preferences about environmental design management. In India, it is essential to keep in mind the well-being of communities and the trajectory of equity and sustainability.

It should be clear for whom the research is conducted: whether it is research for research's

sake, or for academic papers or for doctoral theses or mainly as a part of visualising the education of the future and to resolve complex matters. The National Education Policy (NEP) envisages a multi-disciplinary approach to any desired stream which anticipates every discerning student to cultivate an individual thinking process expeditiously. Contemplative action on attributes stipulated by the experts of the Council of Architecture is also demonstrated by the topics of the streams and sub-themes specified for the IIA ANVESHAN Research Conference. In the future, thought processes will be enhanced and will become game changers, helping the human race to grow and become a more ecologically-conscious and just society. Our institutes should evolve into hubs of great change with interaction about societal phenomenon.

Tracking changes in how we 'learn' shows that constant change is responsible for creating competencies in workforces, which otherwise go obsolete. Thus lifelong learning is the only feasible option. A new generation approaches, with a set of unique behavioural attributes, which will shape the workings of the educational industry, pushing it to develop new formats, modules and approaches. Some such industry trends which are set to dominate the educational sector include nano-learning, lifelong learning, large-scale personalisation, data-driven learning, self-paced learning, addictive mechanisms, engaged and immersive learning, collaborative learning, 21st century skills, and the last learning experience platforms.

3.2 Testing the functionalism and efficacy of the models

Current institutional feedback on the research front shows that it is possible to progress with the support of information and knowledge systems. A sound hypothesis will specify the need or want for research programmes. Training activities in STEAM need collaboration with AI. NEP envisages multi-disciplinary approach to any desired stream which necessitates every discerning student to cultivate individual thinking process as soon as possible.

3.3 Outcome and Remedies

Communities can benefit by building ensembles to habitats with contextual frameworks as a way of learning and teaching. Hard-earned degrees at the UG/ PG/ doctoral/ post-doctoral levels will be affected by:

- New paths charted by the architectural landscape and crafting spaces that fuse seamlessly design with environmental responsibility.

- Systemic awareness of environmental phenomenon and the ability to interpret an array of geographical landscapes and evolve comprehensive contextual perception.
- Every project, irrespective of scale at the urban- or rural-fronts need guidelines substantiated by the research process.

It may be possible to change the very DNA of professionalism in the architectural discipline, which is seen as a 'social art'. Indic ideas manage to retain their essence even as they continue to adapt and grow. True to their heuristic spirit, they are capable of transcending the duality of tradition and modernity. The Indic ethos promotes dynamism and forward-looking thought and remains profoundly the holistic vision of human life, with four mutually non-exclusive goals as the guiding spirit: *artha* (economic prosperity), *dharma* (virtuous conduct), *kama* (emotional fulfilment) and *moksha* (self-realization).

4. Data Analysis and Findings

4.1 Team Architecture- The Consensus

Recent IIA conclaves at Indore, Jaipur, Lucknow explored newer themes and concepts enabling architects to visualize the complexities of professionalism in India. As professionals, in architecture, infrastructure and habitat-planning, special focus is needed on data for adequate knowledge systems and interpretation to build sound hypotheses for project planning tasks, adequately supported by sensitivity about design grammar and ecological sensibilities. It is thus possible to evolve a set of entities from 'known to unknown' and building co-relationships rationally _Tables no. 2 and 3:

- Cultivating instincts and evolving habitat community development
- Develop aptitude and attitude for environmental design activities
- Creating individual development and designing data systems with reference books, articles, research papers and media clips, etc.
- Understanding concepts of natural sciences at the micro- and macro-levels

Glocal scenarios envisioning 'lives and liveability' as a basis, fuse global thinking with various issues arising due to sustainability and climate change. These efforts have to be in synergistic collaboration between professionals and the array of stakeholders.

Tables 1, 2 and 3 – 'Training the trainers', generate action plans with vocabulary and concepts, at the micro- and macro-levels and designing for the

Table 1: Training The Trainers- Synergy for evolving visionaries: The Action Plan
 Source: Author

Part I: Overview		Part-II: Follow Up Action	
Academic scenario- Learning and teaching synergy Define and initiate- Healthy academic progression for architecture by the teaching and student community.		An approach to basic research enriching pedagogy evolving syllabus topics and classroom lessons- as checklist for concepts and vocabulary	
Instilling spirit of architecture in academics	<i>Environmental Planning and Designing Progressions:</i> Mentoring and monitoring w.r.t. information systems in teaching tasks aided by case studies/ research/ DIY & experiential learning	Research data and Information systems	<i>Index-Array of Notes:</i> Design grammar- making concepts Designing and detailing Design theory Landscape- environmental planning & urban planning
Levels of studies and phases	<i>Evaluation by academic teams from individual colleges:</i> AD studio projects, my own academic (learning) & public places; Academic subjects and teachers; Extracurricular activities; Dissertation; Activities; Post-graduate studies, Ph.D. and post-doctoral studies.	Critical thinking: Observe-imagine-learn: 1 Critical thinking- Observe-imagine-learn: 2	<i>Teach Thought:</i> Verbs- Bloom’s Taxonomy Tools for taking charge of your learning & your life
Interpreting environmental functions and systems	<i>Understanding Comprehensive Measures:</i> For monitoring communities and settlements Information systems and processes for environmental planning and designing activities	Education: How we are set to learn	<i>Brain Storming:</i> Intuitive Response Common sense approach in the light of NEP
Architecture and beyond	<i>Statutes, standards, legal sanctions, professional bodies, etc.:</i> Consultancy, execution and management, research, feedback from institutions and implications	Education: Tracking changes in How we are set to learn	<i>The Author’s Observations:</i> Logical explanation for individual pointers
Communication to professional bodies	<i>Communication with IIA and CoA</i>	India of five nations	<i>The five Indian worlds:</i> How they relate to each other and interact
Development concepts at macro & micro levels	<i>Compendium of articles & news snippets</i>	Governance and its relevance to sustenance	<i>Ecological balance:</i> the key dimensions of sustainability at all levels and in all contexts

Table 2: Development and natural sciences: Environmental planning and designing concepts at micro and macro levels: Compendium of articles
Source: Author

Design & Planning Theme	Data Concepts
<i>Natural processes: Understand life sciences</i>	Sense of place- essays Value in nature-ecosystem and human health Nature Bio-centric view of nature
<i>Growth & development: Economics and technology</i>	Elements of a sustainable society Sustainability Regional linkages Bio-regional layers Building as catalyst for sustainability
<i>Environment & ecology: Nature cycles and transition</i>	Environmental impact assessment checklist Strategies & built environment-climate regions Vegetation Building ecology Design principles of sustainable site design Growth: maturity or over-development
<i>Learning guidelines: Establish co-relations</i>	Towards urban systems education Design process- architecture education & design methodology Education for development & sustainability Climate change: an excellent opportunity to overall our education system Landscape design- misc. terms Architecture and environment-glossary
<i>Professional practice: Building Vision</i>	Elements of a sustainable society Sustainability Regional linkages Bio-regional layers Building as catalyst for sustainability
<i>Media reports</i>	Eco-warriors Segregate waste-relentless reformer And the green land beckons Go earthy- guardians of the earth We need an apartheid style boycott to save the planet In 3 years-commercial buildings must go green Beware of the green inquisition Low-carbon growth can tackle poverty, global warming

Table 3: Research data: Information systems- Index-array of notes
Source: Author

Type of Data	Design Grammar; Conceptualization; Designing / Detailing; Design Theory; Landscape - Environmental Planning; Urban Planning
<i>Research Notes</i>	An index table; Elements of visual design; Design for designing; Design progression; Common sensory stimuli
<i>Research Tables</i>	Promenade; Site & space planning; Site planning / survey data; Outdoor space planning; Habitat agenda; Smart city mission- sustainability process; smart city
<i>Abstracts</i>	Outdoor recreation spaces; Architecture design- built profile; Design approach & framework; Design approach; Paving profile; Array of stages- paths for pedestrians; Eco-literacy; Positive development; Environmental planning & design- concept notes; Landscape basis for planning; Climate science; Landscape theory guide lines; Town planning- Development plan
<i>Articles</i>	Teaching architecture design workshop; Critical thinking for architects; Educating the educator; Educating the educators; Education: Tracking changes; Environmental education; Sustainability; New glossary- green towns

syllabus. The overview and follow-up action includes the processes to decipher various concepts to define thinking, monitoring, designing, teaching and learning activities.

4.2 Future

Do-it-yourself (DIY) is ideally suited for motivational exercises, anticipating holistic skill enhancement in any degree programme. Similarly, architects need to envisage a systemic approach to project multi-faceted research proposal based on sound information systems and data analysis to optimize resources of construction industry. All built ensembles, habitations and infrastructure installations are designed with regard to the design brief and its geometry, to optimize resources and display skills on the urban and rural fronts. All correlations in various tasks are expressed through matrices and tables. Architects and related disciplines often engage themselves in formulating built ensembles and infrastructure systems which are scrutinised by predominantly civil engineers for decades in the age-old PWD design grammar but fail to recognise town design concepts in their day. The community of architects and urban designers must strive to plug the holes and equip themselves to upgrade from the earlier trade of 'archi-craft' to architectural visualization for healthy progression toward the 'lives and liveability' of all communities across the country.

National community-development processes reflect urban and rural skylines and other communities under its shadows as they evolve with maturity. Various trademark cults comprising of iconic designs contribute to image building. The cadre at local governance in urban development and have stipulated tenets for the ease of doing business.

5. RESULTS AND DISCUSSION

It is imperative that serious efforts made to demystify research functions and outcomes by intelligent programmes backed by healthy research and development activities contributing to healthy education systems. Graduates pouring out from universities should not be assembly-line products, but equipped with work ethics, work culture and knowledge systems.

5.1 Building Data Base

- Evaluation criteria is the success and failure of research proposals.
- Limitations of exploring scientific tenets of contemplation and visualisation of research mechanisms and ability to communicate to prospective clients and agencies

- Quantification of information systems with qualitative undertones
- Use of data and statistics backed by tangible perspectives of human values

5.2 Classification and Communication

Ultimately value of any process lies in being relevant for healing the past, repairing the present and creating a better future. Systemic approaches to project multi-faceted research proposals based on sound information systems and data analysis to optimize resources is the immediate need.

C) CONCLUDE

6.1 CONCLUSIONS AND RECOMMENDATIONS

Data is not just numbers, they speak volumes, for example, the nationwide data collection for development planning. Relative merits can be examined with cognitive approaches. Universal human needs or values can be grouped into categories of the core needs for well-being (peace), connection (love) and self-expression (joy). There are further sub-categories: critical thinking, clarity, relevance, logic, accuracy, depth, fairness, precision and breadth.

The checklist of tangibles and intangibles with respect to opinions and choices.

A multi-faceted systemic approach to project a typical research proposal based on sound information systems and data analytics illustrates a spectrum of ideas. It also provides analysis for designing activities with well-researched contexts. The two cognitive systems which can be used to make the checklists are the automatic system and the reflective system.

6.2 Smart Choices for Smart Cities

A transparent, robust and credible data system is important for any country because it provides critical inputs to policy makers, investors, political parties, researchers and media to conduct and critically evaluate progress. Data and statistical system is a prerequisite for fast-developing economy. Futuristic project proposals could involve learning various languages and ability to grasp finer aspects of scientific and technical essence with ease. Thus it necessitates creating an encyclopaedia in regional languages and coordination and interaction with technological and scientific disciplines.

6.3 Do-it-yourself (DIY)

The array of concepts visualized here enable discernible stakeholders to delineate individual paths as per leaning and awakening to follow path of R & D activities with missionary zeal in both academics

and professional practice. Availing of mentoring and interaction as necessary from cognoscenti or gurus may be necessary for a successful march ahead. It is the best practice to select suitable cognitive processes in preference to individual basic thoughts. A practical framework can be evolved by a basic lesson in design grammar through the use of verbs for critical thinking, namely, knowledge, understanding, apply, evaluate and lastly create, along with an innate sense is to cultivate oneself by attitude and aptitude, enhancing creativity processes.

6.4 Future of the Profession

The exploratory observations are only ideas to enrich individual value systems which journey through professional interactions in academics as well as professional practice for the last six decades, an exercise in chronicling the array of matters pertaining to developmental activities and rules of the land. It is essential to develop abilities to enable diagnostic surveys of regional contexts and evolve remedies for community health and growth.

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Spaces for India's Youth

By Ar. A.K. Jain

We cannot always build the future of our youth, but we can build youth for the future.

Franklin Roosevelt

The theme of the World Habitat Day 2024 'Engaging Youth to Create a Better Urban Future' is a matter of concern for architects, as they deal with spaces. According to India's National Youth Policy, 2014, the term 'youth' refers to people between the ages of 15 and 29. In 2021, India's youth population is estimated to be 37.14 crore, or about 27.3% of the country's total population, which stood at 1,407,563,842. India in the year 2047 will have a population of 1,640 million, i.e., one-sixth of the world's population, of which 50% each will be urban and rural (820 million each). Of this, about 50% will be women. It will have the world's largest workforce and will be the world's third largest economy of \$36 trillion. It is projected that 75% of GDP and new jobs will be created in the cities. This requires engaging the youth and leveraging their potential.

Youth covers a wide and diverse canvas with regional characteristics in terms of gender, social, physiological, economic, environmental, emotional and other attributes. Making India a developed country is not possible without giving space to youth for living, playing, working and self-development. The space must be affordable, universally accessible, safe and environmentally sustainable.

The Department of Youth Affairs, Ministry of Youth Affairs and Sports, Government of India organized the Youth20 (Y20) Summit-2023 under India's G20 Presidency. During the summit, Y20 Communiqué was signed emphasising the need to empower the youth by skilling, learning, and preparing them for global

challenges. strengthen collaborations, promote worker rights and provide sustainable financing. The universality, indivisibility, and integrated nature of the sustainable development agenda with the interlinkages between development, climate and environment was underlined, together with active involvement of the youth.

Employment Incentive Scheme for the Youth

The Government of India in its budget 2024-25 has launched employment-linked incentive schemes:

- *Scheme A* will provide one month's salary as an incentive to first time employees entering the formal sector and registering with the Employees Provident Fund Organisation (EPFO). This will be up to INR 15,000 in three instalments. This is expected to benefit 210 lakh young employees.
- *Scheme B* aims to help create jobs in manufacturing. It provides EPFO incentive linked to the scale of hiring over the first four years of new hiring. It aims to benefit 30 lakh workers.
- *Scheme C* targets employers, reimbursing up to INR 3,000 per month of employers' contribution to the EPFO for two years.

The workers must be new contributors to EPFO and have a salary below INR 1 lakh/month. This is expected to benefit 50 lakh new workers. The number of beneficiaries projected by these schemes is 290 lakhs. The internship programme will leverage the young persons by faster hiring, lower attrition and higher productivity. It promotes learning by earning, learning by doing, learning with qualification modularity, learning with flexible delivery and learning with signalling value.

New Age Technologies

The youth and new age technology are closely intertwined. The Information and Communication Technology (ICT), artificial intelligence, big data analytics, machine learning, deep learning, blockchain, GIS, GPS, etc. are disrupting the urban space. Digital technology and informatics have multiplied space, energy and time. New forms of energy, services, construction and recycling are characterized by online exchange of information, interactions, dynamic networks and floating nodes. Integration of land use, utilities, transport and buildings on a common network helps optimize space and its configurations (see Figs. 1 & 2).



Fig. 1: Circular Economy is Restorative, Regenerative and Circulatory
Source: Khan, 2022



Fig. 2: Components of Artificial Intelligence
Source: Verma, 2022

Spaces for Work

The foremost priority of youth is a job for living. Unemployment and underemployment are the major issues of urban and rural youth. With lack of jobs in the formal sector, the youth are shifting to small businesses, vending and as labourers. It is necessary that a network of spaces for the informal sector are mandatorily provided for them. Business premises, co-working spaces and MSME clusters for youth, which are affordable and sustainable, can go a long way in self-employment of the professional youth.

To help the youth engaged in vending business, the handcarts can be redesigned with better logistics, storage, packaging and services which can enhance their incomes. The Graduate School of Design, Harvard University has proposed design of electric carts for street vendors which can meet the contemporary needs of the fruit and vegetable retailing (see Fig. 3).



Fig. 3: Electric Cart for Street Vendors
Source: Nagpal, 2023

Spaces for Living

After the partition of the country in 1947, about 5 lakh refugees in Delhi were provided about 1 lakh shelter/plots (80 sq. yd.) in 36 rehabilitation colonies. This transformed their life and enabled them to contribute towards building the nation and the city. It is the space that made all the difference. In view of low levels of income and uncertain jobs, shelter is a major issue of the youth. As a human right, they should be accommodated in various types of housing, such as night shelters, hostels, dormitories, which are located near the transport terminals, markets and work centres.

Youth hostels can provide affordable accommodation to the youth. These are usually self-managed to keep the costs down. In India, dedicated hostels for women have been built in some cities (see Fig 4).

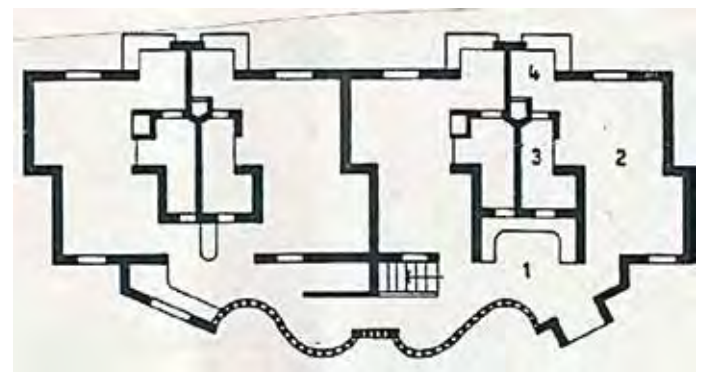


Fig. 4: Trivandrum, Women's Hostel, Laurie Baker, Architect
Source: Bhatia, 1991

Mobile camps as temporary shelter can be seen at large festivals, like the Kumbh Mela, which provide budget accommodation to pilgrims, young backpackers or students. Dormitories and boarding and lodging provide cheap boarding for young people, workers and students. Many colleges and universities provide a variety of dormitories and

hostels usually with communal bathroom facilities, internet facilities, Wi-Fi, computer room, kitchen and a laundry room. These accommodate students and others in minimum space at nominal cost.

Low-Cost Housing

In Indian cities the percentage of population living in slums varies from 19% in Delhi, 32% in Kolkata to 54% Mumbai. A large proportion of housing in old villages/ unauthorised colonies is fragmented, dilapidated and deficiently serviced. This can be redeveloped in a composite manner with proper infrastructure services.

Skeletal housing with evolutionary services can be provided for construction, completion and furnishing by the owners themselves according to their needs, tastes and resources (Fig. 5). The basic infrastructure services can be provided in an evolutionary mode to reduce the initial cost. Such a concept has been implemented by Ar. B.V. Doshi in Aranya Township, Indore (Fig. 6). Low-cost housing by Ar. Laurie Baker provides a good template for economical and sustainable living (Fig. 7).



Fig. 5: Skeleton Housing, Port Elizabeth, Architect Jo Nooru
Source: *The Architectural Review*, August 2017

By modular approach, standardised components can be prefabricated off-site and assembled at site. This allows various permutation and combinations of housing design and construction, which are quick, economical and promote self-help (Fig. 8).

The housing design seeks the formation of the communities and addresses the concerns of jobs, transport, availability of services (water supply, power, drainage, sanitation/sewerage) and health, education and other amenities. The green areas, parks, tot-lots, play areas, chowks and squares are integral to housing. The housing development provides safe spaces and slots for vocations by the

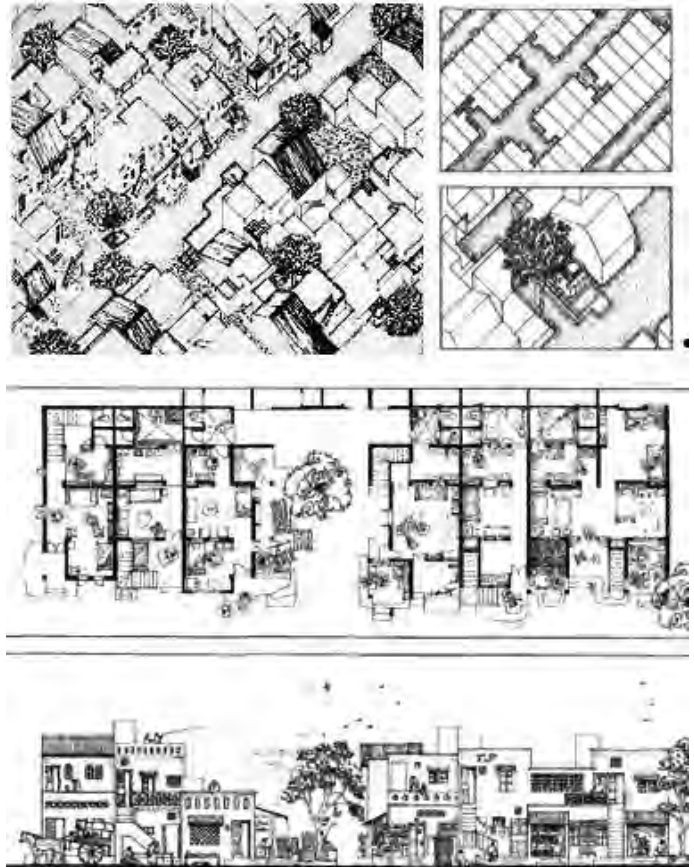


Fig. 6: Aranya Township, Indore, Architect: B.V. Doshi, with staggered streets, community spaces, incremental housing and services
Source: Jain, 2020

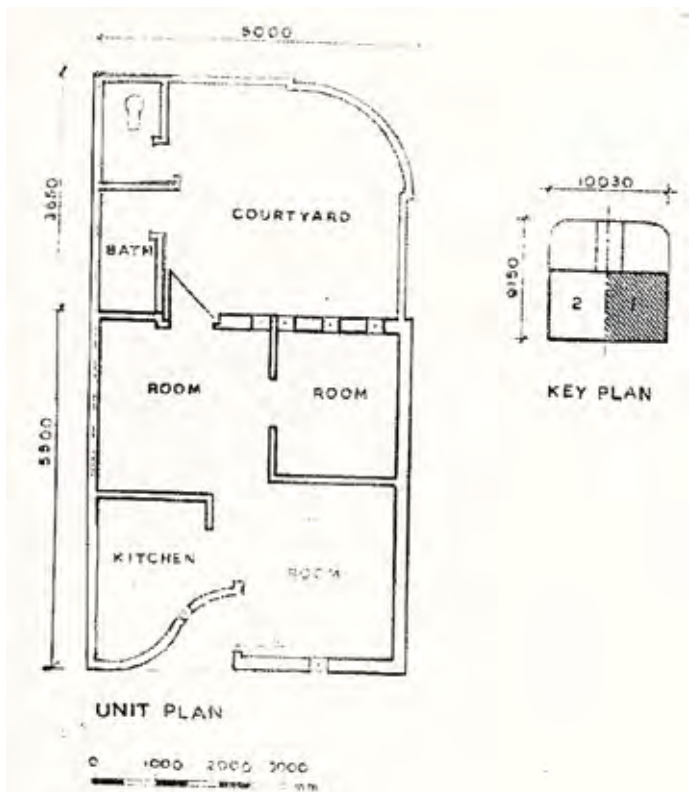


Fig. 7: A 27.5 sqm House with rat trap bond brick wall, burnt brick paving, frameless doors and windows, no plastering and brick shell roof, Architect Laurie Baker
Source: Bhatia, 1991

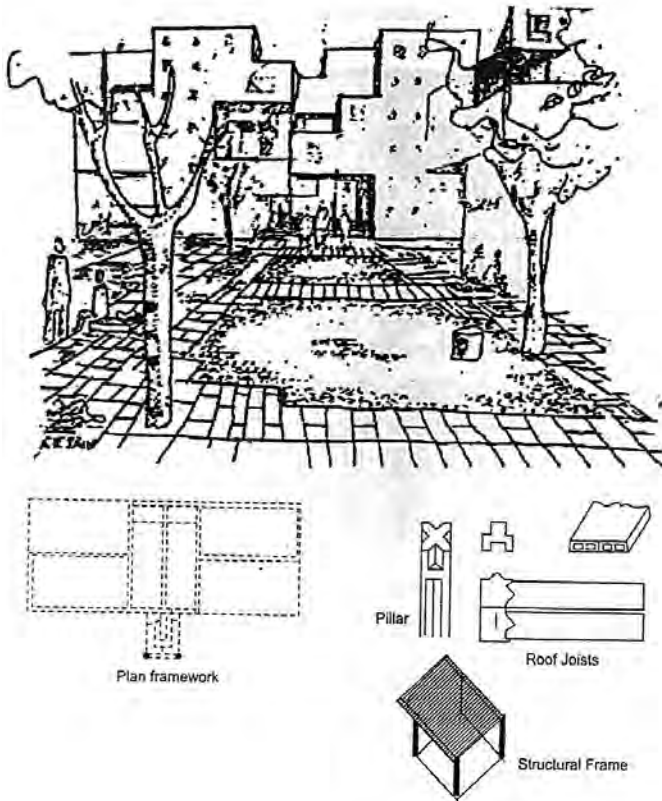


Fig. 8: A Skeleton with standardised prefab components provides a wet core for expandable houses (A.K. Jain)
Source: Jain, 2020



Fig 9: Common Courtyards for the Community, Women and Children
Source: Jain, 2020

women, like coaching, sewing, making pickles and food items for sale (Fig. 9).

Youth Centres

These aim to provide dedicated space for the youth, such as a library, community/ multipurpose hall for cultural performances, cinema, theatre, entertainment programmes, etc. It can also provide a gym, banking, health and computer facilities (Fig. 10).

Schools and Educational Buildings

With the rising level of education and New Education Policy, it is necessary to upgrade and enhance the

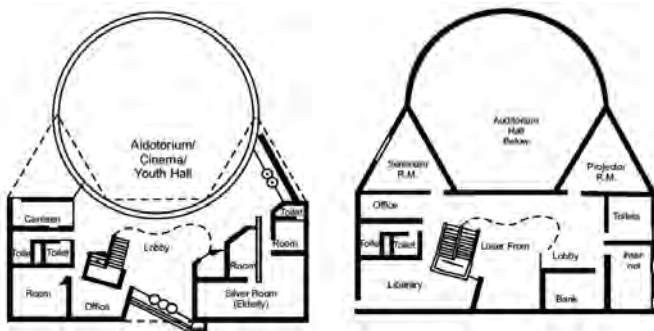


Fig. 10: A youth centre with multipurpose hall for cultural performances, banking, library, health and computer facilities
Source: Jain, 2020

old school buildings keeping in view the needs of space, climate and resources. The facilities can be categorised under basic needs, well-being needs, opportunity needs, and amenity needs, which serve all, including the youth. As far as possible existing facilities should be strengthened and enlarged.

Sports, Playgrounds and Stadiums

The open spaces and playgrounds are very important for children, youth and others. A local park and playground is mandatory at neighbourhood level (10.000-15.000 population), A community park-cum-sports centre is required for a population of 1 lakh, which can be integrated with the school (Fig, 11). For strengthening the spirit of sports and culture among the youth, indoor halls can be built for music events, sports and public ceremonies. These can be quickly and economically erected as pre-engineered structures.

It is necessary that the tot-lots and play areas are safe from traffic and pollution and are furnished with a rain shelter, water fountain, seats, play equipment, lighting, etc. (Fig. 12)

Conclusions

As India is moving towards becoming a developed nation by the year 2047, the engagement of the

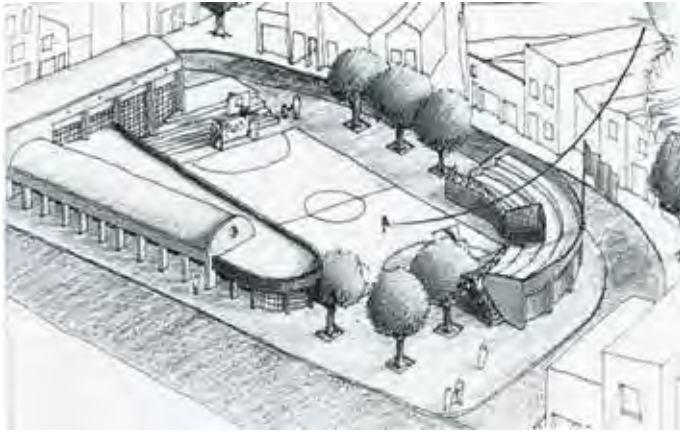


Fig. 11: A playground can be developed as a mini stadium-cum-amphitheatre

Source: Jain, 2020



Fig. 12: A Tot-lot

Source: Playponics

youth is crucial. The youth can play a critical role in leveraging their huge potentials towards national development and space is their breadth. It can be designed and visualised in a futuristic perspective, which addresses the issues of housing, jobs, sustainable development and climate change (Fig. 13).

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Fig. 13: Urban Sequoia concept presented at COP 27, Egypt, (2022) by SOM. New technologies enable design of a visionary urban form which addresses the issues of housing, jobs, sustainable development and climate change

Source: Gonchar, 2022

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Use Of Robotics and AI in Building Construction Processes

By Prof. Ar. Mahesh Bangad and Janhvi Prakash Patil

Introduction

"A great epoch has begun. There exists a new spirit. Industry overwhelming us like a flood that rolls on toward its destined end, has furnished us with new tools adapted to this new epoch, animated by the new spirit." says Le Corbusier. These words still hold true today. In fact, a wonderful new era has begun. Le Corbusier penned those comments after World War I, at a time when the world was awash in automobiles, submarines, consumer products made in factories, grain elevators, and a fresh aesthetic as a result of the industrial revolution.

The construction industry plays a significant role in national and global development. The construction industry is worth 25% of the Gross Domestic Product (GDP) in developing countries and around 10% of the GDP in developed countries. However, the advancement in the existing technology is far less compared to other industries such as the manufacturing industry.

Robotics has created new opportunities for planning, designing, assembling, and overall architectural production. This technology will soon be a necessary step in the construction process. Robotics and artificial intelligence will play an equal and essential part in the construction sector, just as the development of ultra-strong Portland cement and the ground-breaking BIM (Building Information Modelling) software fundamentally changed how we design and construct buildings. These are technological innovations that solve issues like poor productivity, risky working conditions, etc.

This article presents to the readers, through specific cases, a look into how robots and artificial intelligence are changing the existing building construction

practices and helping inspire industry or research to amalgamate such technologies into their practices.

Case Studies

1. Hadrian X by Fastbrick Robotics

The Hadrian X (refer Figure 1), which resembles a scene out of a Transformers movie, is truck mounted and has a 98-foot robotic arm through which customised blocks are supplied so they may be placed. The claw at the end of the arm can automatically correct its position 1,000 times per second and is directed by motion sensors. Specialty glue is sprayed from a nozzle. According to Kiel Chivers, manager of corporate services at FBR, *"deploying our robot is as simple as driving to the site, calibrating our equipment to the slab, and running the build from the datafile."* Additionally, it implies that the constructed structure is extremely exact, enabling the parallel production of parts such as roof trusses, window and door frames, and even the installation of prefabricated kitchens. With a bricklaying rate of up to 200 per hour, the Perth show home's framework was finished in just three shifts.



Figure 1: FBR's Hadrian-X robot

Source: <https://darkroom.ribaj.com/800/aaa215e139d01bf01116282d-d2817387:6dfc85d59e7e1bfdd71009acb66a64ae/fbr-s-hadrian-x-robot-is-mounted-on-a-truck-that-manoeuvres>

2. BOD2 by COBOD

The BOD2 is a monolithic 3D printer the size of a large office desk that can print the complete envelope of a house, down to the foundations, all at once. With a print range of 10m by 10m by 10m, an extrusion head mounted on a gantry and attached to a hose rotates in three distinct directions, squirting out concrete in successive layers.

Because they are modular, printers can be constructed in various sizes (refer Figure 2). A prototype 90m² two-story home was constructed in 2020 using a 10m³ printer at the construction innovation centre Kamp C in Denmark; the largest dwelling to date was 12.5 x 27 x 12.5m.



Figure 2: Curved walls produced by BOD2

Source: <https://darkroom.ribaj.com/800/c2040ac7c5f518cbb-f9290c625570f46:a92e017bd5b4467b2bff826a2cf45ee8/curved-walls-produced-by-bod2-are-three-times-stronger-than-conventional-brickwork-says-the-developer>

As the concrete contains metal fibres, there is no longer a requirement for formwork and less chance of shrinkage and breaking during curing. The Kamp C building did not include service spaces, but integration with BIM software makes this an easy addition.

Because COBOD printers are open source, users can print on any material they like. To develop novel materials, the company collaborates with Lafargeholcim in France, Cemex in Mexico, and Laticrete in the US.

3. SkilledIn Office Pavilion (by Studio RAP, the Netherlands)

The modest structure is the “first robotically manufactured building in the Netherlands,” according to the Studio RAP designers. The building was built by the studio using a robotic arm, and it was given the moniker SkilledIn Office (refer Figure 3). The pavilion, which provides training and office



Figure 3: Pavilion by studio RAP

Source: <https://www.arch2o.com/wp-content/uploads/2020/09/Arch2O-4-buildings-and-pavilions-made-by-a-robotic-arm-1.jpg>

space for technology students and businesses, is situated inside Rotterdam’s Innovation Dock, an educational and technological hub utilised by Alberta College and Rotterdam University. Wessel van Beerendonk, a co-founder of the studio, said: “We see a lot of promise in embracing digital fabrication. We aim to create a physical connection through robotic production between the infinite possibilities of the digital world and the real world. Our goal is to take this out of the academic sphere and apply it to building practise,” he continued. “However, there is a huge difference between the digital design and the building’s actual production, and we are motivated to close this gap”. With the aid of a robotic arm and the “Rhino” software, the studio team assembled the pavilion from 225 pieces of wood. Following that, they assembled the panels to form the main pillar and the 8-m-wide roof.

4. Vulcan by ICON

ICON has constructed twenty 3D-printed homes in the US and Mexico, and recently the start-up produced the first neighbourhood of 3D-printed homes in North America, which is now open for sales in Austin, Texas.

The tablet-controlled robot (refer Figure 4) has a gantry system and can print up to 2000-square-foot single-story structures. Different slab sizes can be accommodated by adjusting the printing widths. With the advancements in automation, mechatronics, and software, anyone with a basic understanding of operation may now manage all processes.

The energy-efficient 1000 to 2000 square foot homes in Austin constructed for developer 3Strands have big covered front porches and front yards, covered parking, and open concept floor designs (refer Figure 5). Each is meant to survive fire, flood, wind, and



Figure 4: Vulcan

Source: <https://darkroom.ribaj.com/800/ba7b65fd31778bf7b299b2a1fe4133d-a:efc030fea7a3bfb58445ac4c387d80bc/vulcan-takes-24-hours-to-print-400-500ft2-of-wall-spread-across-several-days>



Figure 5: House Zero Project Taking Form

Source: https://scontent.fpnq13-1.fna.fbcdn.net/v/t39.30808-6/271090307_647067630041127_7602110343741137293_n.jpg?_nc_cat=103&ccb=1-7&_nc_sid=a26aad&_nc_ohc=VIXCZtZMfs0AX-J7sg2&_nc_oc=AQnZgZN3dzQZPFcnfa5uOpUIEPeQB49aNtqKyaWncsB8ZcPN29dMPK7TG-noVaxTQ9qF0Jqh2Kr9zbn4hw2ie-&_nc_ht=scontent.fpnq13-1.fna&oh=00_AT9pPeoJ2TCeLOEdTm2ZbkRD2t95OYHtrv7pS-CyS069Ww&oe=635142A0

other natural calamities more effectively method to 3D printing one and two storey buildings, according to Alex Le Roux, co-founder and chief technical officer at ICON. Every structural test they have conducted so far on the patented, cutting-edge material Lavacrete has been a success. This indicates that people will be able to live safely in their homes and that they will be resistant to the various environments which might use this technology.

Conclusion

In comparison to traditional approaches, the case studies conducted above show how robotics and artificial intelligence can make the construction process simpler, take less time, and produce less waste. We may conclude from comparing the various machines and robots listed above with the matching structures that they modelled that these structures are more fluid and erratic, breaking the year-long monotony of straight-lined structures and mundaneness (refer Figures 6, 7, 8, 9, 10). The industry can do more and more thanks to these technologies in terms of time savings, efficient cost management, dynamic structure design, sustainable material use, etc.



Figure 6: The finished structure by Hadrian X in less than 3 days

Source: https://www.theb1m.com/assets/images/Hadrian+X+first+test+CUR+house+render.jpg?Action=thumbnail&algorithm=fill_proportional&width=550



Figure 7: Project Zero home by Vulcan

Source: <https://i.all3dp.com/workers/images/fit=cover,w=1284,h=722,-gravity=0.5x0.5,format=auto/wp-content/uploads/2022/03/02163016/Icon-house-zero-A.jpg>



Figure 8: Project Kamp C by BOD2

Source: https://www.kampc.be/l/library/download/urn:uuid:4a50d669-4ec6-46ad-8e6c-8c63903fa7a7/exterieur_c3po_webresolutie.jpg?scaleType=1&width=2042&height=1404



Figure 9: Skilledin Pavillion by Studio RAP
Source: https://static.dezeen.com/uploads/2015/11/Robotics-in-Architecture_Studio-RAP_dezeen_936_3.jpg



Figure 10: 2 storey building by BOD2
Source: <https://cobod.com/wp-content/uploads/2022/09/03-houston3dprintedhouse-creditanthonnyvu-2048x1536.jpeg>

Robotics and artificial intelligence can be used to design and build structures in a manner that optimizes labour, cost, and time while producing a variety of constructible forms. Successfully integrating developing technologies into processes and operations can lead to the creation of new, more sustainable communities. This article also concludes that there are various technologies already in use that have the potential to create amazing constructions. Such technologies can be used by architects to advance and save time. Construction industry executives may focus their investments on areas where AI has the greatest potential to meet the specific demands of their organisation. Entrepreneurs will determine the industry's course and profit both now and in the future. AI and machine learning have a wide range of potential applications in the construction industry where information requests, unresolved problems, and modification orders are commonplace. The mound of data can be examined by machine learning, which functions like

a smart personal assistant. Project managers can be informed of the important issues that require their attention. AI is already used in many applications where its advantages range from basic spam email filtering to sophisticated safety monitoring.

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The Blissful Ignorance of Construction

By Ar. Nikhita Manu

Between the oldest historical empires to the most modern city, the one fact shared in common is that they are never finished in terms of construction. Every burgeoning society perennially continues to demand either new infrastructure or renewal of existing ones based on its shifting socio-cultural, political and economic dynamics. Furthermore, if not for a societal demand, the natural environment itself changes its course from time to time, calling for a renewal. Following this pattern, particularly in our capitalist society, it is a fact that the construction industry continues to thrive as one of the most consistent businesses and also one of the largest employment sectors in most cities across the globe. In India, as of 2023 data, the construction sector is the second largest employer having hired around 71 million workers (Ghazali, 2024). Nevertheless, despite its magnitude, unfortunately or perhaps conveniently, it remains a heavily unorganised sector, operating as a complex hierarchy with various industry actors such as investors/developers at the top followed by architects, engineers, contractors, sub-contractors, micro-contractors and finally the workers. At the bottom of this complex hierarchy, there are millions of rural migrants who have moved to cities such as Delhi or Bangalore amongst others for construction jobs (figure 1). In practice, they are hired through a network of known contractors/ subcontractors or via known friends and family who are already employed in the locality. Harmed by the bubble of informality they work within, it is recorded that most of them if not all, do not have access to legal frameworks, health benefits, and adequate housing which are essential for a decent livelihood.

The Ministry of Labour and Employment through the Model Scheme for Building and Other Construction Workers and Action Plan (for Strengthening Implementation Machinery) lays out a set of recommendations to support the community



Figure 1: Fingerprints lost between mortar and rebars
Source: AI generated image

through infrastructure such as housing, transit accommodation, mobile toilet and creches along with financial models that give health and welfare security (GOI, 2018). However, the implementation of these are questionable across the country and in contrast, migrant workers are commonly spotted to be living under the “blue tents” of the metropolitans. Schemes such as the Affordable Rental Housing Complexes (ARHC) program, launched in 2020 have been implemented only to a marginal effect of 8% as of 2023 (Chitlangia, 2024). These operate in a top down approach and face several challenges such as financial sustainability and land acquisition amongst others.

In all likelihood, a top-down approach alone would not suffice for a comprehensive solution, one would also have to look at this bottom-up. An important perspective which is rather being conveniently ignored is the engagement architecture practices have with the working community. Unlike the other industry actors such as the developers, investors, engineers and contractors, architects are rather professionally trained to look at buildings not only as a structure to be erected but to also understand the larger role it plays in society. It is however a systemic problem that architects are distanced from the hands that actually make their building; they are

only seen as mere providers of design, necessary drawings and the occasional site supervisions. It is not to argue that architects must take the sole initiative and responsibility nor that they are the only community who could be sensitive, but instead attempts to state that architects can play a crucial role in bringing forces together to speak through the language of design. A typical construction site hires a combination of local skilled labour and in-migrant skilled and unskilled labour; based on the scale of the project, associated workers are provided housing either on or off the construction site. Large-scale construction projects offer free housing within the sites as temporary sheds made largely with steel framework, block masonry and corrugated sheets. In such living conditions, dust and sound pollution from ongoing construction, poor air circulation, overcrowding, lack of sunlight, maintenance etc. pose concerns for a healthy living environment. The workers employed in smaller construction sites live outside the work site in formal/informal shared rental housing, where overcrowding, poor ventilation and lack of maintenance prevail as concerns and which could also end up as ghettos within the city (Kotal et al., 2022). Overarching all of the above, is the adversity of the climate breakdown that the country is facing. While the building industry is heavily researching and trying to mitigate this through innovative design and LEED certifications, it is also crucial to look at the sustainability of each building through the lens of its infrastructure during construction. For example, the temporary resting sheds and housing provided today are nothing less than heat furnaces. Ideally, if every practice begins to look at the socio-spatial conditions and inequalities a building creates during construction as a part of their project, then there would be an incredible repository of design solutions to tackle the current crisis across different climatic and cultural zones of the country. Well, without adequate support and collaboration from other stakeholders of industry, design solutions in isolation would be a quixotic approach that might crumble down before it could begin.

Nevertheless, it is fairly reasonable that these conditions i.e. the “housing-work” relationship of workers do have an impact on their overall well-being, productivity and efficiency at work. A better working environment and culture can preclude events such as absenteeism, re-work and can progressively help skill development amongst workers. On an average, not being able to meet construction timelines, schedules and quality are key factors amongst others that affect most architectural practices financially and qualitatively. A cohesive set of design recommendations that addresses housing and other related infrastructure, based on adequate research

has the potential to become the point of reference to create dialogue, invite collaborations with other industry actors and could eventually become a viable model for construction practices. A common pattern seen in the industry is for architects to over time accumulate a network of familiar contractors who can deliver work suiting their respective expectations of efficiency and quality. Ideally, quality of construction and efficiency must be a standard delivery from every contractor and their point of connection with architectural practices must be through a similar stance in design ideologies, construction techniques and typology of work etc.

It is time for the construction industry to not take its workforce for granted and realise the mutual benefits the industry at large can have by addressing the inadequacies of infrastructure at a grassroots level provided for the worker community. Supporting the top-down solutions at the national level with the bottom-up solutions based on various ground realities can speed up the realisation of the vision at large. It would require each of the industry actors in the hierarchy to come together parallel to one another in order to resolve the current system.

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The Significance of Eco-Feminism in the Sustainable Development of India

Ar. Haritha C

Introduction

The term 'sustainability' is very much linked to the way we human beings interact with nature. The discussions on this topic are crucial today as the natural resources are depleting day by day at an alarming rate. We are concerned about how our future generations will survive if the severity shoots up. Women have a significant role in managing natural resources at family and community level and are most affected by environmental degradation. This paper discusses the link between the oppression of nature and that of women and hence the need for having a holistic approach towards both.

Environmental injustice occurs when actions, intentional or unintentional, disproportionately affect the most vulnerable groups (Guedes et al., 2023). In a broader sense, Eco-Feminism relates all forms of oppression with that of nature and shares the desire to have a sustainable future from a different perspective. Feminism emerged as a movement to stand up for equal educational, economic, and political opportunities. It has spread globally in developed as well as developing countries (Tandon, 2008). Eco-Feminism is an extended version of feminism for a bigger goal. The term Eco-Feminism, coined by French feminist Francois d' Eaubonne in 1974, looks at cultural and social concerns dealing with the relationship that the oppression of women has with the degradation of nature. It emerged in the 1970s and 1980s as an intersection of feminist and environmentalist movement. It is significant to identify and acknowledge Eco-Feminism's relevance that underscores the importance of adopting

intersectional and holistic approaches to address the complex issues linking climate and gender domains. In this context, policies and practices must carefully consider the interconnections between systemic challenges to design solutions that are not only more effective but also inclusive. (Guedes et al., 2024)

The concept of Eco-Feminism has two aspects. The first aspect is a purely feminist one which relates the oppression of women directly to that of nature. It is based on the thought that the ethics of women are more appropriate for nature than that of men. Women can be in union with nature where as men have a hierarchical relationship in which they try to dominate nature. It is said that women are the first to observe the environmental degradation. Moreover, women are the ones at the receiving end of any kind of issues. When there is a water crisis in a village, women and children walk many miles to fetch water. Hence, it is natural that the women feel more worried and responsible when there is an environmental issue. Instead of acknowledging the interdependence of the ecosystem, the male-dominated culture views nature and the earth as a mechanical object that can, and should be, manipulated and controlled. The second aspect of Eco-Feminism tries to view the concept in a broader context. All over the world, the major burden of the tremendous costs of unsustainable development are borne by the disadvantaged, powerless and underprivileged section of the society. Hence, all forms of oppression are interconnected and their system structures must be addressed in their totality.

At international level, there are different phases to the Eco-Feministic movements. The Green Belt Movement was initiated by Professor Wangari Maathai in 1977 to address the needs of rural Kenyan women who reported that their streams were drying up, their food supply was less secure, and they had to walk further and further to get firewood for fuel and fencing. The aim of the movement was to prevent desertification and soil erosion by surrounding each village with a 'green belt' of at least a thousand trees. Africa now has more than 40 million trees planted as part of the movement. The movement resulted in less soil erosion in critical watersheds, thousands of acres of indigenous forest restored and the communities are living a healthier life than before.

Indian Eco-Feminism is on the rise and more movements are showing a feminine concern on environment. Some of these are directly handled by women. Some of them, though not necessarily led by women have a feminine approach towards the nature. In the 1970s and 1980s, this resistance to the destruction of forests spread throughout India and became organised and known as the Chipko Movement. The Chipko Movement was the result of hundreds of decentralised and locally autonomous initiatives. Its leaders and activists have primarily been village women, acting to save their means of subsistence and their communities. (Salman, 2008).

Parallels between Eco-Feminism and sustainable development

While we compare Eco-Feminism to sustainable development, parallels can be drawn between the patriarchal system that oppresses women and the capitalistic systems that oppress the environment by exploiting it. In a patriarchal family, the grandfather or father has the lead role and the wife, children and grandmother tend to listen to them for any decision that is taken in the family. We can relate the same to a broader picture. The privileged and wealthy strata of the society tends to exploit the natural resources, the poor and the under privileged people without having any concern on their wellbeing. Hence the sustainable development of any country is dependent on reconsidering the approaches of patriarchy and adopting feminine way of dealing with nature.

Eco-Feminism and Sustainable buildings

The Building sector consumes a major amount of natural resources such as materials, energy, land and water. Buildings use 40% of energy and generate 33% of green house gas emissions globally considering both developed and developing countries.

Therefore, sustainability in built environment is of utmost significance. Looking at the Indian scenario, the country has become the fifth largest economy in 2022. In Glasgow COP26 Climate summit, India has pledged to reach Net-zero carbon emissions by 2070. By 2030, India will ensure 50% of its energy will be sourced from renewable energy sources. India will reduce its carbon emissions by 2030 by a billion tonnes. India will also reduce its emissions intensity per unit of GDP by less than 45%. This is a difficult task to achieve. It is also very important to fulfil social and economic sustainability along with environmental sustainability.

In the case of buildings, social sustainability aligns with the principles of Eco-Feminism by advocating fairness to local communities adopting a more equitable wage without any gender disparity, and encouraging the making of buildings more affordable. Social sustainability has three components: 1) the 'development' aspect that is about meeting basic needs, inter- and intra-generational equity, etc. 2) 'Bridge sustainability' that focuses on changing behaviour to meet bio-physical environmental goals, and 3) 'Maintenance sustainability' that refers to what can be sustained in social terms (Vallance et al., 2011). Incorporating indigenous building materials, techniques, and local labour is an excellent strategy to ensure all pillars of sustainability (environmental, social and economic).

Conclusion

From a purely feministic view point of Eco-Feminism, it can be interpreted that more female participation is to be ensured in organisations that decide India's policies on environmental issues. Though the underprivileged and women are very vulnerable to the environmental problems, they are represented in a miniscule way in policy decisions and have very less access to the centres of decision making. They must have equal participation in political organisations and other significant institutions to bring about a substantial impact. In the case of sustainability in building sector, more female architects and engineers should practice architecture and be involved in building construction activities to mark their representation in the construction industry. Though the intake of female students in architecture colleges is almost equal or more than that of male students, the percentage of practicing female architects is much less. The women deserve the opportunity to express their perspective. The author firmly believes that women's collective perspective will positively affect India's sustainable development.

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The Floating Escape

A Resort Above the Landscape

By Bhoomika Sharma, Ar. Vivek Sehgal and Ar. Ravinder Singh

1. Introduction

Nestled amid the undulating hills of Hamirpur, this resort epitomises sustainable luxury, thoughtfully designed to harmonise with its sloping terrain rather than disrupt it. The 1.9-acre site, characterised by dense forests and a pronounced 28% slope, posed significant design challenges, which were embraced as opportunities for architectural ingenuity. The concept revolves around minimising ecological impact by integrating structures into the landscape, using stilts and elevated pathways to preserve the terrain. Central to this vision is a lift system connecting the resort's distinct areas through transparent skybridges, offering not just functional circulation but a unique opportunity to experience the landscape from above. This seamless blend of modern architecture and nature transforms the site into a sanctuary where every detail celebrates its surroundings (Refer Figure 1 and 2).



Figure 1: Proposed resort 3D view



Figure 2: Site plan with terrace context - An overview of the proposed site layout

2. Central Vision

The resort's design redefines how architecture interacts with topography by adopting a vertically integrated approach that celebrates elevation as an essential design element. At the core of this vision lies the centrally located lift, functioning as a vertical hub connecting residential, leisure and service zones. The transparent skybridges extending from the lift add an architectural drama, floating delicately above the rugged terrain and offering a harmonious fusion of structure and landscapes (Refer Figure 9).

Movement through the resort becomes an immersive exploration, with elevated glass walkways framing panoramic views of the hills and valleys. These pathways provide a sense of floating above the forest, fostering a deep connection with the surroundings. By turning circulation into an experiential journey, the resort's design not only ensures accessibility but also inspires awe and engagement with the site's natural beauty. This innovative strategy of vertical



Figure 9: Lift with transparent skybridges connecting buildings

connectivity reimagines the guest experience, setting a new benchmark for architecture in hilly terrains.

3. Site-Sensitive Design

Preserving the site's natural beauty was a key priority throughout the design process. Stilt construction was employed to minimise ground disruption, allowing the resort to rest gently on the land. Unlike large-scale developments that often require extensive excavation, this project utilised minimal cut-and-fill techniques, preserving the natural topography and ensuring that the resort rises elegantly above the earth rather than being dug into it.

The lift, nestled discreetly within the natural folds of the hillside, emerges subtly from the landscape. Skybridges stretch out from the lift like delicate tendrils, organically connecting various functions of the resort—residential clusters, recreational spaces and communal areas. These elevated pathways invite guests to explore the site's verticality, offering new perspectives at every level. The design encourages discovery as each new height reveals another layer of the landscape, deepening the connection between the architecture and its natural context.

4. Architectural Innovation

The introduction of the central lift and its accompanying skybridge network is both a functional and conceptual innovation. More than just a transportation mechanism, the lift serves as the symbolic heart of the resort's design. Its skybridges, constructed from slender structural elements and transparent materials, dissolve the traditional boundaries between indoor and outdoor spaces. This design allows guests to experience an uninterrupted connection to the environment, enhancing the feeling of floating above the landscape.

The use of glass in these suspended bridges allows light to permeate the space, creating an ethereal atmosphere that complements the resort's organic relationship with its surroundings. The minimal visual impact of the skybridges ensures that the natural scenery remains the focal point, further

reinforcing the seamless blend between architecture and nature. The lift and bridges elevate not only physical movement but also the architectural philosophy behind the project—prioritising minimal environmental impact while offering guests an immersive, elevated experience.

To maintain the focus on the natural environment, the four-story parking structure is carefully integrated into the hillside, with minimal visual intrusion. Guests begin their vertical journey the moment they arrive, with the lift reinforcing the themes of exploration and discovery. This gradual revelation of the resort's spaces adds a sense of anticipation, enriching the overall experience as guests ascend through the various levels of the site.

5. Form and Facades

The resort's buildings each boast a distinct identity, moving away from the monotonous, uniform aesthetics typical of resort design. Some facades incorporate locally sourced stone and timber, paying homage to the region's vernacular architecture, while others feature modern, sleek surfaces that contrast with the rugged landscape. This careful interplay between traditional and contemporary materials ensures that no two parts of the resort are visually identical, offering guests an evolving architectural journey (Refer Figure 3, 4, 5 and 6).



Figure 3: Showcasing spatial organisation across administrative and residential spaces



Figure 4: Combined layout and views of cottage and deluxe room



Figure 5: Combined layout and views of suites area, gym and recreational area



Figure 8: Japanese-inspired recreational area with bridges and shaded seating



Figure 6: Yoga centre

Whether viewed from the skybridges or the lower hillside, each structure contributes to a unique visual dialogue between architecture and nature. The diversity in facade treatments emphasises the dynamic relationship between the resort’s built environment and the surrounding landscape, while creating a sense of place that is both locally grounded and architecturally progressive (Refer Figure 7 and 8).



Figure 7: Curved pathways with shaded canopy

6. Conclusion

This resort exemplifies how modern architecture can harmoniously engage with its natural environment rather than overpower it. Through the use of stilt construction and minimal ground disturbance, the design preserves the beauty of the site, while the innovative incorporation of a central lift system and transparent skybridges redefines spatial movement. Guests are invited to interact with the landscape from an elevated perspective, experiencing the site’s natural contours in a unique and immersive way.

The project serves as an architectural testament to the potential of vertical connectivity. It not only elevates physical movement but also intertwines architecture and nature into a seamless journey of discovery. By offering a design that respects and enhances the landscape, this resort invites architects and visitors alike to explore how thoughtful, site-sensitive design can redefine luxury and create deeper, more meaningful connections with the environment.

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The Antlers Villa

A Sanctuary amidst Nature's Majesty

By Ar. Syed Mohammad Wasil and Ar. Syed Ather Qayoom

FACT FILE:

Location: Dara Hills, Srinagar, Jammu & Kashmir

Typology: Hospitality

Design Firm: AW Designs

Project Completion Year: 2022

Total Site Area: 13600 sqft

Total Built up Area: 3510 sqft

Floor area ratio: 0.2

Introduction

Antler's Villa pays homage to traditional Kashmiri Architecture, characterised by intricate brick facades, sloping roofs and expansive balconies. It is strategically positioned to provide unobstructed views of the surrounding mountains (see figure 1). Each morning, guests are greeted by the awe-inspiring sight of the sun rising over the peaks, casting a golden hue that transforms the landscape into a painting of serenity. The harmonious interplay of light and shadow on the mountains creates a dynamic backdrop that keeps changing throughout the day, inviting guests to explore and experience nature's kaleidoscope. The nearby Dachigam National Park, famous for its rich biodiversity, offers opportunities for wildlife enthusiasts to spot the elusive Hangul deer and a variety of other flora and fauna. Meanwhile, the Zaberwan Hills are a perfect setting for hiking and nature walks, where the crisp mountain air invigorates the spirit. The surrounding fields, with their vibrant wildflowers and lush greenery, add a touch of pastoral charm, creating an enchanting symphony of serenity and delight. The Antler's Villa, with its prime location facing the serene Dal Lake, is a heaven of tranquillity. The villa's positioning offers breathtaking views of the lake and



Figure 1: An aerial view of the site

Source: Authors

the majestic mountains beyond, immersing guests in the natural beauty and calm ambience that the region is famous for.

Architectural Features

The architectural design of Antler's Villa incorporates the use of local materials including brick, stone and wood which ensures that the villa resonates with its surroundings, blending seamlessly into the landscape. As seen in figure 2, this 16-room boutique hotel has been designed as per the topography of the site. The spatial design pins on the dining area and the reception as the main axis, establishing it as



Figure 2: Conceptual sketch of the spatial development

Source: Authors



Figure 3: Floor Plans (L-R Ground Floor, First Floor, Basement, Attic)

Source: Authors

a focal point for spatial organization (see figure 3). The five-foot interval between floors creates a sense of vertical rhythm and continuity, reinforcing the dining area and reception as a central element across different levels, as seen in figures 4 and 5. The use of equal spacing balances the structure's proportions, giving the design a cohesive and intentional flow that extends outward from the main axis. Each room has been placed intentionally towards the west as that side of the site offers majestic views of the Dal Lake.



Figure 4: Elevations - rear elevation (top), front elevation (bottom)

Source: Authors



Figure 5: Section BB'

Source: Authors

Basement Floor:

The basement level is thoughtfully designed to accommodate four versatile rooms which serve various purposes such as guest suites, storage and recreational areas. This floor is strategically insulated to maintain a comfortable climate throughout the year. The layout promotes easy access, with well-placed staircases leading up to the ground floor, ensuring seamless movement throughout the villa.

Ground Floor:

The ground floor serves as the heart of Antlers Villa, featuring:

- **Reception area:** A spacious and elegantly designed reception that welcomes the guests with warm, natural materials and ambient lighting, creating an inviting first impression.
- **Dining room:** This room boasts of large windows that invite natural light and provide views of the surrounding landscape, accommodating guests for meals in a relaxed atmosphere.
- **Administration office:** A dedicated space for administrative tasks, equipped with modern amenities to ensure smooth operations.
- **Additional services:** Utility and service rooms are strategically located for easy access, ensuring that the villa runs efficiently while maintaining a serene environment.

First Floor:

The first floor is designed to maximise comfort and luxury, featuring:

- **Six guest rooms:** Each room is uniquely designed with premium furnishings, en-suite bathrooms and balconies that offer picturesque views of the surroundings (refer to figure 6).
- **Massive lounge:** A central lounge area serves as a social hub, featuring plush seating and stylish decor. Large windows enhance the openness, inviting guests to relax and socialise.



Figure 6: First Floor Bedroom

Source: Imad clicks

- **Open coffee shop:** This coffee shop is designed to provide a casual yet elegant space for guests to enjoy refreshments. It allows patrons to soak in breathtaking views while enjoying their beverages.

Attic Floor:

The attic floor is a private retreat, featuring the spacious and luxurious suites designed for ultimate comfort. Each suite includes a living area, premium furnishings and large windows to take advantage of the scenic vistas. The design emphasises privacy, making it ideal for exclusive stays.

A Sanctuary of Comfort

While The Antlers Villa draws inspiration from heritage architecture, it does not compromise on modern comforts. Each suite is equipped with contemporary amenities, ensuring that guests enjoy a luxurious stay, as seen in figures 8 to 10. The careful blend of traditional design with modern conveniences provides a unique experience where guests can relax in style while feeling a genuine connection to the region's rich history.

Connection to the Landscape:

Situated amidst the majestic Harmukh and Mahadev Ranges, the Antlers Villa offers panoramic views that are simply breath-taking. The design of the villa strategically incorporates large windows and open spaces, inviting natural light and the stunning vistas of Zaberwan Hill into every corner, as seen in figure 7. This connection to the landscape is not just visual; it permeates the very essence of the villa, fostering a deep sense of peace and tranquillity. The surrounding gardens, designed to reflect the natural beauty of the region, feature native plants and flowers that attract local wildlife. Pathways meander through these lush spaces, encouraging guests to



Figure 7: Exterior view showing the site context

Source: Imad clicks



Figure 8: Interior views of the lounge (top) and suite (bottom)

Source: Imad clicks

explore and immerse themselves in the serene environment. This thoughtful integration of nature into the architectural design creates a seamless flow between indoor and outdoor experiences.

The Antlers Villa embodies a remarkable example of how heritage architecture and natural beauty can come together to create a unique and enriching experience. By honouring the traditional designs of



Figure 9: Corridor
Source: Authors

Kashmir while embracing the stunning landscapes that surround it, the villa offers guests a sanctuary that is both luxurious and soaked in culture. Here, visitors can escape the bustle of everyday life, immersing themselves in the tranquillity and beauty of what we call "heaven on Earth."



Figure 10: Dining Area
Source: Imad clicks



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Beyond Barriers: Women's Narratives in Kerala's Architectural Institutions

Ar. Shruti Verma and Dr. Pratheek Sudhakaran

Introduction

The teaching profession, in general, has been considered as an occupation suitable for women. The first image of a teacher that comes to mind is of a woman neatly draped in a *saree*; a physical manifestation of this image is seen in the design of Iris, India's first AI teacher robot (see figure 1). While two-thirds of the global teaching workforce at all education levels consists of women, the proportion of female teachers reduces as the level of education increases (OECD, 2017). This is observed in architectural education as well (Nicholson, 2020), with the findings of the Association of Collegiate Schools of Architecture (ACSA), USA indicating that in affiliate architectural schools in US and Canada, more male teachers (55%) are awarded tenure compared to their female counterparts (40%).

The gender representation in architecture has been known to be tipped heavily towards one side. As a part of the construction industry, architecture practice has been traditionally deemed to be a male-



Figure 1: Iris: India's first AI-enabled robot teacher
Source: <https://www.jharkhandmirror.net/>

dominated profession. Architects are considered male by default, possessing virtues of strength, individualism and genius, much like the image of Howard Roark and women struggled to battle this gendered image of the architect (Stratigakos, 2001). Historically, women have faced significant challenges in gaining recognition and establishing their rightful place within the architectural profession. Over the years, there has been more female representation as evident from the steady increase in the number of female enrolments into the course and the number of female teachers. Though this change is seen noticeably in architectural education, the same pattern does not continue in the profession. According to the statistics available with the Council of Architecture (COA), India, there are fewer women registered as architects in the country than men. The representation of women at the decision-making level is also rather poor —there has been no female president of the Council of Architecture and the Indian Institute of Architects so far. In this context, the study aims to understand the condition of women involved in architectural academia.

This study focuses on the architecture schools in Kerala. Kerala is the most literate state in the country with a significant female majority among school-level educators. The state government is at the forefront of fostering gender-inclusive policies, including maternity benefits for staff of private institutions and menstrual leave for female students. Against this background of progressive measures, this study attempts to explore the employment landscape for women in architecture colleges across the state. This is an ongoing study and the preliminary findings

shared here are drawn from the experiences of architects who have participated so far.

Gender Distribution in Architecture Colleges

There are 34 colleges of architecture in Kerala out of which 23% of colleges have a female head of institution. Approximately 30% of members in the Board of Studies of the four universities in the state are women. This is a rough figure because official data was not available for all the universities.

As shown in figure 2, the gender distribution, based on the data available on the official websites of the colleges, reveals a significantly larger share i.e., 59% of women at the assistant professor level, while it reduces to 40% at associate professor level and 37% at professor level. The minority genders are not represented at all in colleges.

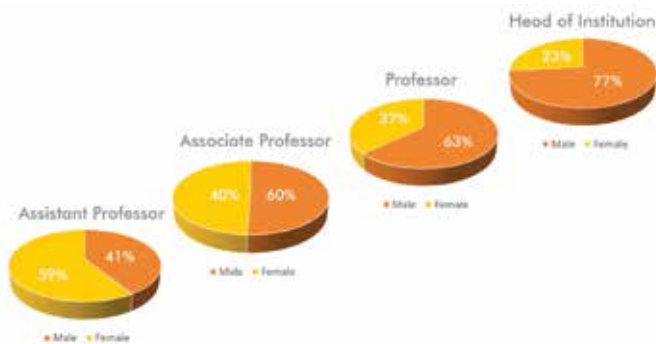


Figure 2: Gender Distribution in Architecture Colleges in Kerala (data as per individual college websites and COA records retrieved on 9th May 2023)

Source: Authors

This was a sample survey in which questionnaires were circulated through personal and professional networks, including the IIA. The survey collected 90 responses through Google Forms, out of which 70 were women (78%) and 20 were men (22%). The respondents included faculty members working in the positions of assistant professors (60), associate professors (18), and professors (13). A large number of the respondents have children (68%).

The questionnaire was categorized into workplace interactions, professional responsibilities, parenthood and career, workplace infrastructure and personal support. The initial findings are presented below.

Workplace interactions

- 39% of respondents reported experiencing gender discrimination, with all of them being women. Among these women, 40% are assistant professors, 30% are associate professors, and 8% hold positions as professors or heads of

institutions. This highlights the significant influence of power dynamics at the workplace.

- 23% of the female respondents stated that they had experienced micro-aggression or subtle forms of discrimination at the workplace
- One-fifth of the female respondents had experienced unequal pay compared to their male counterparts.
- A substantial portion of respondents (35%) believed that gender affected how their ideas were received at work and all of these respondents were women.
- One-third of the respondents felt that gender influences and how they are perceived by their colleagues. All of these respondents were women.

The statements shared by the respondents highlight additional challenges faced by women related to gender stereotypes and roles. Many women felt they were not taken seriously, while some in leadership positions noted that men often struggled to accept tasks delegated by them. It was pointed out that gender roles were entrenched in the workplace, with women more often assigned administrative tasks while men took on leadership and decision-making roles. Some women believed that their work and opinions were undervalued. Some reported being interrupted or ignored during meetings or being second-guessed despite their experience. A few felt it took them longer to earn respect compared to male colleagues with similar capabilities, requiring them to work harder to prove themselves. As a result, women who were assertive in establishing their authority or expertise were often seen as 'coming on too strong' which reflected in the responses of a few male respondents who noted that women seemed to be putting in extra effort to assert their superiority.

The statements shared by the respondents reflect a gender bias in the classroom setting as well with 25% of the respondents (all women) expressing that gender played a role in the way students perceived them. It was shared that students tend to respond more positively to male authority figures, often showing greater respect for male colleagues, even those with less experience. The focus on male architects in the curriculum (figure 3) fosters a subconscious bias among students. Cases of inappropriate behaviour such as indirect sexual remarks from students was also shared by female teachers. It was pointed out that in certain cases, students mirror the superior attitudes of male faculty members, leading to female educators being less respected.



Figure 3: A collage of some of the greatest architects reflects the dominance of men in the architectural profession
Source: <https://www.proarkitects.co.uk/>

Fifteen percent of female respondents felt that the timing of events hosted by professional bodies hindered their ability to network. During recruitment, 56% of respondents, all women, were asked about their marriage or maternity plans, which was at times done formally through specific questions in an application form during the recruitment process.

Additionally, 44% of respondents reported being subjected to a gender-specific dress code, with 90% being women and 10% men. The dress code for women, at times, became a deterrent in carrying out studio and site-related teaching-learning activities, especially during unfavourable weather conditions.

Professional Responsibilities

One-third of the respondents, all women, felt that their gender limited their ability to take on additional duties outside of work hours. The reasons cited included a lack of transportation during the evening or night and family responsibilities such as being primary caregivers or adhering to day-care timing restrictions. Due to family commitments, 34% of the respondents, mostly women, had declined additional responsibilities such as study tours. Twenty-two percent of the respondents (majority were women) had turned down career advancement activities for the same reason. Career advancement for women often coincides with their reproductive years, which can impede their professional progress. For instance, a full-time female faculty member working around 8 hours a day at college may find it challenging to engage in external practice due to family responsibilities. This situation also prevents them from participating in other career development activities, such as faculty development programs, many of which are scheduled in the second half of the day.

Parenthood and Career

A high number of female respondents (47%) did not receive maternity benefits stipulated under the

Maternity Benefits Act 2017, despite being eligible. The respondents who received the benefits were from government colleges. On similar lines, none of the eligible male respondents was granted paternity leave. There is a lack of safe and comfortable space at work for breastfeeding for lactating mothers, as expressed by 70% of the respondents. However, a large number of respondents (61%) indicated that their workplace permits bringing children to work in case of an emergency. These practices were informally done and granted on a case-to-case basis. A large number of male respondents who were parents (80%) had taken leave in the last year for childcare and fulfilling their parenting tasks, indicating the new trend of sharing parenting responsibilities.

"interrupted and ignored during meetings..."

"...been second guessed despite having experience..."

"...loose talks and indirect sexual remarks"

"...worked extra hard to prove expertise"

"...students mirror the attitude of male colleagues when they consider themselves superior"

"administrative work for women and leadership roles for men"

Figure 4: Some statements by women in architectural academia
Source: Compiled by Authors

Workplace Infrastructure

The survey revealed several significant issues regarding workplace facilities. 25% of respondents reported that their campus lacked a dedicated staff toilet for their gender, highlighting a gap in accommodating diverse needs. Additionally, 28% of respondents criticized the poor quality of the existing staff toilet facilities, highlighting broader concerns about hygiene and accessibility. Furthermore, a substantial 64% of respondents noted that menstrual products were not available on campus, which shows that insufficient attention was given to gender-specific needs for employees as well as students.

Personal Support

A significant portion of respondents (45%) have made career decisions influenced by gender or family responsibilities, with 15% of these being men. The main reasons stated by men were parental duties and financial responsibilities whereas for women childcare and marriage came in the way of decision making on careers. This highlights how personal and family-related factors can shape career paths and professional choices.

Majority of the respondents believed that architects who were women encountered unique challenges

within the profession. To address these challenges and fostering a more supportive and equitable professional environment, the key changes suggested were:

- More flexible work arrangements to better accommodate family responsibilities. This would help women balance their professional and personal lives more effectively, enabling them to pursue and maintain careers in architecture.
- Echoing the strong call for equal pay and benefits, the respondents emphasized the need for fair compensation and parity in workplace benefits. This reflects the ongoing concerns about gender-based pay disparities across professions and the importance of equitable treatment in various professional settings.
- The need for greater representation of women in leadership positions was noted. Increasing female presence in decision-making roles is seen as crucial for driving systemic change and fostering a more inclusive academic environment.
- The importance of effective mentorship and networking opportunities for women was emphasized. Providing these resources can help women build professional connections, gain valuable guidance and advance their careers in architecture.

Given below are some of the recommendations made based on the initial research findings:

- **Recommendations for professional bodies**
Gender sensitization programs should be introduced for both staff and students to raise awareness and promote inclusivity. Professional bodies like the Council of Architecture (CoA) and the Indian Institute of Architects (IIA) are encouraged to initiate gender studies to address and understand gender-specific challenges within the field. Additionally, CoA and accreditation bodies should integrate a gender audit component into their evaluation processes to ensure gender considerations are factored into institutional assessments.

Mentoring programs for college faculty are essential for providing support and guidance, particularly to help navigate gender-related obstacles in their careers. Compliance with statutory norms is also crucial, including adherence to maternity benefits regulations and the establishment and effective functioning of mandatory committees such as the Internal Complaints Committee (ICC) to handle grievances.

Regulatory bodies like CoA should mandate the inclusion of gender-specific infrastructure, such as dedicated toilets, availability of menstrual products and facilities like crèches or feeding rooms to accommodate the needs of all individuals in an educational campus. Scheduling professional events and faculty-development programmes during work hours or daytime can also facilitate greater participation, especially for those with family responsibilities.

These measures aim to create a more equitable and supportive academic environment by addressing gender disparities and improving facilities and support systems.

- **Recommendations for institutions**
Educational institutions must establish mandatory committees such as the Internal Complaints Committee (ICC) in accordance with UGC regulations and ensure these committees are both active and effectively strengthened. Institutions should also offer childcare leave and allow staff to bring their children to work during personal emergencies. Promoting the participation of women in professional networking events is crucial for their career development and this must be encouraged by institutes.

Additionally, institutions should consider temporarily reducing workloads for pregnant women and lactating mothers to accommodate their health and family responsibilities. Providing transportation facilities for staff who need to work extended hours is also recommended to ensure their safety and convenience.

A comprehensive handbook on sexual harassment and gender sensitization should be developed to educate staff and create awareness. Creating a safe and comfortable work environment is vital; this includes ensuring adequate lighting on campus, reliable public transport, proper toilet facilities and the presence of female security personnel.

Finally, offering counselling services for staff members can provide valuable support and address personal and professional issues. These measures collectively aim to foster a supportive and equitable environment, addressing both practical needs and systemic issues related to gender equity in educational institutions.

Conclusion

Gender equality is influenced by numerous factors, including societal stereotypes, family norms, workplace practices and other systemic issues. Gender discrimination is deeply entrenched in society but

it is essential to address these issues within societal structures. Specifically, educational settings must be inclusive and nurturing environments that promote equity. Such environments are crucial for ensuring that everyone has equal opportunities to grow and learn. By fostering a supportive and equitable atmosphere, educational institutions can facilitate democratic and liberal discourse, allowing for diverse perspectives and open dialogue. It is imperative that educational institutions lead by example, demonstrating a commitment to gender equality and inclusivity, thereby creating communities where all individuals can thrive and contribute to a broader societal discourse.

This research was presented at Feminarch '23 in Kochi, organised by the Gender Cell of IIA Kerala Chapter.

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The Floral Series

Paintings by Ar. Vilas Avachat, depicting a floral series on canvas.



1. Bluebells



2. Cactus flowers



3. Lilies I



4. Lilies II



5. Roses



6. Sunflowers



Ar. Vilas Avachat (F-F07855) is the President of the Indian Institute of Architects. Alumnus of the prestigious Rachana Sansad's Academy of Architecture, he has a rich experience of over five decades in architecture and architectural education.
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PINKPRINT 2024

Pinkprint: Contributions and Challenges, The International Conference of Women Architects, proudly hosted and curated by IIA Odisha Chapter was held from 8-10 November 2024 at Hotel Swosti Premium, Bhubaneswar and Swosti Premium Beach Resorts, Puri.

Concept: The Genesis of *Pinkprint*

Pinkprint is more than just a concept, it is a movement that celebrates the unique contributions of women architects while addressing the challenges they face in a traditionally male-dominated profession. The name itself is symbolic- 'Pink' signifies femininity, strength and resilience, while 'Blueprint' represents architectural vision, planning and innovation. Together, they encapsulate the idea of women making their indelible mark on the architectural world. This initiative stems from the recognition that, despite their significant impact, women architects often remain under-represented in mainstream architectural narratives and leadership. *Pinkprint* provides a platform to showcase their work, amplify their voices and inspire the next generation of women professionals.

In the context of Odisha, *Pinkprint* takes on a deeper meaning. Odisha's rich architectural legacy, combined with its vibrant cultural identity, serves as the perfect backdrop to explore the evolving role of women in blending tradition with modernity. It highlights how women architects are not only shaping physical spaces but also redefining the very ethos of architectural practice—focusing on inclusivity, sustainability and cultural preservation.

The Logo

The logo of *Pinkprint* draws inspiration from the Chausath Yogini Temple in Hirapur, Odisha, a remarkable example of India's ancient architectural and spiritual heritage. The temple, with its circular plan and unique design houses 64 Yoginis, each representing a powerful feminine force. This served as a metaphor for the diverse skills, talents and contributions of women in architecture. The logo integrates abstract depictions of these feminine

energies to honor their role as creators, innovators and preservers. The use of the colour pink in the logo signifies empowerment, resilience and creativity, aligning with the theme of *Pinkprint*. Accents of earthy tones have been used to symbolize the timeless quality of the temple's architecture and its integration into the profession.

The Chausath Yogini Temple, with its focus on feminine power and spirituality, is one of Odisha's most iconic landmarks. Its design resonates deeply with the ethos of *Pinkprint*, merging cultural heritage, creative expression and the celebration of women's roles in shaping history and the future. By deriving the *Pinkprint* logo from this architectural masterpiece, the initiative honours the rich traditions of Odisha, positioning women architects as vital contributors to the field, bridging the gap between the past and the present.

Sub-Themes

The sub-themes were designed to reflect the essence of *Pinkprint* emphasizing the imprint of women in the field of architecture. These were as follows:

- ***Back to Roots:*** Women architects globally blend cultural heritage with modern innovation while facing gender barriers. They contribute significantly to preserving regional identities through sustainable designs and cultural integration. Pioneers have successfully merged traditional elements with contemporary architecture, despite professional challenges and limited recognition.
- ***The Frontline:*** Women architects as entrepreneurs face unique challenges including gender bias, limited access to funding and work-life balance. Despite these obstacles, pioneers have established successful firms, innovating in sustainable design and public architecture. The field still needs progress in achieving equal opportunities and recognition.
- ***Think Tanks- Redefining Pedagogy:*** Women architects contribute significantly to redefining architectural education through research and

technological integration. They face challenges in gaining equal recognition in academic leadership and tech-driven projects. Despite barriers, they're pioneering AI adoption, smart design innovation and reshaping architectural pedagogy for future generations.

- *Her Identity:* Women architects continuously navigate the complex balance between professional excellence and social expectations. Despite facing gender stereotypes and domestic responsibilities, they contribute uniquely to design innovation and community-focused architecture. Their struggle for identity recognition in the field while managing dual roles shapes contemporary architectural practice and leadership.
- *Beyond Architecture:* Women architects excel beyond traditional practice, diversifying into interior design, project management and product design. While facing industry biases and stereotypes, they've pioneered sustainable solutions and innovative approaches. Their multi-disciplinary contributions expand architecture's boundaries, though challenges persist in gaining equal recognition across these diverse fields.
- *Transitioning to Future:* Women architects are actively shaping architecture's digital future, embracing AI, automation and virtual design while facing tech-industry gender gaps. Despite challenges in accessing leadership roles in technological innovation, they're pioneering creative solutions that balance digital advancement with human-centered design, influencing architecture's evolution beyond traditional boundaries.

Through *Pinkprint*, the contributions of women architects are celebrated, their challenges acknowledged and their stories brought to the forefront, ensuring their imprint on the built environment is both recognized and remembered.

The Process

The organization of *Pinkprint* was a meticulous process led by the IIA Odisha Chapter, from June to November 2024. With prior experience from hosting national events like the IIA Eastern Regional Conference 2022 and IIA Leadership Conclave 2023, the Team quickly took charge upon receiving the invitation from IIA's Head Office. The first step involved formulating the theme, logo, concept and overall event format. IIA Odisha Chapter aimed to elevate the bar by organizing its first international conference.

To manage the diverse aspects of the event, IIA Odisha Chapter members were divided into specialized teams responsible for logistics, hospitality, branding, cultural events and more. They worked closely with ARCASIA, IIA national Office Bearers and the international and national speakers, ensuring smooth coordination. The event featured eight international and twelve national architects who delivered insightful speeches and technical presentations.

Other highlights included plenary sessions, design charrettes, professional networking, a material expo by industry partners and a state design carnival. The careful attention to scheduling, logistics, hospitality and the smooth execution of each segment contributed to the success of the conference, making it a notable milestone for IIA Odisha Chapter.

The Outcome

Pinkprint was a momentous event that celebrated and empowered women architects globally. This three-day conference, held in Bhubaneswar and Puri, was the first of its kind and aimed to highlight the significant contributions and unique challenges faced by women in the field of architecture. The event was inaugurated on Day 1 by Smt. Usha Padhee (IAS) Hon'ble Principal Secretary, Department of Housing & Urban Development & Public Enterprises, Government of Odisha. The ceremony was attended by distinguished leaders from architecture, including Ar. Vilas Vasant Avachat, President of IIA and Ar. Abhay Vinayak Purohit, President of the Council of Architecture.

Day 1 : Started with the students competitions followed by the inauguration of the Contract Place-The Building Material Expo and Design Yatra- display of shortlisted entries of IIA Awards. States Design Carnival students' competitions also took place simultaneously. The Chapter also hosted the IIA national Office Bearers Meeting, the IIA National Council meeting and National General Body meeting on the same day. The evening marked the grand inauguration of *Pinkprint* which was graced by distinguished guests and dignitaries. Chief Guest Smt. Usha Padhee (IAS) Hon'ble Principal Secretary, Department of Housing & Urban Development & Public Enterprises, Government of Odisha, honored the occasion. The ceremony was also attended by esteemed leaders in architecture, including Ar. Vilas Vasant Avachat, President of IIA; Ar. Abhay Vinayak Purohit, President of the Council of Architecture (COA); Ar. Saifuddin Ahmad, President of ARCASIA; Ar. Dorji Yangki, President of the Bhutan Institute of Architects; Ar. Rohana Bandara Herath, President of the Sri Lanka Institute of Architects; and Ar.

Iswar Lal Joshi, President of the Society of Nepalese Architects. The event provided a global platform for women in architecture to share knowledge and experiences. More than 700 delegates participated, including architects and students from Odisha and beyond. The session covered a wide range of topics, including sustainable design, gender inclusion and the transformative impact of women in architecture. The Inaugural evening was concluded with cultural acts and performances. The Odissi Dance and the Rhythms of Odisha Act where Lord Jagannath was the show-stopper, were phenomenal performances and received standing ovations from the audience.

Day 2 : IIA Odisha Chapter hosted the ARCASIA Zone-A Presidents' Meet and the Conference delved deeper into themes of innovation, cultural heritage and social impact in architecture. Over 20 distinguished speakers, including Ar. Diana Kellogg-New York, Ar. IDr. Alice Leong Pek Lian - Malaysia, Ar. Primavera Desta - Indonesia, Dato' Ar. Nafisah Radin - Malaysia, Ar. Rebecca Vanessa Rellosa - Philippines, Ar. Viluckshi Ravindran - Sri Lanka, Ar. Chrysentia Dillummini de Mel - Sri Lanka, Ar. (Dr.) Acharawan Chutarat - Thailand, Dr. (Ar.) Aarti Grover - New Delhi, Ar. Parul Zaveri- Ahmedabad, Ar. Sunitha Kondur - Bengaluru, Ar. Poonam Verma Mascarenhas - Goa, Dr. Suruchi Modi - New Delhi, Ar. Jasleen Waraich - New Delhi, Ar. Rachna Agarwal - New Delhi, Ar. Tarini Mukherji - New Delhi, Ar. (Dr.) Roopa Lakshmi Bhat - Bengaluru and Ar. Aishwarya Tipnis - New Delhi shared their expertise and experiences. The day focused on how architecture can address global challenges such as environmental sustainability and social equity, with women architects leading the charge in pioneering solutions. A valedictory session for the students' competitions of State Design Carnival took place after which an open House interaction with President IIA and President COA with the students and professionals of the state.

Day 3: The third and final day began with a heritage walk to the historic Chausath Yogini Temple, drawing inspiration from Odisha's ancient architectural wonders. Following the heritage walk, the conference resumed at Hotel Swosti Premium, Puri, where the Valedictory Session recognized the achievements of several notable architects. Chief Guest Mr. R.S. Gopalan, IAS, Chief Electoral Officer and Guest of Honour, Mrs. Mridula Thakur Pradhan, joined dignitaries, delegates and attendees to celebrate the outstanding contributions of architects who have shaped and enriched the field.

The prestigious awards presented during the session included:

- *Ar. Otto Koenigsberger Lifetime Achievement Award 2024 :* Awarded to Ar. Rabi Narayan Mohanty
- *Ar. K.B. Mohapatra Award 2024 for Outstanding Contribution to the Field of Architecture :* Awarded to Ar. Mohan Kotamrazu
- *Ar. Adikanda Biswal Legendary Award 2024 :* Awarded to Ar. Rama Chandra Padhi
- *Ar. Saurashtra Das Young Architect of the Year Award 2024 :* Awarded to Mr. Mayukh Sanyal, PMCA

Additional awards recognized the talents of other dedicated architects, including Ar. Shaswat Sekhar Sarangi, Ar. Acharya Suvalaxmi Pattajoshi, Ar. Nilanjana Roy, Ar. Avik Roy, Ar. Atulya Suhula and Ar. Rosalin Patra.

The event concluded with a creative fashion show, *Monuments in Motion*, which celebrated architectural forms and cultural heritage. The Conference closed with visits to the Sri Mandir and Konark Temple, providing delegates with a deeper understanding of Odisha's rich architectural legacy.

On all three days, both venues were packed with culture and tradition of Odisha with the *Dhemsā* tribal dance, *Baagha naacha*, *Shaahi jaata*, *Medha naacha*, etc. Overall, *Pinkprint* was a resounding success, fostering collaboration, knowledge-sharing and empowering women architects worldwide.



Ar. Swopnadutta Mohanty (F16376)
Chairperson
IIA Odisha Chapter



Ar. Mousumi Nanda (F16217)
Vice-Chairperson
IIA Odisha Chapter

Pinkprint IIA Odisha Chapter

DAY 1



IIA Office Bearers Meeting



Inauguration of Building Material Expo- Contract place by Ar. Vilas Vasant Avachat (President IIA), Ar. Jitendra Mehta (Vice President IIA), Ar. Swopnadutta Mohanty (Chairperson, Odisha Chapter), Ar. Mousumi Nanda (Vice Chairperson, Odisha Chapter) and other members.



IIA 10th Council Meeting.



Inaugural Ceremony of Pinkprint: Lamp-lighting by guests.



Launch of Pinkprint Souvenir *Manasaara*



Address by Ar. Abhay Purohit (President COA)



Address by Chief Guest Smt. Usha Padhee (IAS, Principal Sec, Dept. of H &UD, Govt. Of Odisha)



Address by Ar. Devendra Nath Gongal (V.President, Arcasia)



Address by Ar. Saifuddin Ahmed (President, Arcasia)



Malkhamba performance



A performance on culture of Odisha with Lord Jagannath



Design Yatra exhibition



An Odissi dance performance.



Keynote Speech by Ar. Diana Kellog



Medha Nacha performance.



Panel discussion: (from left) : Ar. Preethi Agarwal, Ar. Parul Zaveri, Ar. Shamini Shanker.



Panel discussion: (from left) : Dr. Idr. Alice Leong Pek Lion, Dr. Aarati Grover, Ar. Snehal Sonatkke.



Panel discussion: (from left) : Ar. Jasleen Waraich, Ar. Kajri Mishra, Ar. Rachna Agarwal, Ar. Viluckshi Ravindran



Panel discussion: (from left) : Ar. Primavera Desta, Dato' Ar. Nafisah Radin, Ar. Tarini Mukherjee

DAY 3



Panel discussion: (from left) : Dr. Suruchi Modi, Ar. Rebecca Vanessa Rellosa, Ar. Poonam Verma Mascarhenas



Pinkprint: Heritage walk in the temple city of Bhubaneswar



Open mic discussion with Ar. Vilas Vasant Avachat (President IIA) and Ar. Abhay Purohit (President COA).



Valedictory Address by Ar. Swopnadutta Mohanty



Valedictory Address by Ar. Vilas Vasant Avachat



Bagma Nacha - welcome dance



felicitation of Pinkprint Organising Committee.



Cheering the achievements of women architects



Sand art on the theme of Pinkprint at Puri beach



Ar. Adikanda Biswal Legendary Award winner - Ar. Rama Chandra Padhi



Best Project Commercial/ Institutional: Ar. Acharya Suvalaxmi Patajoshi



Ramp walk by the women architects of the Host Chapter *Monuments in Motion*



Ar. Otto Koenigsberger Lifetime Achievement Award- Ar. Rabi Narayan Mohanty



Best Project Residential: Ar. Shaswat Sekhar Sarangi

Bridging Binaries

IIA Southern Regional Conference (SRC) 2024

The IIA Kannur Centre, in collaboration with the IIA Kerala Chapter, successfully hosted the *Southern Regional Conference 2024* on 29-30 November 2024 at Vythiri Village Resort, Wayanad, Kerala. This landmark event brought together over 900 architects, planners and policymakers to explore the theme *Bridging Binaries* focusing on the intersection of humanity, society and innovation in architecture.

The venue, Wayanad, was purposefully chosen due to its unique ecological and cultural significance and its recent struggles following devastating landslides that disrupted the local economy. By hosting the Conference here, the event sought to contribute to the region's recovery, providing economic resilience and reaffirming its importance on the map.

The Conference began with the inaugural ceremony, featuring the virtual presence of Kerala's Hon. Tourism Minister, Shri P.A. Muhammed Riyas, who formally inaugurated the event. Distinguished IIA dignitaries, including the President Ar. Vilas Avachat, Vice President Ar. Jitendra Mehta, Hon. Treasurer Ar. Sudhir B. Pillai and Immediate Past President Ar. C.R. Raju graced the occasion. IIA Kerala Chapter Chairperson Ar. Vinod Cyriac delivered an inspiring welcome address, followed by speeches from IIA Kannur Centre Chairperson Ar. Sajo Joseph, SRC Convener Ar. Liju T.V. and IIA Kerala Chapter Vice Chairperson Ar. Monolitha Chatterji.

The first day commenced with Ar. Vinu Daniel, who showcased his innovative work using sustainable materials like mud and debris. Ar. Kalpana Ramesh, the 'Water Warrior' followed with practical insights on water conservation and management. Ar. Harsh Vardhan emphasised conscious design that harmonises with local resources and cultural elements, while Sri Lankan architect Thisara Thanapathy explored architecture's role in fostering wellness and harmony with nature. Ar. Pratik Dhanmer shared his vision of creating spaces that

reflect cultural identity and inclusivity, inspiring architects to push boundaries.

A lively panel discussion on *Humanity and Society* brought together architects Kalpana Ramesh, Harsh Vardhan, Thisara Thanapathy and Pratik Dhanmer to discuss social equity, environmental responsibility and cultural preservation. The day concluded with a keynote by Ar. Alejandro Aravena, the 2016 Pritzker Prize Laureate, who shared his transformative *Half a Good House* concept, offering innovative solutions for community housing.

The second day opened with Ar. Zameer Basrai and Ar. Damir Ussenov, who explored technological innovations in architecture. A vibrant panel featuring architects Basrai, Ussenov, Shajay Bhooshan and Ganga Dileep discussed leveraging technology to enhance human experiences. Ar. Deepak Gugarii presented on ecological architecture, emphasising designs aligned with natural systems. Ar. Anupama Kundoo's session captivated attendees with her insights into sustainable materials and construction methods, offering eco-sensitive solutions. The Conference concluded with a powerful discussion between Ar. Alejandro Aravena and Ar. Bijoy Ramachandran on architecture's potential to challenge societal norms and empower communities.

The event celebrated camaraderie through inter-Chapter competitions among the five southern states, including photography, spot-sketching, pot-painting, quizzes and a fashion show. The IIA Karnataka Chapter emerged as the overall winner, showcasing their outstanding creativity.

Senior architects from each Chapter were honoured for their invaluable contributions to the profession, including Ar. V.V.L. Narasimham (Telangana), Ar. Y. Narasimha Rao (Andhra Pradesh), Prof. A.J. Subramanian (Tamil Nadu), Ar. Haroon Salim (Karnataka) and Ar. Sandhya Radhakrishnan and Ar. Jose K. Mathew (Kerala). Special recognition was



Southern Regional Conference 2024: Inaugural Function



IIA Kannur Centre: The Host Centre



Panel Discussion on Humanity and Society



Panel Discussion on Humanity and Innovation



Ar. Anupama Kundoo



Ar. Alejandro Aravena with Ar. Bijoy Ramachandran



Valedictory Function



Bamboo Workshop



SRC Rolling Trophy Handover to Karnataka Chapter



Music Band Night

given to IIA Past President, Ar. Madhav Deobhakta (Mumbai and Bengaluru).

Workshops on bamboo, mud and pottery integrated local artisans from Wayanad, providing cultural exchange opportunities and supporting the local economy. Delegates received thoughtfully curated gift boxes containing Wayanad's pepper, honey and tea powder, embodying the region's spirit. The conference also featured key announcements, including the official declaration of Kasaragod as a new IIA Sub-Centre, the launch of the ABS website and the unveiling of the SRC e-book cover.

The closing ceremony was graced by Chief Guest Hon. Minister of Welfare for Scheduled Castes, Scheduled Tribes and Backward Classes, Shri O.R. Kelu, Guest of

Honour Shri T. Siddique (MLA, Kalpetta) and actress Ms Unnimaya Prasad. The event's success was a testament to the visionary leadership of IIA Kerala Chapter Chairperson Ar. Vinod Cyriac, IIA Kannur Centre Chairperson Ar. Sajo Joseph, SRC Convener Ar. Liju T.V., Organising Secretary Ar. Amith Kamal and Program Coordinator Ar. Lukman Jaleel.

As the baton passes to the IIA Andhra Pradesh Chapter for SRC 2025, the legacy of the IIA Southern Regional Conference 2024 stands as a shining example of architecture's transformative potential. By bridging humanity and innovation, the Conference left an indelible mark, inspiring architects to create resilient, inclusive and eco-conscious communities.

ADVERTISE WITH JIIA



SR. NO	TYPE	1 ISSUE	3 ISSUES	6 ISSUES	12 ISSUES
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	A INSIDE COVER (1 PAGE)	NIL	6,00,000	10,00,000	18,00,000
	B INSIDE COVER (2 PAGES, FULL SPREAD)	NIL	9,00,000	15,00,000	24,00,000
3.	FULL SPREAD INSIDE (2 PAGES)	2,00,000	6,00,000	10,00,000	18,00,000
4.	FULL PAGE	1,00,000	3,00,000	5,00,000	9,00,000
5.	HALF PAGE	50,000	1,00,000	1,50,000	2,50,000

10th COUNCIL MEETING OF THE TERM 2023-2025 AT BHUBANESWAR, ODISHA ON 08-11-2024.

Sr. No.	Associate to Fellow	Chapter	Membership No.
1	Ar. Gyasra R Parkash	Haryana	F09246
2	Ar. Vaseem Anjum Sheriff	Karnataka	F11653
Sr. No.	Direct Fellow	Chapter	Membership No.
1	Ar. Ramya S	Tamil Nadu	F29470
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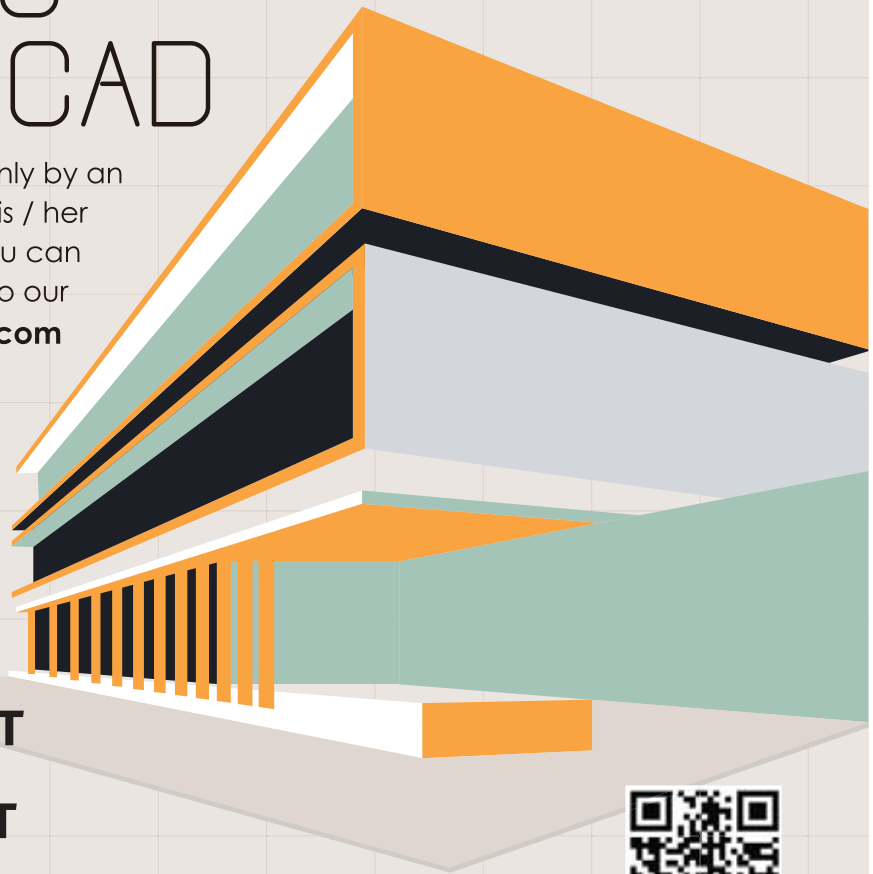
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