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# Sustainable Retrofitting of Commercial Buildings

*Cool climates*

Edited by  
**Simon Burton**



# SUSTAINABLE RETROFITTING OF COMMERCIAL BUILDINGS

COOL CLIMATES

EDITED BY SIMON BURTON

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# SUSTAINABLE RETROFITTING OF COMMERCIAL BUILDINGS

Whilst sustainability is already an important driver in the new building sector, this book explores how those involved in refurbishment of commercial building are moving this agenda forward. It includes chapters by developers, surveyors, cost consultants, architects, building physicists and other players, on the role they can each play in enabling refurbishment to be commercially, environmentally and socially sustainable. Case studies from northern climates show real examples of different building types, ages and uses and will demonstrate what action has been taken to create more sustainable buildings.

The chapters raise and discuss all the relevant issues that need to be considered in retrofitting decision-making. Changing standards, planning, process management, financing, technical issues, site organisation, commissioning and subsequent building management are all considered. *Sustainable Retrofitting of Commercial Buildings* demonstrates that buildings can be made comfortable to occupy, easy to manage and low in energy demand and environmental impact.

**Simon Burton** has worked in the field of energy conservation in buildings and urban areas for more than twenty years. He was a Director of ECD Energy and Environment and subsequently a Regional Director with AECOM in London. He has been responsible for several UK government research projects.

## NOTES ON CONTRIBUTORS

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Simon Burton originally trained as an engineer and urban planner. He subsequently worked in the field of energy conservation in buildings and urban areas for more than twenty-five years. He was a Director of ECD Energy and Environment and subsequently a Regional Director with the Sustainable Development Group at AECOM in London, previous Faber Maunsell. For several years he lived in Brussels and carried out many European Commission supported projects on energy efficiency and renewable energy sources in both new and existing buildings. Low-carbon refurbishment of buildings has been a focus area in the last ten years, leading to editing of 'Energy Efficient Office Refurbishment' in 2001 and writing *The Handbook of Sustainable Refurbishment: Housing*, published by Earthscan/Routledge in 2011.

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John Davies is the Head of Sustainability at Derwent London plc and is responsible for creating and leading the company wide sustainability agenda. John is a highly experienced sustainability management professional, with over fifteen years in industry. He is recognised as an expert in several sectors, in particular commercial property, and has developed and led the creation of many industry leading tools and initiatives. He writes extensively in the sustainability press and sits on many industry panels and committees.

Prior to joining Derwent London, John was Head of Sustainability at Davis Langdon where he was responsible for developing and delivering its range of sustainability services and forming strong relationships across its key client base. Before joining Davis Langdon, John worked in the client domain as a sustainability advisor on a range of major projects and organisations, most notably at BAA, where he lead the sustainability agenda within the T5 design phase and the £10bn Capital Projects function as their Capital Projects Sustainability Manager.

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Having worked on environmental and corporate responsibility issues for a number of global organisations operating in a variety of sectors, Ursula Hartenberger joined RICS in 2006 as Head of EU Policy and Public Affairs, leading the organisation's strategy on energy efficiency, sustainable construction and urban development. In 2009, she took on the role of RICS Global Head of Sustainability and is responsible for coordinating the organisation's strategic activities with regard to capacity building, communication, research and global engagement with decision-makers and sectoral partners. She is member of a series of international sustainable development platforms and stakeholder groups and has been closely involved in RICS publications

and initiatives regarding the value implications of sustainability in the built environment and associated investment decision-making. Holding a Masters Degree in Art Market Valuation, Ursula writes for external publications and academic journals and is a regular speaker at international conferences.

### **Bill Gething, MA (Cantab) Dipl Arch RIBA**

Bill Gething is Professor of Architecture at the University of the West of England, an architect and sustainability consultant, having been a long-standing partner of the architectural and urban design practice Feilden Clegg Bradley Studios. He is a Visiting Professor at the University of Bath and an external examiner at the Architectural Association and the Bartlett School of Architecture, UCL.

He was the RIBA President's Sustainability Advisor from 2003 to 2009 and was lead author of the Green Overlay to the RIBA Plan of Work in 2011. He wrote a briefing report in 2010 setting out the agenda for climate adaptation in the built environment to support design teams involved with UK Technology Strategy Board's Design for Future Climate programme and has drawn out lessons learnt in the first tranche of funded projects in his book *Design for Climate Change*.

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Nigel is a Chartered Quantity Surveyor and is a Director at AECOM. Nigel has over twenty-eight years of experience in the construction industry covering a broad range of building projects and types.

Nigel is based in London as part of the Commercial Office team and specialises in refurbishment projects. He was on the Steering Group with CIRIA for their publication *Good Practice Guidance for the Refurbishing of Occupied Buildings*. He is also the author of the 'Cost Model for Office Refurbishments' published in *Building* magazine. He has been involved in many refurbishments projects with established leading property developers in London such as Derwent London and Land Securities, and buildings such as The Johnson Building, Page Street, 80 Charlotte Street and 20 Eastbourne Terrace.

He is experienced in understanding the cost drivers for refurbishment in order to provide clients with the right strategic advice for a successful project.

### **Dan Staniaszek, MA (Oxon) MSc CEng MEI**

Dan heads up Sustainability Consulting Ltd, offering freelance consultancy services in the sustainable energy space. He is currently working with the Brussels-based Building Performance Institute Europe, where his responsibilities have included heading up BPIE's data management, renovation and financing portfolios, as well as developing BPIE's modelling and scenario



analysis capabilities. His current role builds on a broad experience base spanning twenty-seven years, including fifteen in senior positions. In various advisory roles in the UK public/non-profit sector at national, regional and local level, he has influenced the design of EU Directives and UK energy policy, including the Renewables Obligation and the Energy Efficiency Obligation, and directed a wide variety of initiatives, including evaluation, certification and knowledge management services. He has also worked with numerous UK and international consultancies.

### **Lizi Cushen, M Arca ARB**

Having studied at the Royal College of Art in London, and had previous experience working for acclaimed UK Passivhaus practitioner, Justin Bere, Lizi joined Allford Hall Monaghan Morris in 2010 as a Part II Architectural Assistant. She qualified as an Architect from Cambridge University in 2012 and has a broad range of experience on residential, commercial and public realm schemes including Green Tea, London. Lizi was also Project Architect for AHMM's BREEAM Outstanding offices, completed in 2013.

She takes an active role in AHMM's sustainability working group which has successfully promoted low energy design across the practice and is working to develop the practice's reference library.

### **Nick Baker**

Nick Baker qualified in physics and after a brief period working in medical physics, he moved to building science as a teacher, researcher and consultant. He has recently retired from University of Cambridge Department of Architecture, where he was involved with several EU-funded research projects, mainly in the fields of building energy, daylight, natural ventilation and comfort, on which he has published many papers. During this time he has written several books, including *The Handbook of Sustainable Refurbishment*, and contributed to others on comfort and sustainability.

### **David Richards, BSc (Hons) CEng**

David Richards is a Director of building design in Arup. Originally a mechanical engineer he has developed an understanding of integrated design founded on a rich and varied project experience in the UK, America and Middle East. Since 2012 he has been leading the facades team in London and the UK. Dave's particular skills are the strategic planning of the building form, facade performance and passive low energy design. He has a particular focus on the energy performance of the building envelope and the interaction with the mechanical and passive systems of a building. He has led integrated engineering teams on a variety of projects including headquarter office buildings, commercial developments, cultural facilities, university campus buildings and airports.

Dave has a strong interest in the subject of learning and has been a visiting tutor of environmental design at the Architectural Association, The Bartlett, MIT, Columbia University and the University of Pennsylvania.

### **Ljubomir Jankovic, BSc PhD FIAP CEng MCIBSE**

Ljubomir Jankovic has worked as an academic, researcher and practitioner on instrumental monitoring, dynamic simulation, and environmental design of buildings for almost three decades. He studied for his undergraduate degree at the University of Belgrade and his PhD at the University of Birmingham. He is a Chartered Engineer, a Member of CIBSE, and a Fellow of the Institution of Analysts and Programmers. His book *Designing Zero Carbon Buildings Using Dynamic Simulation Methods* was published by Routledge in 2012. He was conferred as Professor of Zero Carbon Design by Birmingham City University in 2013.

### **Paul Appleby, BSc (Hons) CEng FCIBSE FRSA**

Paul Appleby advises design and master-planning teams on the integrated sustainable design of buildings and communities. He has worked in the construction industry as a consultant, lecturer and researcher for forty-five years, working on award winning projects with some of the world's leading architects and developers. As well as writing some seventy publications, including key guidance published by CIBSE and others, his book *Integrated Sustainable Design of Buildings* has appeared in a list of the Cambridge University's 'Top 40 Sustainability Books of 2010'. His follow up, *Sustainable Retrofit and Facilities Management* was published in January 2013. He is a Built Environment Expert for the Commission for Architecture and the Built Environment (Cabe), involved in Design Reviews for major projects seeking planning approval, and is actively involved with the UK Green Building Council, sitting on its Policy Committee and Retrofit Incentives Task Group.



## PREFACE AND ACKNOWLEDGEMENTS

This book is the companion volume to one with the same title for 'Warm Climates' published by Earthscan/Routledge in 2013, edited by Professor Richard Hyde from Sydney University. Many of the buildings issues are similar for both cold and warm climates, and with climate change this is likely to become more so in the future. For this and other reasons, the approach taken in this book is to focus on the buildings industry and examine how the various players are thinking about and responding to the challenge of sustainable retrofitting of our existing non-domestic buildings, be they historic, outdated, unmanageable, energy guzzlers or simply ready to be refurbished.

The authors of the various chapters are experts in their field, drawn from leading companies, universities and other organisations. The content of the chapters is therefore the view of the individual authors and although this inevitably leads to some overlap and differences of opinion, and many stylistic differences, the whole book has been designed and edited to give a comprehensive picture of the subject, from different perspectives. As the authors are mostly the partners, or typically represent the partners, necessary for major refurbishment projects, we can understand how the different approaches and emphases need to be brought together for a successful product.

As well as acknowledging the contributions of all the chapter authors, it is important to remember all those contributing information for the case studies included in Chapter 15. Many people are involved before a good case study can be presented and these case studies are short summaries only of many years of work, leading to insights into the real world of commercial refurbishment.

My thanks therefore go to all the chapter authors, those providing information and text for the case studies, all the organisations providing back up and permission to use their buildings as case studies, and the photographers who in all cases have given their photographs for free. Several other individuals have been most helpful, offering suggestions, information, comment and support and I would particularly like to thank Nic Crawley, Roderic Bunn and Lionel Delorme in this context. Additionally there are others without whose support this book would never have been produced, at Routledge, Nicki Dennis for the invitation and support and Alice Aldous for constant organisational back up, and my partner Daphne Davies for unfailing encouragement and enthusiasm for the project.

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# INTRODUCTION

*Simon Burton*

Most of the world's scientific community believe that the apparent climate change is manmade, being largely caused by emissions from the use of fossil fuels, and we know that around 40 per cent of this energy is used in buildings. Reducing energy use in our building stock is thus a major concern, with the associated need to make the buildings resilient to the climatic changes that are already apparent and inevitably will become more severe in the future.

Energy is used in the materials and process of construction and in all aspects of using and managing the building for as long as it is occupied. The latter includes energy used for the building itself – ventilating, lighting, heating, etc. – the electrical appliances and equipment in and around the building, the water used, transport of people to and from the building, and so on. This book focuses on the decision-making and process of retrofitting existing commercial buildings to use less energy in all these areas and how this can be achieved at the same time as enhancing the other aspects of sustainability, related wider environmental and social issues.

## **RETROFITTING IS MORE SUSTAINABLE THAN DEMOLITION, BUT CAN WE DO MORE?**

Why are we interested in sustainable retrofitting of non-domestic buildings? We know that new buildings can be quite easily built to be environmentally friendly, and legislation inexorably moves us in this direction. But in most countries we have a large stock of offices and other non-housing buildings that are certainly not efficient to run nor necessarily comfortable to work in, so their future must be to either demolish them or refurbish them. There are at least three valid reasons for refurbishment rather than demolition: the building may be an important historic building; it may be capable of refurbishment at lower cost than demolition and new build; or it may be considered that the environmental impact is less if it is refurbished rather than demolished.