



**BUILT ENVIRONMENT
RESEARCH INSTITUTE
ANNUAL REPORT
1 AUGUST 2012 - 31 JULY 2013**

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1 August 2012 – 31 July 2013

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I. FOREWORD: RESEARCH INSTITUTE DIRECTOR



It is a great pleasure to present the Annual Report for the Built Environment Research Institute (BERI) for the academic year 2012-2013. Once again this has been a year of considerable achievement including the further development of our research infrastructure base, major success in research grant funding, publication of papers by members in leading journals in the discipline area and research student success. Significant external research funding was achieved through the Seventh Framework Programme (FP7), the Engineering and Physical Sciences Research Council (EPSRC), government departments/agencies and the private sector.

In this foreword, we briefly review the activities of the four research centres within the Built Environment Research Institute: the Fire Safety Engineering Research and Technology Centre (FireSERT), the Hydrogen Safety Engineering and Research Centre (HySAFER), the Centre for Sustainable Technologies (CST), and the Centre for Research on Property and Planning (RPP). The main report provides details of academic and research staff in the Research Institute, details of PhD projects and graduating PhDs, publications and research grants.

Over the period of this annual report FireSERT staff continued to attract considerable project funding (about £1.5 million) from the UK research councils, government, the European Union, KTP, INI innovation vouchers and industry including consulting projects. Current externally funded projects include fire safety related to advanced computer modelling (EPSRC), the performance of structures (cellular beams) (EPSRC, FP7), elliptic cross section columns in fire situations (EPSRC) and merging flows during evacuation for high rise buildings. New Computational Fluid Dynamics models were developed for the prediction of soot and radiation in fires including the Lattice Boltzmann method. Other projects include: Flashover and façade fires in collaboration with the SKFSL (State Key Fire Safety Laboratory, China) and Tokyo University of Science (TUS), the assessment and evaluation of fire safe nanoparticle materials including the potential for nano-engineered materials (FP7), the replacement of brominated fire retardants (FRs) with environmentally compatible FRs (FP7) and fire safety of aircraft composite materials (FP7).



University Council members visiting the facilities at FireSERT

Professor Ali Nadjai chaired and organized an international workshop in November 2012 regarding Innovative Construction Design for Fire Safety Engineering: New European Fire Design Guidance. The extended design guidance concerning the whole floor structure has been published by the EU and is available at <http://bookshop.europa.eu>. The international standing by FireSERT was reflected in an invitation to attend and have a display booth at the EXPO for international fire research and testing laboratories in Cologne, Germany in May 2013.



FireSERT stand at EXPO, Cologne, May 2013

FireSERT technologies, led by Professor Faris Ali won in the Hi-Tech category of the Northern Ireland Science Park 25K Award for a Fire-Blast Protection system, at a VIP gala ceremony in the iconic Titanic Belfast building, in September 2012. The Fire-Blast Protection system aims to provide superior safety, protection and security for people and assets, by offering an innovative Fire-Blast Protection system that is uniquely designed to provide dual protection against blasts and fires at a tenth of the cost of conventional, competing systems.



Professor Faris Ali (right) receiving the 25K Award for the Hi-Tech Category, September 2012.

Over the year 2012-2013, HySAFER (Hydrogen Safety Engineering and Research centre) successfully completed the projects TrainHy-Prof (<http://www.hysafe.org/TrainHyProf>) and HyFacts (www.hyfacts.eu) on development of research-led education/training of young professionals and regulators respectively. Several high

profile research grants were secured by HySAFER with external funding from prestigious sources including Fuel Cell and Hydrogen Joint Undertaking projects (HyResponse and SUSANA) and EPSRC for a project on Integrated safety strategies for onboard hydrogen storage systems. HySAFER leads networking activities within the FP7 grant Integrating European Infrastructure to support science and development of Hydrogen and Fuel Cell Technologies towards European Strategy for Sustainable, Competitive and Secure Energy (www.h2fc.eu).

Research undertaken during 2012-2013 includes releases and dispersion of hydrogen in enclosures with one vent; indoor jet fires, simulation for the first time self-extinction phenomena using CFD models; vent sizing of enclosures; behaviour of plane jets. Building on HySAFER's international recognition in CFD studies of hydrogen safety phenomena, a new strategic research direction concerns innovative solutions for fire resistance of onboard hydrogen storage supported by funding from both the UK (EPSRC) and Europe.

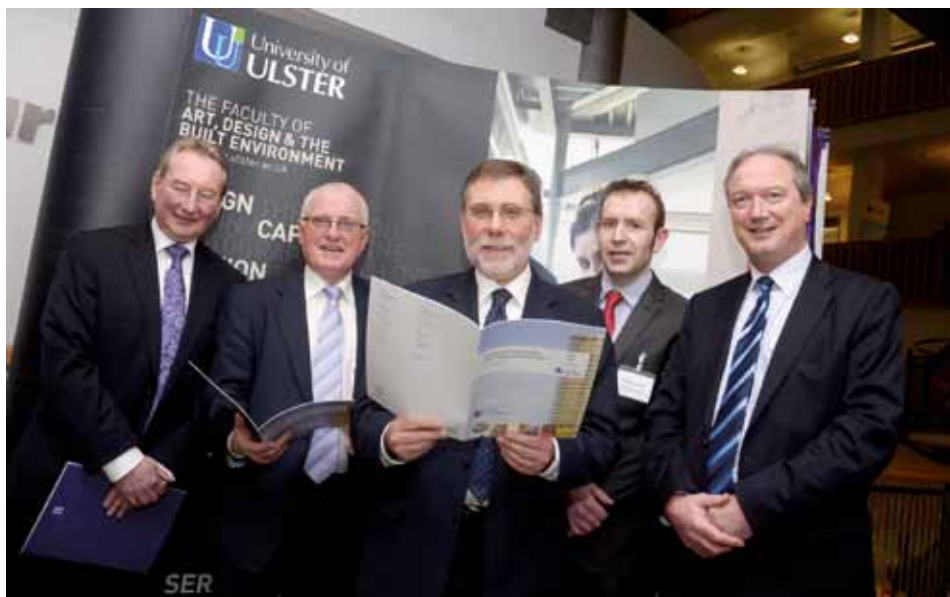
The Centre for Sustainable Technologies (CST) covers a wide range of research applicable to the sustainable built environment agenda including highways engineering, hydraulics, procurement and infrastructure enhancement but has its primary focus on energy. CST has enjoyed a highly successful research year over 2012-2013 including the start of a range of projects addressing industrial energy efficiency, building energy efficiency, advanced heat pump development and advanced glazing and solar innovations.

Solar energy now boasts a state-of-the-art solar simulator for the development and evaluation of solar energy technologies including the patented Solacatcher (a low cost solar water heater developed in conjunction with Invest Northern Ireland and with investment linked to the University spin-out company Solaform Ltd by E-Synergy). Advanced glazings in the form of novel solar energy systems are currently being developed under EPSRC funding and support from Invest Northern Ireland. Additional projects include Royal Society support for solar energy development in Tanzania and UKIERI support for solar energy driven anaerobic digestion in India.



Mr Dominic McLarnon and Dr Mervyn Smyth displaying their patented product, Solacatcher

The Centre for Research on Property and Planning, likewise has continued to attract significant research funding with the theme of urban security and emergency planning to the forefront in further FP7 research awards (HARMONISE and COBACORE). The Centre's long expertise in property market performance was marked by funding from the Northern Ireland Housing Executive for a project on House price, rents and affordability. In the commercial property market, the Centre working in conjunction with the Investment Property Databank (IPD) and sponsored by Belfast City Council, the Department for Social Development (DSD) and leading commercial real estate practices launched a new report (December 2012) on the Performance of the commercial property market.



Minister Nelson McCausland, Department for Social Development, with Professor Jim Berry, Professor Alastair Adair, Dr Martin Haran and Professor Stanley McGreal at the launch of the commercial property market report, December 2012.

The policy relevance of research within the Centre is highlighted by projects undertaken for the National Asset Management Agency concerning land holdings and housing in Northern Ireland and research funded by the Royal Institution of Chartered Surveyors into public private partnership and infrastructure funding. The latter project attracted invitations from RICS Americas to chair a roundtable workshop in Miami and take part in a high level discussion forum in New York. Colleagues in the Centre have worked in close collaboration with Belfast City Council in the development of a 3-d model to stimulate the city and allow projections concerning the impact of new development.

Further details of research expertise at the Built Environment Research Institute can be found at www.beri.ulster.ac.uk or by contacting Mrs S Magee (Admin Support) at (028) 90368638.

Handwritten signature of Stanley McGreal

Professor Stanley McGreal
Director Built Environment Research Institute

2. RESEARCH INSTITUTE: ACADEMIC STAFF MEMBERS STATUS AT 31 JULY 2013

Surname	Forename	Title	Position	Institute Status
Adair	Alastair	Prof	PVC (Development) & Provost (Jordanstown & Belfast)	Core
Ali	Faris	Prof	Professor of Structural Engineering	Core
Anderson	Mark	Mr	Lecturer	Associate
Berry	James	Prof	Professor in Urban Planning & Property Development	Core
Blair	Neale	Dr	Senior Lecturer	Associate
Boyce	Karen	Dr	Senior Lecturer	Core
Brennan	Sile	Dr	Lecturer	Core
Choi	Seng-Kwan	Dr	Lecturer	Core
Dahoe	Arief	Dr	Lecturer	Associate
Davis	Peadar	Dr	Lecturer	Associate
Davison	Lisa	Dr	Lecturer	Core
Delichatsios	Michael	Prof	Professor of Fire Dynamics and Flammability/Director of FireSERT	Core
Eadie	Robert	Dr	Lecturer	Associate
Gray	Paddy	Prof	Professor of Housing	Associate
Griffiths	Philip	Dr	Associate Head of School	Core
Haran	Imelda	Dr	Lecturer	Associate
Heaney	George	Prof	Professor of Construction	Core
Hemphill	Lesley	Dr	Lecturer	Associate
Hewitt	Neil	Prof	Professor of Energy/Director of CST	Core
Hine	Julian	Prof	Professor of Transport	Core
Huang	Ming Jun	Dr	Lecturer	Core
Huang	Ye	Dr	Lecturer	Core
Hyde	Trevor	Dr	Reader	Core
Joseph	Paul	Dr	Senior Lecturer	Core
Kashyap	Anil	Dr	Lecturer	Associate
Keenan	Michaela	Dr	Lecturer	Associate
Levendis	Yiannis	Prof	Professor of Fire Safety Science	Core
Lim	Lay-Cheng	Dr	Senior Lecturer	Core
Lloyd	Greg	Prof	Professor of Urban Planning/ Head of School of the Built Environment	Core
Lyness	John	Dr	Reader	Associate
MacIntyre	Sean	Mr	Senior Lecturer	Associate
Makarov	Dmitriy	Dr	Reader	Core
Martinez-Perez	Alona	Mrs	Lecturer	Associate
McAnulty	Ursula	Ms	Lecturer	Associate
McCluskey	William	Dr	Reader	Core
McConnell	Nigel	Dr	Lecturer	Associate
McCord	Michael	Dr	Lecturer	Core

Surname	Forename	Title	Position	Institute Status
McGreal	Stanley	Prof	Professor of Property Research/ Director of BERI and RPP	Core
McIlveen-Wright	David	Dr	Lecturer	Core
McKeown	Clare	Ms	Lecturer	Associate
McLernon	Tim	Dr	Senior Lecturer	Associate
McPhillips	Karen	Dr	Lecturer	Associate
Millar	Phillip	Dr	Lecturer	Associate
Molkov	Vladimir	Prof	Professor of Fire Safety Science/ Director of HySAFER	Core
Mondol	Jayanta	Dr	Lecturer	Core
Murphy	Martina	Dr	Lecturer	Associate
Nadjai	Ali	Prof	Professor of Fire Structural Engineering	Core
Novozhilov	Vasily	Prof	Professor in Fire Dynamics	Core
Odeyinka	Henry	Dr	Lecturer	Core
Peel	Deborah	Prof	Professor of Planning Research and Scholarship	Core
Pimenidou	Panagiota	Dr	Lecturer	Associate
Rafferty	Gavan	Mr	Lecturer	Associate
Ritchie	Heather	Dr	Lecturer	Associate
Ryan	Donal	Dr	Lecturer	Associate
Smyth	Mervyn	Dr	Reader	Core
Strong	Alan	Mr	Senior Lecturer	Associate
Van der Krabben	Erwin	Prof	Professor of Real Estate	Core
Woodward	David	Dr	Reader	Associate
Yohanis	Yigsaw	Prof	Professor of Building Services Engineering	Core
Zhang	Jianping	Dr	Lecturer	Core

3. RESEARCH INSTITUTE: RESEARCH STAFF MEMBERS STATUS AT 31 JULY 2013

Surname	Forename	Title	Position	Research Centre
Chernyavskiy	Boris	Dr	Research Associate	HySAFER
Colclough	Shane	Dr	Research Fellow	CST
Dave	Ashok	Mr	Research Associate	CST
Devlin	Steven	Mr	Research Associate	CST
Fang	Yueping	Dr	Research Fellow	CST
Han	Sanghoon	Dr	Research Associate	FireSERT
Haran	Martin	Dr	Senior Research Fellow	RPP
Keatley	Patrick	Dr	Research Associate	CST
Keenan	James	Dr	Research Associate	HySAFER
Lytvyn	Inna	Dr	Research Associate	CST
Lytvyn	Iurii	Mr	Research Associate	CST
Manktelow	Matthew	Dr	Research Associate	FireSERT
McCord	John	Dr	Research Associate	RPP
McIlhatton	David	Dr	Research Fellow	RPP
Novaes	Marcio	Mr	Research Associate	CST
O'Brien	Vincent	Mr	Research Associate	CST
Ramani	Alwar	Dr	Research Assistant	FireSERT
Ramirez	Miguel	Mr	Research Associate	CST
Redpath	David	Dr	Research Associate	CST
Rolfe	Angela	Miss	Research Associate	CST
Tretsiakova-McNally	Svetlana	Dr	Research Associate	HySAFER
Zacharopoulos	Aggelos	Dr	Research Fellow	CST

4. RESEARCH STUDENTS

The following research students were registered on research degree programmes during 2012-2013.

Student Name	Thesis Title
Adi Maimun, Nural Hana	The economic values of green residential buildings
Alexander, Gareth O	Novel floor constructions to improve the performance and energy efficiency of ground source heat pump (GSHP) powered underfloor heating
Ali, Sadiq	Thermal / mechanical / electrical storage systems suitable for deployment in the Built Environment
Anderson, Mark T	Biomass pelletisation, fuel variability and pelletisation for co-gassification process
Arya, Farid	Producing cheap vacuum glazing sheets which can be cut in different sizes
Atefi Aghayan, Hooman	Developing a numerical method for simulating intumescent materials in fire
Banerjee, Urbi	Effect of urban form on dynamic nature of travel behaviour
Bradley, Philip	A carbon valuation model for commercial buildings in a market downturn
Byrne, Conor	Dynamical system (Lattice Boltzmann) modelling of compartment fires
Byrne, Orla M	Investigation into the potential practical application of “smart growth” within an Irish case study
Caldwell, Stephen	A study into sustainable bitumen use
Clarke, Mervyn C	Strategic property performance management
Cotter, Donal F	The role of building simulation as an assessment methodology for new and existing dwellings
Dave, Ashok	Techno – economic assessment of novel IGCC systems with CO ₂ capture
Dixon, Andrew JP	Experimental studies to investigate merging behaviour in a staircase
Doyle, Conor	Investigation of household energy use and its effective reduction
Eghbalighazijahani, Amir	Governance and planning policies to increase the resilience of urban areas to climate change
Eni, Sabariah	Value capture model as a financial tool for urban regeneration
Farnan, Emma MA	Evaluating community planning: towards better outcomes?
Firth, Simona	Vacuum window performance evaluation and characterisation
Gamu, Faoziah	Analysing real estate values in emerging economies. A case study of Nigeria
Ghayur, Muhammad A	Techno-economic modelling of bio-refinery concepts
Golden, Saul	Urban design decision support systems - assessment tools for successful urban civic space
Gunasekera, Sanwara	Modelling the relationship between organisational and supply chain performance in the construction industry
Hardie, Brian	The behaviour of compartment masonry walls in fires
Harpur, Amy	Development and analysis of a database on dwelling fire deaths in Northern Ireland
Harrison, Justin	Sustainable communities - mapping and measuring the balance of trade-offs
Henry, Keith	Planning and public spaces: a property rights perspective
Kang, Sungwook	Fundamental technologies for development of nanoclay dispersed intumescent polymer composition in applications for built environments and automobiles
Kashyap, Poonam	Innovative storage systems suitable for deployment in the Built Environment

Student Name	Thesis Title
Keig, Peter Richard	An investigation into establishing a hierarchy of sequential retrofit solutions
Kelly, Rachel Mary	NAMA: asset management on non performing real estate in a depressed economy
Larkin, Keren	Modelling risk impacts on variability between contract sum and final account in contractor design and build projects
Lewis, John	Innovation in construction procurement – case based reasoning and artificial intelligence techniques
Lytvyn, Iurii V	Novel evacuated glazing system
McClelland, Andrew G	The anatomy of architectural heritage destruction in Northern Ireland from the 1960s to the 21st Century
McDermott, Eva	Articulating heritage values
McDermott, Rodney PJ	Water conservation impact on solid transfer in sewers
McDonald, Kiera E	The linkages between mobility and lifestyle: an analysis of older people's travel behaviour in Northern Ireland
McElduff, Linda	Regenerating coastal communities on the island of Ireland
McKeown, Clare	To develop an economic operator prequalification model to assist in the award of public contracts
McKeown, Paul J	Legislative and operational issues for sustainable urban drainage systems
McNally, Yvonne	Energy saving via retrofit compared to replacement housing
McQuaid, Grainne	Potholes in asphalt surfacing materials
Mellor, Kate	Slippery surfaces: photography, architecture and the cityscape of seduction
Millar, Phillip	A spatial rationale for engineering performance of highway surface materials based on digital photogrammetry
Minic, Ivica	An experimental study of air-source heat pump defrosting using solar collector as heating source
Mitchell, Ruth	Durability of warm asphalts for road surfaces
Moorehead, Donagh	Tradable heat - using Northern Ireland as a demonstrator for resource mapping, demand mapping and transport concepts
Moss, John	Sustainable rural communities – A carbon model
Murray, Aaron	A study in traffic planning
Novaes, Marcio F	Oilseed rape as a potential feedstock for domestic boilers
O'Brien, Vincent	Development and performance evaluation of nano-encapsulated solar concentrating panels and their potential for modular construction techniques
Petrou, Klelia	Fire compartments having long span cellular steel beams
Quigley, Denise	Achieving an optimum balance across capital, life-cycle and environmental costs
Quinn, Michael	Behaviour of glazing panel systems in tall buildings
Redpath, Gwyneth M	Risk mapping of minor ('B' class) roads in rural Northern Ireland, reasons for the high proportion of collisions resulting in death or serious injuries, especially to young drivers
Rolfe, Angela	Integrated wind-compressed air energy storage system with combined heating and cooling
Salehi Kouhestani, Mohammad	Investigation on advanced heat pumps in domestic appliances

Student Name	Thesis Title
Samsudin, Salfarina	Exploring the role of land administration in supporting sustainable land use management
Shafie, Shahril	Synchronization of house price and buyer affordability: residential property in Malaysia
Shah, Nikhil K	Vapour compression heat pumps driven by advanced engine concepts and incorporating heat recovery
Shentsov, Volodymyr	Indoor use of fuel cell and hydrogen systems
Stevenson, David M	Coastal environmental determinism. Parameters for land use planning
Tierney, Christopher A	Dynamic road / tyre interaction
Williamson, Oscar	Assessing driver behaviour due to in-car distractions
Yates, David	Innovation solutions to reduce separation distance for hydrogen and fuel cell systems
Yi, Sung-Hee	Research on characteristics of fire behaviour and heat release rate of Korean high-rise buildings with state-of-the-art interior materials

Graduated December 2012

Student Name	Thesis Title
Akram, Waseem	Car culture and city design
Naili, El-Hadi A	Behaviour of composite floor structures in fire
Keatley, Patrick	Cyclic operation of baseload thermal plant in the Irish power system in high wind energy penetration scenarios
Mahmoud, Moataz	Design, access and security in public transport infrastructure (an integrated assessment tool for sustainable public transportation)

Graduated July 2013

Student Name	Thesis Title
Akbar, Muhammad R	Sustainable technologies, environmental subsidies, end user needs and business opportunities in the delivery of zero carbon homes
Friel, Shaun	Early life skid resistance
Keenan, James J	Modelling and LES of vented hydrogen-air deflagrations
McClements, Sharon	Selection of consultants based on trust
Quinn, Matthew V	Heat pumps digital compressor
Scullion, Thomas	Performance of axially restrained steel columns subjected to severe fire

5. PUBLICATIONS

Details of all publications by BERI staff are on the University of Ulster's Institutional Repository <http://eprints.ulster.ac.uk/>. This section reports those outputs published over the period of this report and classified as either journal articles, books/chapters in books, research reports and published conference papers.

5.1 Journal Articles

Ahern, C, Griffiths, P and O'Flaherty, M (2013) State of the Irish housing stock—Modelling the heat losses of Ireland's existing detached rural housing stock & estimating the benefit of thermal retrofit measures on this stock. *Energy Policy*, 55. pp. 139-151.

Amirabedin, E and McIlveen-Wright, D (2013) A feasibility study of co-firing biomass in the thermal power plant at Soma in order to reduce emissions: an exergy approach. *International Journal of Environmental Research*, 7 (1). pp. 139-154.

Arteconi, A, Hewitt, NJ and Polonara, F (2013) Domestic demand-side management (DSM): Role of heat pumps and thermal energy storage (TES) systems. *Applied Thermal Engineering*, 51. pp. 155-165.

Arteconi, A, Hewitt, NJ and Polonara, F (2012) State of the art of thermal storage for demand-side management. *Applied Energy*, 93. pp. 371-389.

Beekmans, J, van der Krabben, E and Martens, K (2012) An indicator for decline of industrial estates. *Journal of European Real Estate Research*, 5 (3). pp. 229-249.

Beji, T, Ukleja, S, Zhang, J and Delichatsios, M (2012) Fire behaviour and external flames in corridor and tunnel-like enclosures. *Fire and Materials*, 36 (8). pp. 636-647.

Blair, N, Hine, J and Bukhari, S (2013) Analysing the impact of network change on transport disadvantage: a GIS-based case study of Belfast. *Journal of Transport Geography*, 31. pp. 192-200.

Boyce, K, Purser, D A. and Shields, TJ (2012) Experimental studies to investigate merging behaviour in a staircase. *Fire and Materials*, 36 (5-6). pp. 383-398.

Bragin, MV, Makarov, DV and Molkov, VV (2013) Pressure limit of hydrogen spontaneous ignition in a T-shaped channel. *International Journal of Hydrogen Energy*, 38 (19). pp. 8039-8052.

Brennan, S and Molkov, V (2013) Safety assessment of unignited hydrogen discharge from onboard storage in garages with low levels of natural ventilation. *International Journal of Hydrogen Energy*, 38. pp. 8159-8166.

Breslin, G, Liston, K, Prentice, G and McConnell, NC (2013) Making the successful transition to university: psychological predictors of first year sports students' academic performance expectations. *Perspectives on Pedagogy and Practice*, 4. pp. 43-56.

Brown, L, McGreal, S and Adair, A (2013) The role of bidding in determining sales price for residential property. *Journal of Housing Research*, 22 (1). pp. 39-57.

Choi, JY and Choi, SK (2013) Temperature on structural steelworks insulated by inorganic intumescent coating. *Steel and Composite Structures*, 15 (1). pp. 1-14.

Dai, J, Delichatsios, M and Yang, L (2013) Piloted ignition of solid fuels at low ambient pressure and varying igniter location. *Proceedings of Combustion Institute*, 34. pp. 2497-2503.

Dai, J, Delichatsios, M, Yang, L and Zhang, J (2013) Piloted ignition and extinction for solid fuels. *Proceedings of Combustion Institute*, 34 (2). pp. 2487-2495.

Dave, A, Huang, Y, Rezvani, S, McIlveen-Wright, D, Novaes, M and Hewitt, N (2013) Techno-economic assessment of biofuel development by anaerobic digestion of European marine cold-water seaweeds. *Bioresource Technology*, 135. pp. 120-127.

Davison, L and Ryley, T (2013) The relationship between air travel behaviour and the key life stages of having children and entering retirement. *Journal of Transport Geography*, 26. pp. 78-86.

Eadie, R, McKeown, C and Anderson, K (2013) The impact of recession on construction procurement routes. *International Journal of Procurement Management*, 6 (1). pp. 24-38.

- Eadie, R, Millar, P and Grant, R (2013) PFI/ PPP, private sector perspectives of UK Transport & Healthcare. *Built Environment Project and Asset Management*, 3 (1). pp. 89-104.
- Eadie, R, Millar, P and Harte, N (2013) A comparison between CESMM3 and MCHW as methods of measurement for civil engineering work. *International Journal of Procurement Management*, 6 (5). pp. 523-543.
- Eadie, R, Millar, P and Toner, L (2013) Public private partnerships, reevaluating value for money. *International Journal of Procurement Management*, 6 (2). pp. 152-169.
- Gu, H, Zhang, K, Wang, Y, Huang, Y, Hewitt, N and Roskilly, AP (2013) Waste biomass from production process co-firing with coal in a steam boiler to reduce fossil fuel consumption: A case study. *Journal of Energy Chemistry*, Vol. 22 (3). pp. 413-419.
- Halleux, JM, Marcinczak, S and van der Krabben, E (2012) The adaptive efficiency of land use planning measured by the control of urban sprawl. The cases of the Netherlands, Belgium and Poland. *Land Use Policy*, 29 (4). pp. 887-898.
- Haran, M, Davis, P, McCord, M, Grissom, T and Newell, G (2013) Equities or Real Estate? An International Evaluation of Listed Property Markets. *Journal of European Real Estate Research*, 6 (2). pp. 139-162.
- Haran, M, McCord, M, Hutchison, N, McGreal, S, Adair, A, Berry, J and Kashyap, A (2013) Financial structure of PPPs deals post-GFC: an international perspective. *Journal of Financial Management of Property and Construction*, 18 (2). pp. 184-203.
- Harpur, AP, Boyce, KE and McConnell, NC (2013) An investigation into the circumstances surrounding fatal dwelling fires involving very young children. *Fire Safety Journal*, 61. pp. 72-82.
- Haurin, D, McGreal, S, Adair, A, Brown, L and Webb, JR (2013) List price and sales prices of residential properties during booms and busts. *Journal of Housing Economics*, 22. pp. 1-10.
- Hess, S, Ryley, T, Davison, L and Adler, T (2013) Improving the quality of demand forecasts through cross nested logit: a stated choice case study of airport, airline and access mode choice. *Transportmetrica A: Transport Science*, 9 (4). pp. 358-384.
- Hu, L, Delichatsios, M, Li, J, Zhang, X, Wang, S and Huo, R (2012) Experimental study on diffusive solid combustion behavior during transition from normal- to reduced-gravity. *International Journal of Heat and Mass Transfer*, 55 (7-8). pp. 2035-2043.
- Hu, L, Lu, K, Delichatsios, M, He, L and Tang, F (2012) An experimental investigation and statistical characterization of intermittent flame ejecting behavior of enclosure fires with an opening. *Combustion and Flame*, 159 (3). pp. 1178-1184.
- Hu, L, Wang, Q, Delichatsios, M, Tang, F, Zhang, X and Lu, S (2013) Flame height and lift-off of turbulent buoyant jet diffusion flames in a reduced pressure atmosphere. *Fuel*, 109. pp. 234-240.
- Huang, MJ and Hewitt, NJ (2013) The experimental analysis of the effect of ambient factors on the defrosting of economised vapour injection compressor air source heat pump in marine climates. *International Journal of Refrigeration*, 36 (3). pp. 820-827.
- Huang, Y, McIlveen-Wright, D, Rezvani, S, Huang, MJ, Wang, YD, Roskilly, AP and Hewitt, N (2013) Comparative techno-economic analysis of biomass fuelled combined heat and power for commercial buildings. *Applied Energy*, 112. pp. 518-525.
- Huang, Y, Wang, MH, Stephenson, P, Rezvani, S, McIlveen-Wright, D, Minchener, AJ, Hewitt, N, Dave, A and Fleche, A (2012) Hybrid coal-fired power plants with CO₂ capture: A technical and economic evaluation based on computational simulations. *Fuel*, 101. pp. 244-253.
- Huang, Y, Wang, Y, Rezvani, S, McIlveen-Wright, D, Anderson, M, Mondol, JD, Zacharopoulos, A and Hewitt, N (2012) A techno-economic assessment of biomass fuelled trigeneration system integrated with organic Rankine cycle. *Applied Thermal Engineering*, 53(2). pp. 325-331.
- Hutchison, N, Fraser, P, Adair, AS and Rahul, S (2012) Regime shifts in ex post UK commercial property risk premiums. *Journal of Property Research*, 29 (3). pp. 247-269.
- Jay, S, Klenke, T, Ahlhorn, F and Ritchie, H (2012) Early European Experience in Marine Spatial Planning: Planning the German Exclusive Economic Zone. *European Planning Studies*, 20 (12). pp. 2013-2031.
- Johnston, HT, Hamill, GA, Wilson, PR and Ryan, D (2013) Influence of a boundary on the development of a propeller wash. *Ocean Engineering*, 61. pp. 50-55.

- Joseph, P and Tretsiakova-McNally, S (2012) Combustion behaviours of chemically modified polyacrylonitrile polymers containing phosphorylamino groups. *Polymer Degradation and Stability*, 97 (12). pp. 2531-2535.
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- Kamruzzaman, M and Hine, J (2013) Self-proxy agreement and weekly school travel behaviour in a sectarian divided society. *Journal of Transport Geography*, 23. pp. 74-85.
- Keatley, P, Shibli, A and Hewitt, N (2013) Estimating power plant start costs in cyclic operation. *Applied Energy*, 111. pp. 550-557.
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- Kim, S, Kim, S, Ryu, D and Choi, SK (2013) Fire resistance of U-shape hybrid composite beam. *Journal of Korean Society of Steel Construction*, 25 (4). pp. 379-388.
- Kitagawa, K, Joseph, P, Novozhilov, V and Shimada, T (2012) Characteristics of chemically modified and nanocomposite polymers as novel fuels for hybrid rocket propulsion. *International Journal of Energetic Materials and Chemical Propulsion*, 11 (6). pp. 549-566.
- Kwaśniewski, L, Ali, F and Balcerzak, M (2013) Coupled structural-thermal calculations for restrained steel columns in fire. *Journal of Structural Fire Engineering*, 4 (1). pp. 59-70.
- Lee, YP, Delichatsios, M and Ohmiya, Y (2012) The physics of the outflow from the opening of an enclosure fire and re-examination of Yokoi's correlation. *Fire Safety Journal*, 49. pp. 82-88.
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5.2 Books/Chapters in Books

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5.3 Research Reports

Adair, A, McGreal, S and McIlhatton, D (2012) Northern Ireland Quarterly House Price Index for Q3 2012 Report 112. Northern Ireland Housing Executive and Bank of Ireland. University of Ulster. 8 pp.

Adair, A, McGreal, S and McIlhatton, D (2012) Northern Ireland Quarterly House Price Index for Q2 2012 Report 111. Northern Ireland Housing Executive and Bank of Ireland. University of Ulster. 8 pp.

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Adair, A, McGreal, S, McIlhatton, D and McCord, J (2013) Northern Ireland Quarterly House Price Index for Q4 2012 Report 113. Northern Ireland Housing Executive and Bank of Ireland. University of Ulster. 8 pp.

Haran, M, Davis, P, McCord, M, McGreal, S, Newell, G and Grissom, T (2012) Commercial real estate investment: Co-integration and portfolio optimisation. European Public Real Estate Association. European Public Real Estate Association. 36 pp.

Ritchie, H, Yates, K, Kidd, S and Magowan, L (2013) Irish Sea issues and opportunities. University of Ulster University of Ulster. 36 pp.

Young, G, O'Sullivan, T, Redmond, D, Blair, N, Cave, S and Gibb, K (2012) Crossing borders. BRIC Partnership: Rural Development Council (RDC); Northern Ireland Housing Executive (NIHE); TIDES Training, Northern Ireland Housing Executive. 126 pp.

5.4 Published Conference Papers

Artamendi, I, Phillips, P, Allen, B and Woodward, D (2013) Development of UK proprietary asphalt surfacing skid resistance and texture. In: Airfield and Highway Pavement 2013, Los Angeles. American Society of Civil Engineers. 10 pp.

Eadie, R, McKeown, C, Millar, P, Odeyinka, H and McMorran, G (2012) Public and private sector views of electronic government tendering in light of the Glover report in Northern Ireland. In: 7th International Conference on Innovation in Architecture, Engineering and Construction (AEC), Sao Paulo, Brazil. Escola Politecnica, University of Sao Paulo Brazil. 12 pp.

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Eadie, R, Millar, P, McKeown, C and Courtney, K (2012) An analysis of public sector procurement in Ireland. In: International Conference on Civil Engineering Design and Construction (Science and Practice), Varna, Bulgaria. 6 pp.

Eadie, R, Millar, P, McKeown, C and Ferguson, M (2012) The feasibility and rationale for using early contractor involvement ECI in Northern Ireland. In: 7th International Conference on Innovation in Architecture, Engineering and Construction (AEC), Sao Paulo, Brazil. Escola Politecnica, University of Sao Paulo Brazil. 13 pp.

Friel, S and Woodward, D (2013) Predicting the development of asphalt surfacing properties in Ireland. In: Airfield and Highway Pavement 2013, Los Angeles. American Society of Civil Engineers. 12 pp.

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Joseph, P, Kitagawa, K, Novozhilov, V and Shimada, T (2012) Reactive and additive routes to novel polymer-based fuels for hybrid propulsion. In: 9th International Conference on Flow Dynamics, Sendai, Japan. Global COE Program, Tohoku University, Japan. 2 pp.

Joseph, P, Tretsiakova-McNally, S and Byrne, C (2013) Effects on the combustion behaviour of polyacrylonitrile (PAN) polymers modified with covalently-bound penta-valent phosphorus under different chemical environments. In: Fire and Materials 2013, San Francisco, USA. Interscience Communications, London, UK. 12 pp.

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Mitchell, R, Woodward, D and Ryan, D (2013) Use of microwave conditioning to rapidly age asphalt mixes. In: Airfield and Highway Pavement 2013, Los Angeles. American Society of Civil Engineers. 8 pp.

Mondol, JD, Kishore, VVN, Smyth, M, Zacharopoulos, A, Kansal, A and Anderson, M (2013) Solar accelerator anaerobic digester design for small-scale bio-gas production. In: 21st European Biomass Conference and Exhibition, Copenhagen, Denmark. ETA-Florence Renewable Energies 5 pp.

Mondol, JD, Smyth, M, Zacharopoulos, A and Damasen, P (2012) Comparative performance analysis of solar heat exchangers for solar hot water systems. In: EuroSun 2012, Rijeka. Croatian Solar Energy Association Rijeka, Vukovarska 58, Croatia. 8 pp.

Woodward, D, Millar, P, Friel, S and Waddell, C (2013) Measuring grip and the contact patch. In: Airfield and Highway Pavement 2013, Los Angeles. American Society of Civil Engineers. 12 pp.

Zacharopoulos, A, Paul, DI, Mondol, JD and Smyth, M (2012) Optical characterisation of a PV concentrator under simulated and realistic solar conditions using an isolated cell PV module. In: EuroSun 2012, Rijeka. International Solar Energy Society. 8 pp.

6. RESEARCH FUNDING: NEW AWARDS NOTIFIED - 1 AUGUST 2012 - 31 JULY 2013

Research Institute Member	Title of Award	Funding Body	Value
Ali, Prof FA	The Smart Fire-blast Protection System	Invest NI – Proof of Concept	£105,455
Blair, Dr N Lloyd, Prof MG	CROSPLAN 2	INTERREG IVA	£30,335
Davis, Dr PT Ali, Prof FA Boyce, Dr KE Haran, Dr I Haran, Dr M Hyde, Dr TJ Lyness, Dr JF McCluskey, Dr WJ McCord, Dr M McGreal, Prof WS McIlhatton, Dr D	HARMONISE: Holistic Approach to Resilience and Systematic Actions to make Large Scale Urban Built Infrastructure Secure	CEC – Framework 7 - Security	£284,761
Delichatsios, Prof M	Experimental and Modelling work on Large-Area Fires	Atomic Weapons Establishment	£90,000
Delichatsios, Prof M	Flame behaviours from enclosure fires over facades in tall buildings	The Royal Society	£12,000
Delichatsios, Prof M Zhang, Dr J	ELISSA: Energy efficient lightweight-sustainable-safe-steel construction	CEC – Framework 7	£285,996
Delichatsios, Prof M Zhang, Dr J	Fire hazards of exterior wall assemblies	Fire Protection Research Foundation	£9,641
Griffiths, Dr PW Huang, Dr M Hewitt, Prof NJ	MERITS – More Effective use of Renewables Including Compact Seasonal Thermal Energy Storage	CEC – Framework 7	£233,296
Haran, Dr M McCluskey, Dr WJ Davis, Dr PT Ali, Prof FA Lloyd, Prof MG McGreal, Prof WS McIlhatton, Dr D McCord, Dr M	COBACORE – Community Based Comprehensive Recovery	CEC – Framework 7 - Security	£414,560
Hewitt, Prof NJ	Higher Education EU Support Fund – Theme Leader Energy (NICP)	DEL	£197,013
Hewitt, Prof NJ Huang, Dr M Huang, Dr Y	POREEN: Partnering Opportunities between Europe and China in Renewable Energies and Environmental Industries	CEC – Framework 7 – Marie Curie RTN	£62,273

Research Institute Member	Title of Award	Funding Body	Value
Hewitt, Prof NJ Griffiths, Dr PW Huang, Dr M Huang, Dr Y Keatley, Dr P	SPIRE – Storage Platform for the Integration of Renewable Energy	INTERREG IVA	£2,932,732
Hewitt, Prof NJ Huang, Dr M	Interdisciplinary Centre for Storage, Transformation and Upgrading of Thermal Energy (i-STUTE)	EPSRC/ESRC	£831,903
Hyde, Dr TJ	High Performance Vacuum Flat Plate Solar Thermal Collectors for Hot Water and Process Heat	EPSRC	£270,608
Makarov, Dr DV Molkov, Prof V	SUSANA: Support to Safety Analysis of Hydrogen and Fuel Cell Technologies	CEC – Framework 7 – Fuel Cell Hydrogen	£249,640
Makarov, Dr DV Joseph, Dr P Molkov, Prof V	Integrated safety strategies for on-board Hydrogen Storage Systems	EPSRC	£970,514
McAnulty, Miss U	Review of Housing Association Governance	Various Housing Associations	£17,789
McCord, Dr M Berry, Prof JN McGreal, Prof WS Haran, Dr M McIlhatton, Dr D	Unlocking Land	NIHE	£30,000
McGreal, Prof WS McCord, Dr M McAnulty, Miss U Adair, Prof AS McIlhatton, Dr D	House Prices, Rents & Affordability	NIHE	£295,000
McLernon, Dr CT	Congruent Assessment and Feedback that Satisfies Education and Students in Higher Education	Higher Education Academy	£6,420
Molkov, Prof V	HyResponse	CEC – Framework 7 – Fuel Cell Hydrogen	£269,923
Mondol, Dr J	Development of Solar Concentrating Technologies for Rural Tanzanian Communities	The Royal Society – International Exchange Scheme	£5,950
Nadjai, Prof A	LOCAFI	CEC – Coal and Steel	£78,185
Smyth, Dr MA Mondol, Dr J Zacharopoulos, Dr A McLarnon, Mr D	Hybrid Photovoltaic/Solar Thermal (HyPV/T) Façade Module	Invest Northern Ireland – Proof of Concept	£105,792
Zacharopoulos, Dr A Mondol, Dr J Smyth, Dr MA Hyde, Dr TJ	Concentrating Photovoltaic Evacuated Glazing (CoPEG) multi-functional building façade element	Invest Northern Ireland – Proof of Concept	£105,382

