

Aakash C. Rai

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Editor, [Building and Environment](#)

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PROFESSIONAL PROFILE

I am an Associate Professor in the Department of Sustainable Energy Engineering at the Indian Institute of Technology Kanpur (IIT Kanpur). My research focuses on improving building energy efficiency through the integration of building physics, experimental investigations, computational modelling, and data-driven approaches. My current research programme encompasses the hygrothermal performance of building envelopes, climate-adaptive retrofit strategies, building energy modelling, and smart-meter-based residential energy efficiency. I currently serve as an Editor of Building and Environment and have established an independent research programme supported by competitive research funding, publications in leading international journals, and the successful supervision of doctoral students.

PROFESSIONAL APPOINTMENTS

Editor , <i>Building and Environment</i>	Jan 2025 onwards
Associate Professor , Sustainable Energy Engineering, IIT Kanpur, India	July 2023 onwards
Assistant Professor , Sustainable Energy Engineering, IIT Kanpur, India	May 2022 – Jun 2023
Assistant Professor , Mechanical Engineering, BITS-Pilani, India	Nov 2017 – May 2022
Research Fellow , Civil and Environmental Engineering, University of Surrey, UK	Sep 2016 – Oct 2017
Research Engineer , General Electric, India	Jun 2014 – Aug 2016
Scientist B , Combat Vehicles Research and Development Establishment, India	Dec 2008 – Aug 2010

EDUCATION

PhD in Mechanical Engineering (GPA: 3.74/4, Supervisor: Prof. Qingyan Chen) Purdue University, West Lafayette, Indiana, USA	Sep 2010 – May 2014
Bachelor of Technology (Honours) in Mechanical Engineering (GPA: 7.59/10) IIT Kharagpur, West Bengal, India	Jul 2004 – Jul 2008

PUBLICATIONS

Peer-reviewed Journal Articles

1,300+ citations, h-index = 13 ([Google Scholar](#), July 2026)

- Budaniya M, Mishra AK, **Rai AC**, and Dasgupta MS, 2025. Indoor plants' effect on occupants' performance, perceived comfort, and affect in an open-plan space in composite climatic regions, India. [Building and Environment 274, 112785](#).
- Ukey R and **Rai AC***, 2024. Envelope retrofits for enhancing thermal comfort in detached houses in hot semi-arid climatic conditions: A year-long monitoring and simulation study. [Building and Environment 257, 111536](#).
- Babu ADCA, Srivastava RS, and **Rai AC***, 2024. Impact of climate change on the heating and cooling load components of an archetypical residential room in major Indian cities. [Building and Environment 250, 111181](#).
- Budaniya M and **Rai AC***, 2022. Effectiveness of plants for passive removal of particulate matter is low in the indoor environment. [Building and Environment 222, 109384](#). **Paper cited by a [BBC news article](#).**
- Rai AC***, 2021. Energy performance of phase change materials integrated into brick masonry walls for cooling load management in residential buildings, [Building and Environment 199, 107930](#).
- Ukey R and **Rai AC***, 2021. Impact of global warming on heating and cooling degree days in major Indian cities. [Energy and Buildings 244, 111050](#).
- Tiwari V, **Rai AC***, and Srinivasan P, 2021. Parametric analysis and optimization of a latent heat thermal

energy storage system for concentrated solar power plants under realistic operating conditions. [Renewable Energy 174, 305–319](#).

8. Sharma V and **Rai AC***, 2020. Performance assessment of residential building envelopes enhanced with phase change materials. [Energy and Buildings 208, 109664](#).
9. **Rai AC**, Kumar P, Pilla F, Skouloudis AN, Di Sabatino S, Ratti C, Yasar A, and Rickerby D, 2017. End-user perspective of low-cost sensors for outdoor air pollution monitoring. [Science of the Total Environment 607, 691–705](#).
10. **Rai AC**, Lin C-H, and Chen Q, 2015. Numerical modeling of particle generation from ozone reactions with human-worn clothing in indoor environments. [Atmospheric Environment 102, 145–155](#).
11. **Rai AC**, Lin C-H, and Chen Q, 2014. Numerical modeling of volatile organic compound emissions from ozone reactions with human-worn clothing in an aircraft cabin. [HVAC&R Research 20, 922–931](#).
12. **Rai AC**, Guo B, Lin C-H, Zhang J, Pei J, and Chen Q, 2014. Ozone reaction with clothing and its initiated VOC emissions in an environmental chamber. [Indoor Air 24, 49–58](#).
13. **Rai AC**, Guo B, Lin C-H, Zhang J, Pei J, and Chen Q, 2013. Ozone reaction with clothing and its initiated particle generation in an environmental chamber. [Atmospheric Environment 77, 885–892](#).
14. **Rai AC** and Chen Q, 2012. Simulations of ozone distributions in an aircraft cabin using computational fluid dynamics. [Atmospheric Environment 54, 348–357](#).

*Dr. Rai is the corresponding author.

Conference Articles and Poster Presentations

1. Jaberswamy S and **Rai AC**, 2026. Moisture accumulation and mould growth risk in externally insulated brick masonry walls: evidence from in-situ experiments. The International Conference of Building and Simulation, Hong Kong. Nominated for the best paper award.
2. Bontha CD and **Rai AC**, 2026. Developing residential building archetypes for single-storey houses in India. The International Conference of Building and Simulation, Hong Kong.
3. Budaniya M and **Rai AC**, 2021. Phytoremediation of airborne particulate matter in indoor environments. Healthy Buildings Europe, Oslo, Norway. Awarded long paper of distinction.
4. **Rai AC** and Kumar P, 2017. Quantifying the reduction of air pollution by vegetation in urban areas. International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes, Bologna, Italy.
5. **Rai AC**, Prabhudharwadkar D, Murthy S, Giametta A, and Johns D, 2016. Effect of air-curtains on labyrinth seal performance. ASME Turbo Expo, Seoul, South Korea.
6. Chen Q, **Rai AC**, and Lin C-H, 2016. Numerical modeling of VOC emissions from ozone reactions with human-worn clothing in an aircraft cabin. ASHRAE Winter Conference, Orlando, FL, USA.
7. **Rai AC**, Lin C-H, and Chen Q, 2014. Modeling VOC emissions from ozone reactions with human-worn clothing in an aircraft cabin. International Conference on Indoor Air Quality and Climate, Hong Kong.
8. **Rai AC**, Chen C, Lin C-H, and Chen Q, 2014. Numerical modeling of particle generation from ozone reactions with human-worn clothing in an environmental chamber. International Conference on Indoor Air Quality and Climate, Hong Kong.
9. **Rai AC** and Chen Q, 2012. Computational fluid dynamics modeling of ozone distributions in an aircraft cabin. International Conference on Energy and Environment, Boulder, CO, USA.

FUNDED RESEARCH PROJECTS

Total Funding $\approx$ ₹ 21 million ($\approx$ \$ 220,000 $\approx$ € 200,000)

No.	Title	Role	Duration	Funding agency	Amount (₹)
1.	Retrofitting of building no. P-85 (HQ CECC) for compliance with GRIHA/Green building norms and achieving carbon neutrality	PI	2025	Indian Army	118,000
2.	Promoting residential energy efficiency through an appliance-level electricity monitoring system	Co-PI	2024-26	KSS	4,160,000

3.	Net-zero energy buildings for India	PI	2023–24	IITK	4,500,000
4.	Advanced insulation systems for energy-efficient buildings	PI	2022–25	IITK	2,500,000
5.	Impact of climate change on residential heating and cooling load components in major Indian cities	PI	2022–23	CKCEPCS	100,000
6.	Demand side management for energy efficient IITK campus	Co-PI	2022–24	CKCEPCS	500,000
7.	Improved design methodology for high-temperature thermal energy storage systems for concentrated solar power plants	PI	2022	EU-SFERA	300,000
8.	Development of a reliable, low-cost, portable, IoT-enabled, optical device for measuring PM _{2.5} concentration in air	PI	2020–22	DST	2,951,000
9.	Assessment of indoor plants for improving air quality in buildings	PI	2019–22	SERB	3,805,000
10.	BITS outstanding potential for excellence in research and academics (OPERA) award	PI	2017–22	BITS	1,980,000
11.	Green infrastructural interventions for combating air pollution in the national capital region	PI	2018–19	BITS	200,000

BITS: Birla Institute of Technology and Science, CKCEPCS: Chandrakanta Kesavan Center for Energy Policy and Climate Solutions, DST: Department of Science and Technology, EU-SFERA: European Union's Solar Facilities for the European Research Area, IITK: Indian Institute of Technology Kanpur, KSS: Kotak School of Sustainability, PI: Principal Investigator, SERB: Science and Engineering Research Board.

RESEARCH SUPERVISION

Ph.D. Supervision: 3 completed, 4 ongoing.

<i>No.</i>	<i>Name</i>	<i>Institute</i>	<i>Topic</i>	<i>Duration</i>
1.	Rahul Ukey	BITS-Pilani	Envelope retrofits for enhancing thermal comfort in Indian residences against the backdrop of global warming	2018–24
2.	Mukesh Budaniya	BITS-Pilani	Assessment of indoor plants for improving air quality in buildings	2019–24
3.	Vivek Tiwari [#]	BITS-Pilani	Design and development of high-temperature latent heat thermal energy storage for power generation	2017–23
4.	Jaberswamy S	IIT Kanpur	Hygrothermal risk assessment for residential buildings	2022 onwards
5.	Charles D B	IIT Kanpur	Residential building prototypes and stock-level energy analysis	2024 onwards
6.	Siddharth Chaudhary	IIT Kanpur	Smart-metering-based strategies for reducing energy consumption of residential buildings	2024 onwards
7.	Sabil Hasan	IIT Kanpur	Hygrothermal performance of wall insulation	2024 onwards

[#]Dr. Rai was the co-supervisor.

Master's Supervision: 4 completed, 2 ongoing.

<i>No.</i>	<i>Name</i>	<i>Institute</i>	<i>Topic</i>	<i>Duration</i>
1.	Rishabh Gupta	BITS-Pilani	Impact of global warming on heating and cooling degree days in major Indian cities	2020
2.	A Aravinda De Chinnu	BITS-Pilani	Impact of climate change on the heating and cooling energy consumption in residential buildings in India	2020
3.	Md. Hashim	IIT Kanpur	Detached net-zero energy houses for India: a feasibility study	2022–23
4.	Shubham Patil	IIT Kanpur	Developing residential building prototypes for India	2022–25
5.	Jigmet Y	IIT Kanpur	Sensitivity-guided calibration of a building energy model for predicting indoor air temperature in a residential apartment	2025 onwards
6.	Shantanu Bhardwaj	IIT Kanpur	Sensitivity analysis, calibration, and application of residential building energy models for retrofit assessment	2026 onwards

COURSES TAUGHT

<i>No.</i>	<i>Course</i>	<i>Institute</i>	<i>Type</i>	<i>Level</i>
1.	Heating, ventilation, and air-conditioning of buildings	IIT Kanpur	L	PG
2.	Design strategies for net-zero energy buildings	IIT Kanpur	L	PG
3.	Thermodynamics of energy systems	IIT Kanpur	L	PG
4.	Seminar participation and presentation	IIT Kanpur	L	PG
5.	Thermodynamics	BITS-Pilani	L and T	UG
6.	Applied thermodynamics	BITS-Pilani	L, T, and P	UG
7.	Operations research	BITS-Pilani	L and T	UG
8.	Refrigeration and air-conditioning	BITS-Pilani	L	UG
9.	Heat transfer	BITS-Pilani	P	UG
10.	Heating and cooling of buildings	BITS-Pilani	L	PG

L: Lecture, T: Tutorial, P: Practical, UG: Undergraduate, and PG: Postgraduate.

INVITED TALKS

1. Lessons from indoor phytoremediation and implications for algae-based urban infrastructure (Jun 2026). Meet on Smart Solutions from Algae, organised by the Ignite Life Science Foundation at Lonavla, India.
2. Machine learning applications for enhancing energy efficiency in Indian residences (Jan 2025). International Workshop on Building Energy Efficiency and Indoor Environmental Quality in the AI Era, organised by the Hong Kong Polytechnic University.
3. Assessment and mitigation of the impact of climate change on the cooling energy consumption in buildings (Aug 2020). Online short-term course organised by NIT Silchar.
4. Overview of the Horizon 2020 iSCAPE project (November 2016). Meeting of the London Region Pollution Study Group at the Chartered Institute of Environmental Health, London, UK.
5. Ozone-initiated chemistry and its impact on indoor air quality (May 2014). RITE/ACER partners' meeting, Melbourne, FL, USA.
6. CFD modelling of ozone distributions in an aircraft cabin (Mar 2012). RITE/ACER partners' meeting, New Brunswick, NJ, USA.

PROFESSIONAL ACTIVITIES

1. Editorial advisory board member, *Building and Environment* (2019–2024).
 2. Reviewer for *Building and Environment*, *Applied Energy*, *Energy and Buildings*, and *Renewable Energy*.
 3. Member of the Indian Society of Heating, Refrigerating, and Air-conditioning Engineers since 2019.
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HONOURS AND AWARDS

1. Distinction Award for paper presented at Healthy Buildings Europe 2021.
 2. Early Career Research Award in 2019 for pursuing innovative research in air pollution management.
 3. BITS OPERA Award in 2017 for outstanding potential for excellence in research and academics.
 4. GE Beliefs Award in 2016 for maturing a new labyrinth seal technology from the conceptual design stage to integration in several products.
 5. GE Above and Beyond Patent Award in 2016 for filing a patent on a new labyrinth seal design.
 6. GE Above and Beyond Award in 2015 for critically evaluating labyrinth seal designs with air-curtains.
 7. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Grant-in-Aid Honorarium in 2014 for paper publication in HVAC&R Research.
 8. ASHRAE Grant-in-Aid Award in 2013 for excellence in HVAC-related education and research.
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