Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

ANNUAL REPORT 2023 - 2024

TrinityHaus

The Michael McNamara Research Centre for Construction, Innovation and Sustainability

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CENTRE

Centre Name: Trinity Haus
Director: Asst Prof John Gallagher
Deputy Director: Assoc Prof Liwen Xiao

INTRODUCTION

TrinityHaus was established in 2008, as a response to the cross-cutting challenges of sustainability, climate change, well-being, health, and inclusion in the built environment, and the goal to deliver transdisciplinary research and co-creation across multiple sectors and spatial scales. From housing to health care settings and from building material innovations to urban design, TrinityHaus research projects focus on the role and impact of the built environment in creating low-carbon, resilient, healthy, and inclusive communities.

TrinityHaus was originally set up through a very generous benefaction by Bernard McNamara which provided seed funding for the research centre, including the institution of the Michael McNamara Chair of Construction Innovation and Sustainability. The remit of the centre has expanded through its transdisciplinary approach which has led to collaboration between disciplines, from its links in Engineering to Medicine and Natural Sciences, Business to Architecture.

In recent years, four key transdisciplinary research themes (health and inclusive environments; climate action and sustainability; construction innovation; and co-creation and engagement) have been defined within TrinityHaus to reflect the research outputs produced the centre, all addressing different facets of integrated and people-centred research and design solutions within our buildings, neighbourhoods, towns, and cities.

Figure 1. Research Themes in TrinityHaus.

The Centre has generated over €5 million in research funding for Trinity College between 2020-2024 through a range of National (EPA, SFI/Research Ireland, SEAI, Enterprise Ireland, etc) and International (Horizon, Interreg, etc.) sources. Most recently, TrinityHaus became a founding member of Enterprise Ireland's funded research centre ConstructInnovate, Ireland's Centre for Construction Technology and Innovation, of which TrinityHaus is leading on several funded projects on topics of inclusive and sustainable design, innovation construction materials and design, reducing environmental pollution and maximising energy efficiency in buildings, and climate risk mitigation for buildings.

GOAL AND MISSION

TrinityHaus focuses on innovation in construction design and practice, adopting a co-creation process to address the intersection between the built environment, health, wellbeing and inclusion, climate action and sustainability.

KEY RESEARCH GROUPINGS/THEMES

The four research themes in TrinityHaus includes: health and inclusive environments; climate action and sustainability; construction innovation; and co-creation and engagement.

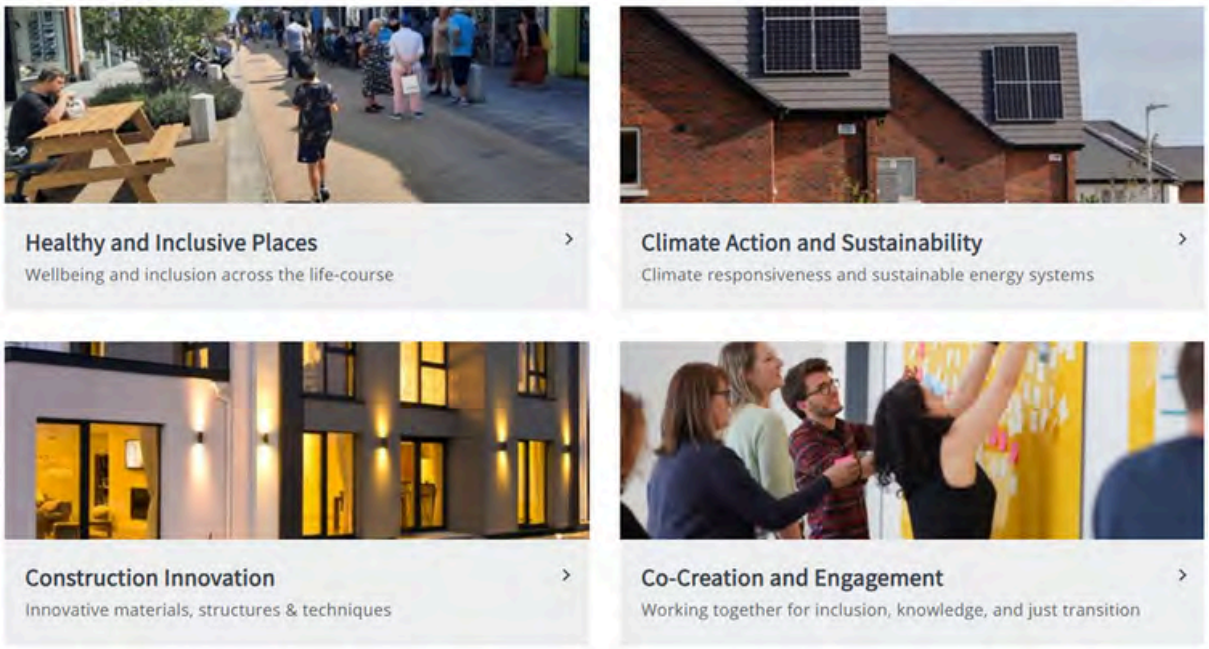


Figure 1. Research Themes in TrinityHaus.

PRINCIPAL INVESTIGATORS

Assistant Professor John Gallagher
Associate Professor Liwen Xiao
Professor Alan O'Connor
Professor Brian Broderick
Professor Sarah McCormack
Associate Professor Breiffni Fitzgerald
Professor Desmond O'Neill
Assistant Prof Julie Clarke
Assistant Professor John Hickey

FTable 1. Principal Investigator List.

NUMBER OF RESEARCHERS (FELLOWS AND RAS)

Mr Tom Grey	2009 - Present
Ms Dimitra Xidous	2014 - Present
Dr Saviour Okeke	2022 - 2023
Dr Miguel Casero Florez	2022 - 2023
Dr Dunzhu Li	2015 - 2023
Dr Yunhong Shi	2015 - 2023
Ms Jennifer O'Donoghue	2020 - Present
Mehak Puntambekar	2021 - 2024
Mr Madhavan Vasudevan	2024 - Present
Dr Aditya Rahul	2024 - Present
Dr Benjamin Obe	2024 - Present
Dr Saravanan Gurusamy	2023 - Present
Ms Katherine Hardgrave	2023 - 2024
Mr Alan McCabe	2024 - Present

Table 2. Number of Researchers

PHD STUDENTS

Dervilla Niall	2019-2023
Zihan Zhang	2021 - Present
Peiyin Kang	2021 - Present
Manish Kanoija	2021 - Present
Kiran Apsunde	2020 - Present
Xiaoyu Wang	2023 - Present
David Honan	2024 - Present

Table 3. Number of PhD Students

OTHER STAFF

Gary Corcoran

Table 4. Number of Other Staff

RESEARCH OUTPUT

Publications (Sept 2023 – Aug 2024) from members of the centre – information from SciVal/Scopus

Scholarly Output: The number of publications from Centre members based in Trinity College Dublin

56

Number of citations

164 – Combined citation Count

Number of publications related to Sustainable Development Goals

1	Zero Hunger (SDG2)
10	Good Health and Well-Being (SDG3)
1	Quality Education (SDG4)
6	Clean Water and Sanitation (SDG6)
13	Affordable and Clean Energy (SDG7)
3	Decent Work and Economic Growth (SDG8)
8	Industry, Innovation and Infrastructure (SDG9)
2	Reduced Inequalities (SDG10)
8	Sustainable cities and communities (SDG11)
3	Responsible consumption and production (SDG12)
3	Climate action (SDG13)
2	Life on land (SDG15)

RESEARCH OUTPUT

Top Research Topic Clusters

Computational Fluid Dynamics

Biodegradation

Differential Scanning Calorimetry

Polylactide

Electric Utility

Tidal Power

COVID-19

Atmospheric Aerosol

Boundary Layer

Emissions

RESEARCH OUTPUT

Top Cited Publications (Sept 2023-Aug 2024)

Goli, V.S.N.S., Paleologos, E.K., Farid, A. and 16 more (...) (2024). Extraction, characterisation and remediation of microplastics from organic solid matrices. Environmental Geotechnics,11(4) 259-292.

Shi, Y., Shi, L., Huang, H. and 8 more (...) (2024). Analysis of aged microplastics: a review. Environmental Chemistry Letters,22(4) 1861-1888.

Mérida García, A., Gallagher, J., Rodríguez Díaz, J.A. and 1 more (...) (2024). An economic and environmental optimization model for sizing a hybrid renewable energy and battery storage system in off-grid farms. Renewable Energy, 220.

Jin, M. Y., Zhang, L. Y., Peng, Z. R., He, H. D., Kumar, P., & Gallagher, J. (2024). The impact of dynamic traffic and wind conditions on green infrastructure performance to improve local air quality. Science of the Total Environment, 917, 170211.

Abbas, Q., Sarwar, J., Arafat, S. M., Tayyab, M., Uddin, G. M., Niazi, S. G., ... & McCormack, S. J. (2024). Performance analysis of a medium concentrated photovoltaic system thermally regulated by phase change material: Phase change material selection and comparative analysis for different climates. Applied Thermal Engineering, 236, 121653.

POLICY CITATIONS AND IMPACT

16 publications (since 2019) from School of Engineering centre members have been cited in 50 policy documents from 28 sources across 14 countries. 53% of these articles are cited more than once in policy.

The nexus between air pollution, green infrastructure and human health

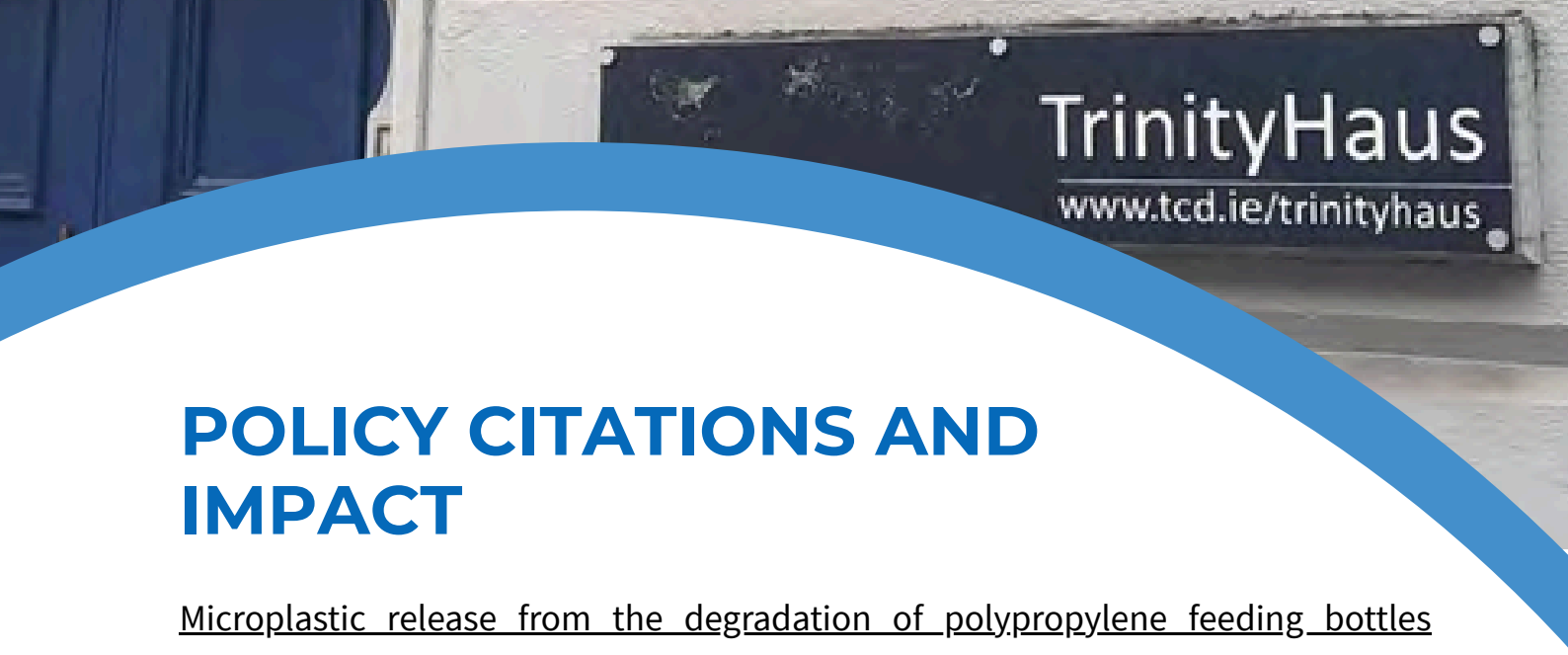
Kumar, P., Druckman, A., **Gallagher, J**., Gatersleben, B., Allison, S., Eisenman, T.S., Hoang, U., Hama, S., Tiwari, A., Sharma, A. and Abhijith, K.V., 2019. The nexus between air pollution, green infrastructure, and human health. Environment international, 133, p.105181.

WINNER: 2023 Haagen-Smit Prize for Groundbreaking Air Pollution Research

Cited by 12 policy documents including:

Australia	Australian Institute of Health and Welfare	Benefits of the environment to health. A literature review of health benefits derived from 3 ecosystem services: air filtration, local climate regulation, and recreation
EU	Publications Office of the European Union	Evaluating the impact of nature-based solutions: a handbook for practitioners.
IGO	World Health Organization	Measures to reduce risks for children's health from combined exposure to multiple chemicals in indoor air in public settings for children with a focus on schools, kindergartens and day-care centres
Spain	Oficina de Ciencia y Tecnología del Congreso de los Diputados	Air quality: advances and best practices
USA	Government Publishing Office (GPO)	Climate adaptation actions for urban forests and human health

Table 5 The nexus between air pollution, green infrastructure, and human health



POLICY CITATIONS AND IMPACT

Microplastic release from the degradation of polypropylene feeding bottles during infant formula preparation

Li, D., Shi, Y., Yang, L., **Xiao, L.**, Kehoe, D.K., Gun'ko, Y.K., Boland, J.J. and Wang, J.J., 2020. Microplastic release from the degradation of polypropylene feeding bottles during infant formula preparation. Nature Food, 1(11), pp.746-754.

Cited by 6 policy documents including:

UK	Committee on Toxicity	Overarching statement on the potential risks from exposure to microplastics
IGO	Food and Agriculture Organization of the United Nations	Thinking about the future of food safety
Belgium	Belgian Federal Public Services	Policy informing brief
Finland	Government of Finland	Nanomaterials as part of society: Towards a safe future of nanotechnology
Ireland	Oireachtas Éireann Library & Research Service	Spotlight: Nanotechnology - The influence, risks, and opportunities of a rising technology

Table 6 Microplastic release from the degradation of polypropylene feeding bottles during infant formula preparation

POLICY CITATIONS AND IMPACT

A life cycle assessment of the construction phase of eleven micro-hydropower installations in the UK

Ueda, T., Roberts, E.S., Norton, A., Styles, D., Williams, A.P., Ramos, H.M. and **Gallagher, J**., 2019. A life cycle assessment of the construction phase of eleven micro-hydropower installations in the UK. Journal of cleaner production, 218, pp.1-9.

Cited by 4 policy documents including:

Clean Energy Technology Observatory: Hydropower and Pumped Hydropower Storage in the European Union - 2023 Status Report on Technology Development, Trends, Value Chains and Markets (Joint Research Centre, EU)

POLICY CITATIONS AND IMPACT

Nursing Home Design and COVID-19: Balancing Infection Control, Quality of Life, and Resilience

Anderson, D.C., **Grey, T**., Kennelly, S. and O'Neill, D., 2020. Nursing home design and COVID-19: balancing infection control, quality of life, and resilience. Journal of the American Medical Directors Association, 21(11), pp.1519-1524.

Cited by 4 policy documents including:

Final report on the development of the draft National Aged Care Design Principles and Guidelines - Evidence review (Australian Government Department of Health)

International Review of Innovations to Protect Nursing Home Residents from Infectious Diseases such as COVID-19 (AARP, USA)

POLICY CITATIONS AND IMPACT

Energy security to safeguard community water services in rural Ireland: Opportunities and challenges for solar photovoltaics

Devereux, C., Coscia, J., Adeyeye, K. and **Gallagher, J.**, 2021. Energy security to safeguard community water services in rural Ireland: Opportunities and challenges for solar photovoltaics. Sustainable Energy Technologies and Assessments, 47, p.101377.

Cited by: Solar energy as an agent for decarbonizing the energy matrix: a proposal for the region (Government of Peru)

POLICY CITATIONS AND IMPACT

Comparing the environmental and economic impacts of on- or off-grid solar photovoltaics with traditional energy sources for rural irrigation systems

García, A.M., **Gallagher, J**., McNabola, A., Poyato, E.C., Barrios, P.M. and Díaz, J.R., 2019. Comparing the environmental and economic impacts of on-or off-grid solar photovoltaics with traditional energy sources for rural irrigation systems. Renewable Energy, 140, pp.895-904.

Cited by: Grid-connected solar irrigation in Nepal - exploring opportunities and identifying hurdles (CGIAR, France)

GRANTS AWARDED 2023/24

Projects starting/funding awarded to centre researchers based in the School of Engineering

PI Name	Project Title	Funding Body	Call Name
Julie Clarke	A National Climate Risk Index for the Built Environment	Science Foundation Ireland	SFI National Challenge Fund-2050 Challenge
Alan O'Connor / Rui Teixeira	A study to evaluate alternative methods of remediation of buildings damaged by defective concrete block	Enterprise Ireland	Construction Technology Centre
Thomas Grey	Ageing population and universal access – Building Regulations compliance assessment of UD Homes	Enterprise Ireland	Construction Technology Centre
John Gallagher	An investigation of the effectiveness of Technical Guidance Document J (TGD J) provisions regarding flue outlet locations for solid fuel burning appliances at preventing smoke particles entering the dwelling or neighbouring dwellings	Enterprise Ireland	Construction Technology Centre
Liwen Xiao	Assessment and Mitigation of microplastics (MPs) In the Dairy foods	Teagasc	Teagasc Walsh Scholarship Programme 2023

GRANTS AWARDED 2023/24

Projects starting/funding awarded to centre researchers based in the School of Engineering, continued,

PI Name	Project Title	Funding Body	Call Name
Alan O'Connor	Durability of Dense Aggregate Concrete masonry units in Irish structures - Assessment of future anticipated performance	Enterprise Ireland	Construction Technology Centre
Thomas Grey	Mitigating Environmental Disruptive Events Using People-centric Predictive Digital Technologies to Improve Disaster and Climate Resilience	European Commission	HORIZON-CL5-2023-D4-02-02
Sarah Mc Cormack	RevRenew: Revving up Renewable Integration: Standardizing Smart Connections for EVs and Renewables	Sustainable Energy Authorit	Research, Development and Demonstration Funding Programme 2023
John Gallagher	Transforming Rural water communities As positive Climate and Energy districts (TRACE)	Science Foundation Ireland	SFI NCF 2023-Sustainable Communities
John Gallagher	Transforming Rural water communities into positive Climate and Energy Districts across Europe	Enterprise Ireland	Horizon Europe Coordinator Proposal Preparation Support Scheme

FUTURE STRATEGY OF CENTRE

The future research conducted by TrinityHaus and its focus on the built environment is inspired by and supports a range of key global, European, and Irish national frameworks and policies. Examples of these at a global level include the UN Sustainable Development Goals (SDGs), or HABITAT III-The New Urban Agenda. At a European level it includes the European Green Deal or the New European Bauhaus. At a national level the work aligns with, and responds to, key policies such as the Climate Action Plan 2024, Project Ireland 2040-National Planning Framework, or Housing for All-a New Housing Plan for Ireland.

In addition, the new TrinityHaus Director (Asst Prof John Gallagher) is setting up a governance panel of internal and external stakeholders, and a new Board put in place to provide guidance and input into TrinityHaus's future.

THREATS TO THE CENTRE'S STRATEGY

TrinityHaus previously had 4 floors of 16 Westland Row, and in 2021 this was reduced to occupy only two floors of 16 Westland Row, limiting its capacity to accommodate only 12 postgraduates/postdoctoral researchers and provide office space for just three research staff. Retaining this office space for researchers and staff is crucial to create a collaborative community, something that has not been as strong for a number of years during which no Director was in place.

NEWS

Click on the links below to view the full story

Harnessing Nature's Power: Willow Trees Revolutionise Wastewater Treatment in Rural Ireland
25 March 2024

Dementia Friendly Hospital Design MOOC shortlisted for The Education Awards 2024
20 March 2024

Trinity College Dublin Academics Win 2023 Haagen-Smit Prize for Pioneering Air Pollution Research
19 March 2024

Researchers join National Challenge Fund to help Ireland prepare for green transition and digital transformation
11 September 2023

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