Curriculum Vitae

Dr. Cairan Van Rooyen, PhD, MCIBSE, CEng
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Research Statement

I am an experienced building physics researcher focused on the critical nexus between the built environment, indoor environmental quality (IEQ), the climate, and human health. My work integrates empirical measurements, advanced modeling, and data-driven analysis to examine how buildings shape indoor environmental conditions and in turn how this imapcts occupant comfort, well-being and physical health. I develop integrated frameworks that account for energy use, economic factors, carbon emissions, and health outcomes to inform sustainable design and climate-resilient policies. My research bridges engineering, public health, and environmental science to address complex challenges.

Education

PhD in Building Physics 2019–2024
University College London, UK

Master of Research 2018–2019
University College London, UK

BEng (Hons) Building Services Engineering 2008–2011
Coventry University, UK

Research Experience

Researcher in Climate, Energy and Health 2026–Current
Imperial College London, School of Public Health, Faculty of Medicine

Conducting research at the intersection of climate, energy, and health as part of the NIHR Healthy Homes project. Developing epidemiological and building-physics frameworks to quantify the health outcomes of energy efficiency retrofits on older adults across the UK housing stock.

Researcher in Climate, Energy and Health 2026–2026
University College London, Energy Institute

Research on the complex interactions between climate change, energy use, indoor environmental quality and human health. Developing integrated frameworks to evaluate the health impacts of energy efficiency interventions in buildings.

Postdoctoral Scholar 2025–2026
École Polytechnique Fédérale de Lausanne (EPFL), Switzerland

Leading the IEQ aspect of a large-scale multi-year EU-Horizon funded project (RENOMIZE), conducting empirical research on indoor environmental quality and ventilation for occupied buildings undergoing prefabricated robotic retrofit.

Research Fellow 2024–2025
University College London, Institute for Environmental Design and Engineering

Research fellow responsible for developing and upgrading NBM-Health, a Python-based bottom-up household level health impact model. This involved detailed evidence assessments, translating and integrating this into a policy evaluation tool for quantifying health impacts of home energy efficiency interventions in the English housing stock.

MRes and PhD Student 2018–2024

University College London, Energy Institute, London–Loughborough EPSRC CDT

Conducted doctoral research examining the relationship between ventilation practices and indoor environmental quality in British homes. This encompassed the design and deployment of high spatio-temporal resolution IEQ and event monitoring systems in occupied dwellings, administration of occupant surveys, and advanced data analysis employing multivariable statistical methods and machine learning techniques to investigate human-building interactions and their impact on indoor environmental conditions.

Peer-Reviewed Journal Articles

Du, B., Crosby, S., **Van Rooyen, C.**, and Licina, D. (2026). 'ATLAS: A Novel Performance-Based Index for Assessing Residential Indoor Environmental Quality', *Indoor Air*. (Manuscript submitted).

Van Rooyen, C. and Sharpe, T. (2025). 'Survey data on ventilation provision and use in homes in Great Britain', *Data in Brief*, 63, 112090.
https://doi.org/10.1016/j.dib.2025.112090.

Van Rooyen, C. and Sharpe, T. (2024). 'Ventilation provision and use in homes in Great Britain: A national survey', *Building and Environment*, 257, 111528.
https://doi.org/10.1016/j.buildenv.2024.111528.

Peer-Reviewed Conference Papers

Dedesko, S., Du, B., **Van Rooyen, C.**, Li, Y., and Licina, D. (2026). 'Air Exposure and Energy Trade-offs of Energy Efficient Building Standards: A Swiss Pilot Kitchen Study', *ISES2026 Meeting*. Vancouver, Canada, 4–8 October 2026.

Du, B., **Van Rooyen, C.**, and Licina, D. (2026). 'Integrating Real-Time Occupancy into Ventilation and Indoor Air Quality Assessments for Classrooms', *Asian Conference of the International Building Performance Simulation Association (ASim2026)*. National University of Singapore, 16–18 November 2026.

Du, B., Crosby, S., **Van Rooyen, C.**, and Licina, D. (2026). 'ATLAS: A Flexible, Performance-Based IEQ index', *Indoor Air 2026 – Enhancing Wellbeing in Existential Challenges*. Singapore, 14–18 June 2026.

Van Rooyen, C., Banerjee, A., Nicholls, C., Malocco, D., Gresswell, E., Hamilton, I., Hsu, S., and Symonds, P. (2025). 'Health impacts of housing retrofits in England using the NBM-Health model', *CIBSE IBPSA-England Technical Symposium 2025*. UCL, 24-25 April 2025. Paper available at: click here. Presentation available at: click here.

Peer-Reviewed Technical Reports

Symonds, P., **Van Rooyen, C.**, Hsu, S., and Hamilton, I. (2025). *Health impacts of net-zero housing in England - A report summarising the updates to the National Buildings Model Health*

(NBM-Health) Module. Gov.uk. Available at: https://www.gov.uk/government/publications/health-impacts-of-net-zero-housing-in-england.

Van Rooyen, C., Hsu, S., Hamilton, I., and Symonds, P. (2025). *Model Documentation for: NBM Health: Valuing the Health Impacts from Bill Rebates, Energy Efficiency and Heating Measures*. UK Government Report.

Manuscripts in Preparation and Research in Progress

Van Rooyen, C., Elwell, C., Fenech, B. 'Using outdoor and indoor sound measurements in an occupied dwelling to infer if a window is open, ajar or closed'. *Target journal: Nature Journal of Exposure Science and Environmental Epidemiology*. (Manuscript in final editing).

Van Rooyen, C., Dimitroulopoulou, S., Fenech, B., Davies, M., Elwell, C. 'The relationship between ventilation practices and air exchange rates in seven occupied homes in England'. *Target Journal: Building and Environment* (Manuscript in final editing).

Van Rooyen, C., Hsu, S., Hamilton, I., and Symonds, P. 'Health effects of home energy efficiency interventions in England: a modelling study'. *Target journal: British Medical Journal*. (Manuscript in preparation).

Van Rooyen, C. 'Exploring the roles of ventilation, housing characteristics, occupants and their behaviours on mould in homes in Great Britain'. *Target Journal: Building and Environment*. (Manuscript in preparation).

Van Rooyen, C., Licina, D. 'High-Resolution Three-Dimensional Spatiotemporal Variation of Indoor Environmental Quality Under Varying Occupancy and Ventilation Conditions'. *Target Journal: Data in Brief and Building and Environment*. (Data collection phase).

Crosby, S., Altomonte, S., Du, B., **Van Rooyen, C.**, Licina, D., Schweiker, M., Wargocki, P., Wei, W. 'Ten questions on developing multi-domain IEQ Indices: challenges and opportunities'. *Pre-approved: Building and Environment* (Manuscript in preparation).

Dedesko, S., Du, B., **Van Rooyen, C.**, Li, Y., and Licina, D. 'Indoor Air Exposures and Energy Trade-offs of Recirculating vs Exhausting Kitchen Range Hoods'. *Target Journal: Building and Environment*. (Data collection phase).

Poster Presentations at Conferences

Dedesko, S., Du, B., **Van Rooyen, C.**, Li, Y., and Licina, D. (2025). 'Informing Healthier Kitchen Ventilation Policies - Assessing Indoor Air Exposures, Health, and Energy Impacts'. *Connecting Health and Climate Change conference (ENBEL2025)*. 16-18 October 2025, Tallinn, Estonia.

Van Rooyen, C. (2022). 'The relationship between ventilation practices, indoor air quality, noise and overheating, and their impact on health.'. *Energy Resilience and the Built Environment 2022 Annual Colloquium*. London, UK.

Van Rooyen, C. (2021). 'The relationship between ventilation practices, indoor air quality, noise and overheating, and their impact on health.'. *Energy Resilience and the Built Environment 2021 Annual Colloquium*. 11 November 2021, London, UK.

Van Rooyen, C. (2020). 'Relationship between occupant ventilation practices and indoor air quality, overheating and noise.'. *Energy Resilience and the Built Environment 2020 Annual Colloquium*. 12 November 2020, online.

Van Rooyen, C. (2019). 'Ventilation practices in UK homes in relation to indoor air quality, noise and overheating.'. *LoLo/ERBE 2019 Annual Colloquium.* 7 November 2019, London, UK.

Teaching and Mentorship Experience

University College London (2021-2022): Post graduate teaching assistant for the Smart Distributed Energy Systems (BENV0144) module on the Smart Energy and the Built Environment MSc. I was responsible for preparing lecture material, delivering lectures, assisting with tutorial sessions, marking dissertations, and providing student support.

Plymouth University (2016): Guest lecturer for the MSc Sustainable Building Design module. I delivered an interactive lecture on the relationship between theoretical building physics, passive design and architectural form in practice.

Coventry University (2012): Guest lecture for the BEng (Hons) Building Services Engineering building physics modelling module. I led a practical session and tutorial demonstrating the use of IES VE for dynamic thermal simulation, energy and carbon emissions modeling.

Professional Mentorship (2006-2017): During my time as a Chartered professional building physicist and engineer, I have mentored and supported numerous undergraduate, graduate and senior engineers to obtain Chartership (e.g., CEng, MCIBSE).

Technical Skills

Environmental Monitoring: High spatio-temporal resolution measurements of indoor environmental quality (temperature, humidity, sound, light, PM, CO_2, CO, NO_x, VOCs, formaldehyde and more).

Questionnaire Design and Analysis: Development, deployment, and statistical analysis of occupant surveys related to indoor environmental quality and building performance.

Programming & Data Analysis: Python, Linux, InfluxDB, Grafana, BASH, AWS (EC2), multivariable statistical modeling, and machine learning (e.g., statsmodels, scipy, scikit-learn).

Building Physics: Dynamic thermal modeling (IES and EnergyPlus), daylight modeling (IES and radiance), contaminant, airflow and ventilation modeling (IES and CONTAM).

Other Software: Adobe Creative Suite, AutoCAD, and Revit.

Statistical Methods: Multi-variable timeseries analysis, machine learning, and predictive modeling.

Professional Qualifications and Awards

Professional Memberships

Member of the Chartered Institute of Building Services Engineers	MCIBSE Chartered
Engineer, Engineering Council UK	CEng

Awards

Baxi Commercial Special Achievement Award	2011
Building Services Incorporated Engineer of the Year, West Midlands	2007
Building Services Special Achievement Award	2007
Building Services Technician Engineer of the Year, West Midlands	2006