



### Profession

Sustainability Consultant

### Current Position

Principal and founder:  
Twinn Sustainability Innovation

### Contact information

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### Previous employment

28 years with Ove Arup & Partners  
Director & Arup Fellow

### Nationality

British

### Qualification

BSc (Hons) Architectural Engineering  
Chartered Engineer 1985

### Professional Associations

Honorary Fellow of Royal Institute of  
British Architects  
Fellow of Royal Society of Arts  
Fellow of Chartered Institution of  
Building Services Engineers  
Corporate Member: Energy Institute

### Selected Committees & Roles

The EDGE Think-tank: Committee  
UK Design Council: Expert Associate  
Sustainable Development Foundation:  
Board member  
LETI - Low Energy Transformation  
Initiative: Board member  
LETI – Retrofit Task group leader

Chris is a strategic sustainability and zero carbon adviser with more than 40 years' experience in the design and construction of the built environment. Taking a 'Total Design' systemic approach to integrating planning & policy, architecture, engineering, building physics & economics, he is recognised as a world leader in this field. Meanwhile he continues his in-depth involvement in the practical design and delivery of fabric and systems for environmentally sensitive buildings.

He has demonstrated the ability to recognise the most appropriate design, policy and business solutions, drawing on his extensive experience of applying locally suitable solutions in many different markets around the world.

Much of his recent work has focused on how sustainability can cost less than business-as-usual through a process of questioning conventional technical and institutional practises. A Smart building environment should need smaller & fewer systems and materials, so offering the opportunity to cost less.

*"Chris has a unique experience combination covering policy formulation, planning, design and the delivery of projects seeking advanced levels of sustainability"*

### Selected projects:

#### Green Futures Partnership – Future energy assessment methods

Research and recommendations for assessing retrofit options in existing building stock. Examined both current and future direction for delivering zero carbon homes. In collaboration with Altair Ltd for a group of major UK housing associations with portfolio of 300,000 homes.

#### LETI Climate Emergency Retrofit Guide - project lead

How to decarbonise our existing homes – researching "How many, how deep, at what cost" with some 80 LETI contributors, for publication summer 2022.

#### LETI Climate Emergency Design Guide co-author

Published by LETI (Low Energy Transformation Initiative) 2020 in response to the Climate Emergency declarations. What does 'good' look like for net zero carbon new-build.

#### Parkhouse Street mixed use development, London

Strategic design and planning advisor to developer Joseph Homes for 110 homes and 1500m<sup>2</sup> commercial development in 11-storey high-density constrained city site. Exploits advanced high efficiency 'fabric first' to achieve 'Heat Autonomy' and natural ventilation cooled homes within standard cost benchmarks. Targeting operational energy consumption of 80% better than current building regulations, with in-built route-map to zero-carbon.

#### BEIS research into low carbon non-domestic HVAC

Examining technology options for retrofitting low and zero carbon HVAC systems into a range of non-domestic building types. Included wider

HKGBC Advancing Net Zero: Judging panel technical committee. Jun 2021

CIBSE: TM16 'Heat pump installations for multi-unit residential buildings': steering group member

CIBSE: TM17 'Heat pumps for large non-domestic buildings': steering group member

UKGBC: 'Net Zero Whole Life Carbon Roadmap - A Pathway to Net Zero for the UK Built Environment': workstream member

UK Building Regulation Overheating-Approved Document: BRAC working group member

Solar Decathlon judging panel Dubai Nov 2018

UKGBC Advancing Net Zero Task Group: Management Committee

Haringey: Quality Design Review Panel Highams Park Neighbourhood Planning Group: TWG chairman

Highams Park Community Interest Company: Director

CIBSE: HVAC SIG vice-chair

CIBSE: Sustainability Guide L task group Committee

CIBSE: AM10 Natural Ventilation in Non-domestic Buildings - co-author

CIBSE: Natural Ventilation SIG Committee

Chatham House: Specialist advisor

English Heritage: Urban Panel

China Green Building Council – UK Chapter Committee

UK-China Eco-cities and Green Buildings Group

BRE: Global Sustainability Board member overseeing BREEAM/CSH

RIBA: Sustainable Futures Committee.

RIBA: Building Regulation Part L Review Group.

UK-GBC: Ambassador.

UKGBC: Zero Carbon Definition Task Group.

UKGBC: Pay as You Save (Financing Low Energy Refurbishment in Housing) Task Group.

UKGBC: Policy & Technical Rapid Response Team

Zero Carbon Hub: Compliance & Policy Assumptions Task Group.

London First: Decentralised Energy Steering Group

CIBSE/RIBA: Architectural Guide to Building Services: management committee

industry workshops with CIBSE, technical parameter research and output reviews for the creation of policy modelling software.

#### **Kinyinya Hill, Kigali, Rwanda**

Masterplan for 135,000 population Kigali urban extension. Technical, economic, policy and governance strategic input for delivering advanced zero carbon, water autonomy, transport modal shift and 80% affordable homes for less than business-as-usual costs. Collaboration with SWECO consultants Sweden, drawing on best of European and African high-density urban design and Smart systems thinking. Development of cost valued resource-use targets, with IFC Edge-buildings localised cost benefit tool for establishing 50% reductions for building energy use, zero carbon, 50% water reductions and 65% embodied energy reductions.

#### **Silvan Grove mixed use development, London**

Strategic design and planning advisor to developer Joseph Homes for 220 homes and 3000m<sup>2</sup> commercial development in a 30-storey high density constrained city site. Advanced high efficiency 'fabric first', 'Heat Autonomy' homes and Smart fitout standards for delivering increased occupiable space and less plant, within standard cost benchmarks. Targeting operational energy consumption of 70% better than current building regulations, with in-built route-map to zero-carbon.

#### **Residential 'Heat Autonomy' (how to design-out district heating)**

Research exploring the cost 'sweet point' where eliminating conventional heating systems pays for Passivhaus type levels of envelope fabric thermal performance. Internal heat gains then become the only heat source needed for both domestic hot water and space heating. Allows exceptionally low capacity heat system with heat pump enhanced winter performance and eliminates the need for district heat networks. Overall energy demands meet Paris-proof zero carbon targets. Research results published in CIBSE peer reviewed technical paper to encourage wide dissemination

#### **Jersey Archive Building, Channel Islands. (original building & subsequent extension)**

Feasibility, outline and detailed design for a new archive and repository building. Passive environmental control to achieve PD5454 ±5% relative humidity close-control using only passive moisture and thermal abilities of the building fabric with natural ventilation. Lead R&D for developing analytical techniques and building physics software, the design and site implementation, and in-operation monitoring. Subsequently used environmental monitoring feedback analysis as part of design input into subsequent zero-carbon enabled further phase of building of below conventional cost benchmarks.

#### **Rockingham Street Office Tower, London**

Strategic design advisor to developer Joseph Homes for office development on high density constrained city site, proposing advanced high efficiency 'fabric first' and Smart fitout standards for delivering increased occupied space and less plant, but within standard cost benchmarks. Targeting operational energy consumption of 60% better than current building regulations, zero-carbon for regulated energy and 10% reduced embodied energy use.

#### **Kota Harapan Indah, Jakarta, Indonesia**

Technical, economic, policy and governance strategic masterplan input for 150,000 population urban extension masterplan. Collaboration with CPG Consultants of Singapore, to deliver the best of European and East

CIBSE: AM10 Non-domestic Natural Ventilation Application Guide management committee / co-author

### Selected publications

'LETI Climate Emergency Retrofit Guide' contributing author, LETI 2021

'LETI Climate Emergency Design Guide' co-author, LETI 2020

'Hydrogen: A decarbonisation route for heat in buildings?' lead author, LETI 2021

'Heat Autonomy - Life after District Heating' author of peer reviewed technical paper CIBSE National conference April 2019

'The Design Companion for Planning and Placemaking' chapter author UDL/RIBA Publishing 2017

'Professionalism, sustainability and the public interest: what next?' technical paper, Building Research & Information, 41:1, 123-128, Routledge 2013

The EDGE Futures series: Globalism and Regionalism, with Jonathan Porritt, Black Dog Publishing 2008

'Mixed-Mode Ventilation Design' CIBSE Applications Manual 13:2000, section author

'Urban Office' chapter author 'European Directory of Sustainable & Energy Efficient Buildings 1997', James & James

'The New Parliamentary Building' (Portcullis House) author of technical paper CIBSE National Conference 1997

'Passive control of relative humidity to  $\pm 5\%$ ' author of technical paper CIBSE National Conference 1997

'Urban Office of the Future?' CIBSE Journal March 1996

### Selected Awards

Building Services Engineer of the Year: H&V Awards 2002 for BedZED

Environmental Initiative of the Year: Building Services Awards 2002

Air Movement Product of the Year: H&V Awards 2002, for BedZED wind cowls working with specialist contractors, academics, and suppliers

Building Services Engineer of the Year: H&V Awards 1996

Green Building of the Year: HVAC Awards 1996, for Inland Revenue Centre Nottingham

Green Building of the Year: HVAC Awards 1996, for Queen's Building Anglia Polytechnic University

Asian high-density urban design and Smart systems thinking. Development of cost valued resource-use targets, with IFC Edge-buildings as localised cost benefit tool for establishing 50% reductions for energy, water and materials impacts.

### Madinat Al Irfan Masterplan, Oman

Brief preparation, client design advisor / design review and design team selection for 5 million m<sup>2</sup>, 280,000 population mixed-use urban extension seeking 'Next stage' sustainability - to deliver 50% energy, 50% water, 50% car-use reductions, while doubled GFA, all at less than benchmarked capital costs. Involved new delivery governance framework, which has now commenced on site. Client was Omran, the Omani government's development corporation, masterplanners were Allies and Morrison and infrastructure engineers Arup.

### Design Companion for Planning & Placemaking, chapter author

Published by UDL/RIBA in 2017, with associated planning officer training on topics including environmental standards, microclimates and impacts of tall buildings and their clustering

### Dudley College Advance II, England

Passive environmental strategic design for a new faculty building as part of an integrated design and responsibility team (IPI and Constructing Excellence demonstrator). Working as a key member of the contractor's team and their supply chain to deliver high performance building with advanced low energy use at significantly lower than normal capital resource use and running costs.

### Urban Design London

Lecturer and coach for planning officer and councillor training. Focus on social technical and planning process, covering environmental standards, urban design principles, innovation opportunities, current policy critique, new policy formulation and negotiation approach. Includes a particular stream on high-rise building energy, microclimate and environmental issues.

### Research project for evolving UK new energy building regulations

Led the EDGE think-tank preparation of an industry thought piece performance-based alternative to the current process-compliance Building Regulations. Involved harnessing Smart systems monitored in-use new homes performance. Draws on first-hand experience of using similar principles in the Australian NABERS assessment system.

### Chatham House: UK-China Bilateral Reform and Innovation Forum

UK delegation team member to the PR of China. Forum established in 2014 by Premier Li Keqiang and Prime Minister David Cameron. Involves minister level UK-China engagement (Ministry of Housing, Urban-Rural Development), identifying best practice exchange.

### Barangaroo Development, Sydney

500,000m<sup>2</sup> mixed use, carbon-neutral, water-positive, high-density urban new-build winning project on behalf of developer Lend Lease. ESD training for local team, design concept testing for masterplan and for subsequent phase one high-rise offices / mixed-use buildings.

**Selected projects – continued:****Construction Industry Council ZCB Building, Hong Kong**

Initiated the idea for a Zero Carbon demonstration building in the Kai Tak Kowloon City District regeneration area to act as a trigger for local debate about carbon reductions. Designed to harness passive design features, including natural ventilation for a humid climate. Responsible for competition winning concept building design and then assisted local engineering design team and architect Ronald Lu & Partners, through to detailed design.

**Dongtan Eco-City, Chongming, Shanghai**

Masterplanning, concept design, technology testing & associated business strategy for energy aspects of a carbon neutral city to allow a 'one planet' lifestyle Eco-footprint. Involved developing the governance and end-user engagement mechanisms together with proof of technical systems reviews. Outline business model for procuring utilities and its influence on technical design solutions.

**UK-China Eco-cities and Green Buildings Group**

Best Practice Guide preparation and associated engagement with Chinese municipal policymakers, sponsored by the UK Government Prosperity Fund and the Chinese MOHURD and Finance Ministries. Publication seeks to illustrate the best of UK practice published in June 2012. Member and author contributor to finance section committee.

**Deir Al-Surian Library & Archive, Egypt**

Designer for a new 3-storey plus basement library and archive building within the grounds of the Al-Surian Monastery seeking to provide a low capital & running cost, locally appropriate, solution for storage of unique historic manuscripts. Harnesses the local climate matched with appropriate construction materials and details, to provide a completely passive approach without any air conditioning, thus mimicking the successful artefact preservation over the previous many hundreds of years. Responsible for the concept design of building physics and mechanical systems.

**Policy consultation responses**

Lead collaborator for consultation responses on the National Planning Policy Framework 2018, the London Plan 2017, the London Environmental Strategy 2017. Organised consultations and prepared drafts for the EDGE think-tank, LETI and CIBSE.

**California Academy of Sciences, San Francisco.**

New natural history museum that fully integrates green building features to reflect its mission to protect the natural world. Includes a naturally ventilated 5500m<sup>2</sup> 3-storey exhibit hall, research laboratories, naturally ventilated open offices, classrooms, an auditorium, an organic cafeteria, and five levels of collections housing 18 million natural history specimens, achieving LEED Platinum environmental rating. Responsibilities for the strategic and detailed design of natural ventilation environmental control systems.

**Kings Cross Central, London**

Preparing the masterplan strategic energy and water resource advice and the planning application Energy Statement for 800,000m<sup>2</sup> redevelopment & regeneration project.

**Bow River Village**

Strategy research and development of a tailoring German 'Passivhaus' standards to UK climate, cost benchmarks and construction capabilities, working with Southern Housing Group on high-density affordable homes. Aiming for significant energy, occupant bills and maintenance cost reductions, as well as redirecting capital to delivering more homes and less infrastructure. Governance input for appointing design team & implementation, and planning application strategy.

**Good Homes Alliance Dwelling Overheating Project**

Preparation of strategic stage design advice to assist planning officers identifying projects where overheating is likely to become an issue, particularly with high-density homes.

**Chinese 12th Five Year Plan Consultation**

Formulated response to PRC National Development and Reform Commission's Open Request Campaign for improving the Construction Industry's response to the carbon emission targets for buildings and associated infrastructure.

**UK National Audit Office Sustainable Buildings**

Study to generate a profile of the relative sustainability of recent government building projects and value for money in assessing sustainability objectives. Fieldwork and analysis to benchmark government buildings in sustainability terms and interviews to establish how value for money concerns are being incorporated and whether there are lessons from alternative approaches used in the public and private sector.

**UK Commission for Architecture & Built Environment Sustainable Cities Manual**

Contributing author and technical advisor for the preparation of a manual for town planners and associated professionals

**Beddington Zero-energy Development (BedZED), UK**

Mixed-use sustainability development of 85 homes. Designed to be zero fossil energy using advanced low energy building design with carbon-neutral biomass CHP. Extensive water and materials recycling. Photovoltaic solar power generation for electric cars. Responsible for concept, design and implementation for buildings services, building physics and energy systems. Likewise, for the design concept, development and testing of wind powered heat recovery ventilation cowls. Involved working closely with innovation research partners.

**London 2012 Olympics Utilities Procurement**

Initial concept design of site and legacy as extension of the Stratford City development energy strategy. Procurement strategy & financial model for transfer of capital procurement to energy services company (ESCO).

**Stratford City & 2012 Olympic Village, London**

1,200,000m<sup>2</sup> mixed-used development with 300-unit retail centre. Development of sustainability strategy, including pathway to 80% carbon reductions and community wide energy systems together with associated planning offer. Collaborated on developing and establishing the governance framework for subsequent teams to implement across the site.

**New Parliamentary Building (23,000m<sup>2</sup>), Portcullis House, Westminster, London**

Building fabric thermal capacity used to control indoor climate. Night ventilation natural cooling. Highly integrated services, structure and architecture. Ventilated facade with full heat recovery. Direct aquifer cooling source. Low energy use services systems. Responsible for building physics and mechanical systems concept and detailed design. Involved close collaboration with academic colleagues for testing the extent to which passive environmental control could displace conventional mechanical systems.

**Hermes Responsible Investment, London**

Develop a 'cost benefit analysis of sustainability improvements' for Hermes Real Estate Investment Management Ltd real estate assets. Builds on existing knowledge, tools and systems developed in-house over the last 15 years.

**Lancaster West Estate Refurbishment, London**

Architectural ideas stage of residents' co-design upgrade for more than 1000 homes. Invited collectively by the top name architectural practices involved to work with them to help identify worldwide environmental and refurbishment best practice. Involved extensive face-to-face collaboration with residents on knowledge building and optioneering.

**New United States Embassy in London.**

Developed the environmental sustainability brief / program for the US Department of State. Involved proposing benchmarks and testing them against political, planning and operational issues and then providing guidance on solutions.

**Vanke Beijing Green Building Park**

Design leader for the first phase of an innovation park to demonstrate future best practice in PR of China. The Visitor's Centre building design targeted 'true operational zero carbon' and BREEAM 'Outstanding' environmental assessment.

**Samsung Zero-energy House, Seoul** Carbon neutral demonstration building with on-site energy autonomy & 80% water use reduction as part of the first LEED® Platinum certified project in East Asia. Responsible for team delivering concept design and implementation design checking.

**Kingspan Zero-carbon Lighthouse, UK**

First completed building to achieve Level 6 zero-carbon of the UK's new Code for Sustainable Homes. Concept, detailed design and site implementation for building physics & building services systems.

**Bickleigh Downs Eco-village, UK**

Concept and detailed design for a 90-home new development to deliver net 'Zero Energy Bills' - going beyond zero carbon as part of a more customer focused sustainability design approach for a major contractor

**The Crystal, Siemens Urban Sustainability Centre, London**

Expert technical advisor for public exhibition. Specialist sustainability consultancy review and advice on strategic public messages for exhibition, worldwide case-studies selection, examples of best practice legislation & policy. Building certified with the highest grades of BREEAM 'Outstanding' and LEED 'Platinum'.

**Hanham Hall Carbon Challenge, Bristol, UK**

Working for national house builder Barratt on the design of the first English Partnership Zero Carbon development. Responsible for energy systems concept design and sustainability assessment.

**Pennbury Ecotown, Leicester, UK**

Team member developing the masterplan for a new zero carbon town of some 15,000 homes and 20000m<sup>2</sup> mixed use. Overseeing energy concept design and sustainability concept coordination.

**Inland Revenue Centre, Nottingham (40,000m<sup>2</sup>)**

Concept design for first office building to achieve maximum BREEAM environmental assessment rating. Natural ventilation with passive cooling and stack ventilation extract. Involved working closely with academia and industry researchers to develop new analytical prediction and verification techniques.

**English Partnership Energy Strategy**

Study to develop a range of options to assist the development of energy and service supply strategies on all EPs future development activity. Energy services consultancy including financial and organisational modelling. Involved developing a bulk data and grouped parameter analysis technique software.

**Adapting to Climate Change Publication**

Authorship of a Best Practice Guide for Developers for the South East Climate Change Partnership of south east England regional authorities. Research, review and critique examples of best practice to support planning authorities as they formulate local policies and negotiate development planning applications.

**Jubilee Wharf, Penryn**

Community focused mixed-use waterfront regeneration development. Local, reclaimed and low environmental impact materials. Super-insulated with high thermal mass & heat recovery wind cowl driven natural ventilation. Extra low water demand & low electrical demand systems. Renewable energy includes wood-pellet boilers, solar hot water, solar PV & wind turbines for delivering zero carbon

**Earth Centre Conference Building, Doncaster**

Solar collectors fuelled heating via inter-seasonal heat-store. Wind powered ventilation with heat recovery. Photovoltaic solar and wind turbine power generation. Recycled and low embodied materials. Concept and detailed design for building physics, energy systems and building services.

**Anglia Polytechnic (Ruskin) University, Queen's Building Learning Resource Centre, Chelmsford**

6000m<sup>2</sup> atrium stack-driven building, natural ventilated with night purge system to provide 100% natural cooling. Low NO<sub>x</sub> condensing boiler installation. EU funded demonstration project. 1996 Green Building of the Year finalist.

**National Energy Foundation Headquarters, MK**

Natural cooling, natural ventilation & exemplar low energy use and low capital cost office building. Project engineer designer.

**Noble House, Linford Wood, Milton Keynes**

BREEAM 'Excellent' rated low-energy speculative office buildings (5100m<sup>2</sup>). Trailblazer project using the newly introduced (in 1991) world-first building design environmental assessment system. Project mechanical engineer.