

Institution: Oxford Brookes University		
Unit of Assessment: 13: Architecture, Built Environment and Planning		
Title of case study: <i>The Green Guide to Specification</i> – Reducing the environmental impacts of over 2,500,000 buildings worldwide		
Period when the underpinning research was undertaken: Methodology development and data gathering 1994-2009. Online tool impact data continuously updated between 2009 and present.		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
David Shiers	Reader in Sustainable Architecture;	[text removed for publication]
Miles Keeping	Associate Lecturer	
Daniel Rapson	Senior Lecturer	
	Research Associate	
Period when the claimed impact occurred: 1 August 2013 – 31 December 2020		
Is this case study continued from a case study submitted in 2014? Y		
1. Summary of the impact <p>The mission of the <i>Green Guide to Specification</i> is to reduce the negative environmental impacts of buildings by helping designers and manufacturers become more environmentally responsible.</p> <p>The <i>Green Guide</i> provides an easy-to-use, A+ to E environmental rating system for common construction materials. By showing a green 'score' for specific products, <i>Green Guide</i> makes it commercially imperative for materials producers to improve their environmental performance relative to other competing alternatives. It has been produced as part of research work within the former Real Estate and Land Policy (RELP) research group (now part of the consolidated Land, Design and Development research group) in the School of the Built Environment at Oxford Brookes University.</p> <p>The information in the <i>Green Guide</i> is based on quantitative, verifiable environmental impact assessment (EIA) and life-cycle assessment (LCA) data. Its tabular layout enables architects, building owners, property managers and policymakers to select the best environmental choices for their building projects. In this way they can reduce embodied and operational climate change impacts and harmful effects on ecosystems and human health.</p>		
2. Underpinning research <p>The current fourth edition of the <i>Green Guide to Specification</i> was co-written by David Shiers of Oxford Brookes University (OBU) and Jane Anderson, then of the Building Research Establishment (BRE). It profiles more than 1,600 materials and components, used in six generic building types (commercial, educational, healthcare, retail, residential and industrial), against 19 environmental impacts, including climate change, resources use, water extraction, wastes created and human toxicity (see 3.1 & 3.2). As of 2020, the online version profiles more than 2,000 materials and components.</p> <p>The <i>Green Guide</i> collates quantitative 'cradle-to-grave' LCA data for each environmental impact. The overall range of values is divided by six, and these data are then translated into a simple A+ to E tabular scale that can be used to assess materials and components, where A+ represents the best environmental option and E the worst (most environmental impact). For example, when considering the decision to specify the window type for a new residential building; a powder-coated (painted) aluminium-framed unit would be <i>Green Guide</i> rated overall as an 'E', while its timber equivalent (from a sustainable source) scores an A+.</p> <p>Early editions of the <i>Green Guide</i> used mainly UK LCA data. However, the international nature of many environmental concerns (such as resources use and atmospheric emissions) has now been</p>		

taken into account. The current edition uses a wider range of data sources and analytical models, including the Swiss database *EcoInvent*, and data and analytical factors developed by the UN's Intergovernmental Panel on Climate Change (IPCC). The system of environmental weightings used in the methodology was devised in collaboration with an independent international expert panel including representatives from the Sustainable Europe Research Institute (SERI), the World Wide Fund for Nature (WWF), the UK Environment Agency (EA), the United Nations Environment Programme (UNEP) and the Society for Environmental Toxicology and Chemistry (SETAC) LCA policy units (see the Shiers/Hamilton research papers in section 3).

David Shiers of OBU is the originator and developer of the methodology, and the lead author and project co-coordinator of all four editions of the *Green Guide*, undertaken in collaboration with BRE and the UK Construction Products Association (CPA). The development of the methodology and the accessible presentation of complex findings reflects the unique and tangible benefits of consultative, collaborative working that involved practising designers, specialists in materials science and environmental impact assessment, UK Government policymakers, building cost consultants, and construction industry and materials manufacturing representatives.

The development of the methodology and the collection of LCA/Environmental Impact Assessment (EIA) data, carried out in collaboration with BRE, was funded and supported by UK Government departments and agencies including the Department for Environment, Food and Rural Affairs (DEFRA), the Department for Business Innovation & Skills (now BEIS), the Department for Business, Enterprise and Regulatory Reform (BERR) and the Office of Government Commerce (Now the CCS); Waste reduction in the processed food sector (WRAP); private sector property owners and constructors; Royal Mail Property Holdings; the CPA and, for OBU staff time, by the Higher Education Funding Council for England (HEFCE).

3. References to the research

- 3.1 Anderson, J., **Shiers, D.**, & Steele, K. (2009). Current Edition: *The Green Guide to Specification* (4th ed.). Blackwell-Wiley & IHS/BRE, (226pp). ISBN: 9781848060715 (Peer reviewed by international expert panel)
- 3.2 The current on-line, interactive version of *Green Guide* (2020) is available through: <https://www.bregroup.com/greenguide/podpage.jsp?id=2126>
- 3.3 Hamilton, L., Edwards, S., Aizlewood, C., **Shiers, D.**, Thistlethwaite, P., & Steele, K. (2007). *Creating environmental weightings for construction products* (BRE Research Study 493). IHS/BRE, ISBN: 9781860819681
- 3.4 Aizlewood, C., Edwards, S., Hamilton, L., **Shiers, D.** & Steel K. (2007). *Environmental weightings; their use in environmental assessment* (BRE Information Paper IP 4/07). IHS/BRE, ISBN: 9781860819674
- 3.5 **Shiers, D.**, **Rapson, D.**, Roberts, C., & **Keeping, M.** (2006). Sustainable Construction: the development and evaluation of an environmental profiling system. *Construction Management & Economics*, 24(11), 1177-1184, DOI:10.1080/01446190600892987. (Refereed journal paper) Submitted to RAE2008, Oxford Brookes University, UoA31-Town and Country Planning, DE Shiers, RA2, Output 2.
- 3.6 Anderson, J. **Shiers, D.** & Sinclair, M. (2002). *The Green Guide to Specification* (3rd Edition utilising 2001 methodology and datasets; refereed by UK expert panels). Blackwell Science ISBN 978-0632059614 & 0-632-05961-3

4. Details of the impact

The first publicly available edition of the *Green Guide to Specification*, published in 1998 and launched by the then UK Construction Minister, Nick Raynsford MP, provided the **world's first reliable, quantitative method of evaluating and comparing the environmental impacts of construction materials**. Even now, in the UK and globally, there are still no regulatory requirements for designers, building owners and project managers to use low environmental impact materials. Under current UK building regulations, a material or component is only required to be 'fit for purpose', reach the relevant British Standard and achieve (where appropriate) the correct thermal performance. Hence to significantly reduce the environmental impact of buildings developers and building owners worldwide have been encouraged to use voluntary schemes such as *Green Guide* and the Building Research Establishment Environmental Assessment Method

(BREEAM) by the Government, local authorities and other regulatory bodies.

BREEAM certification

As well as being a stand-alone design guide, the *Green Guide* has been part of the BREEAM certification system since 1998. It is used by BREEAM as the mechanism to measure the environmental impact of specifications for key building elements. The elements assessed and the value of the particular credits varies within each BREEAM scheme. Worldwide, there are more than 558,200 BREEAM-certified buildings (an estimated 92,000 since 2013), and around 2,260,300 projects (an additional 230,000 since 2013) have been registered for BREEAM assessment. The briefing paper 'Assessing Carbon Emissions in BREEAM' demonstrated that **the average CO₂ saving for a BREEAM-assessed 'green' commercial building is 22%**, while a **BREEAM Excellent building reduces carbon emissions by 33%** (BRE, 2015, 2017 & 2019) (sources 1).

The ways in which materials are profiled as part of the BREEAM programme may change as the system moves towards using the environmental standard EN 15804. The *Green Guide to Specification* will remain online until 2025 (two years beyond the 2023 completion date for BREEAM UK New Construction design stage assessments) so that projects can get the recognition required for specification choices. Certified Environmental Profiles will continue to be published on the Green Book Live (www.greenbooklive.com), and certificates will be listed for the period of their validity. **The *Green Guide* will therefore remain relevant and in use until 2023.**

Benefits to building occupiers and owners

The use of materials highly rated in the *Green Guide* leads to better indoor air quality in buildings. According to the World Green Building Council, this **increases productivity of occupants by as much as 8–11%, improves their general health and morale, and reduces absenteeism** (<https://www.worldgbc.org/clean-air-buildings> and <https://www.worldgbc.org/benefits-green-buildings>, 2016). The *Green Guide* must be used in order for a building to be BREEAM rated, and these projects **can command up to a 30% increase in asset value over traditional buildings** (see page 5, the BRE 2016 Briefing paper (in sources 1) & 'Capturing the value of sustainability: Identifying the links between sustainability and business value' (2018), available [here](#)). The *Green Guide* is also used as the key text on materials selection by the UK Green Building Council (UKGBC, 2019), the International Energy Agency's Energy in Buildings and Communities Programme (IEA EBC, 2019) and the National Building Specification (NBS, 2018), as well as the Better Buildings Partnership, LaSalle Investment Management and Morgan Lovell Office Design (2019) (sources 2, 5, 8 & 10).

Code for Sustainable Homes

Between 2007 and 2015, **the *Green Guide* set the materials standards for the UK Government's National Planning Policy Framework for Energy Efficient Homes**, as part of the UK's Code for Sustainable Homes (see page 92–124, Technical Guidance, source 11). It was **used on almost 300,000 dwellings in total**, with over 90,000 between 2013 and 2014 (see Department for Communities and Local Government, Statistical Release February 2015, source 11). In the Code, **the use of the *Green Guide* as the chosen materials design guide for the London 2012 Olympics remained as a legacy** in the ongoing development of the Queen Elizabeth Park (see page 18, London Legacy Development Corporation Environmental Sustainability Report 2015/16, available [here](#)).

Reducing environmental impacts

Not only the *Green Guide* remains as an important part of the BREEAM programme, it is also used as a stand-alone design guide by organisations such as the Crown Estate and the Greater London Authority (GLA). In the Mayor of London's Sustainable Design and Construction Supplementary Planning Guidance on the Design and Construction of Affordable Homes (2016), **the *Green Guide* was a key resource in design guidance**: 'minimising the environmental impact of materials in construction and minimising waste [...] by selecting environmentally sensitive materials through the *Green Guide to Specification* and which are responsibly sourced and do not release harmful fumes' (see source 4). The GLA owns approximately 650 hectares of land and

property worth an estimated £750 million (GLA Property Asset Strategy, 2020, available [here](#)).

The concrete industry recommends that its manufacturers and design engineers refer to the *Green Guide* to reduce their sector's environmental impacts. In 2011, data showed that the energy use for concrete production had fallen by around 11% compared to the 2008 baseline (CPA, 2012). The UK CPA names the *Green Guide* as a source of guidance as it monitors the environmental performance of UK materials producers. In 2016, **it introduced a series of waste reduction targets using Green Guide LCA base data**, and other action plans to continue to 'green' the sector (source 3).

Use of *Green Guide* ratings in construction and real estate sector

Construction and property businesses use *Green Guide* ratings to publicise their commitment to greater environmental responsibility. In 2016, the Better Buildings Partnership identified several schemes where *Green Guide* performance was quoted to indicate standards higher than industry norms. For example, on a refurbishment project on London's William IV Street, the developers Shaftesbury Estates stated that 'More than 80% of new building materials and elements were responsibly sourced using the *Green Guide to Specification*' (source 10). At Hammerson's Elliot's Field shopping park in Rugby, '91% of materials for the building shell achieved a *Green Guide to Specification* rating of A or above' (source 10). Organisations such as LaSalle Investment Management and the Morgan Lovell Office Design consultancy cite the *Green Guide* as a key source of advice when they select materials (sources 10).

The Crown Estate is a £14.3 billion UK real-estate business, and uses the *Green Guide* as a key source of advice in both its office fit-out guide and its retail and leisure design standards (source 9, 2019). As well as the concrete industry, as mentioned earlier, **product manufacturers in the steel, roofing, flooring and insulation sectors also use the Green Guide to publicise their green commitment and promote better practice** (source 7).

UK Local Authorities

The *Green Guide* is used to drive down the environmental impacts of construction projects by many local authorities across the UK, including Kent County Council, North Devon (Sustainable Construction Technical Appendix: DVS1A and ECN15) & Devon County Council (Sustainable Design & Construction Guide), Dundee (Sustainable Development Guide for Construction), Fife, Bristol, Newcastle City Council, Staffordshire, Glasgow, Edinburgh, Oldham & Rochdale and the London Borough of Camden (source 6).

According to Google Scholar, to date the *Green Guide* has been cited in research papers and reports 252 times. BRE/BREEAM continues to use, reference and publish explanations on *Green Guide*. For example, Gumra, S, & Abbe, O. (2017), 'Green Guide to Specification, Certified Environmental Profiles and BREEAM', briefing paper, BRE Centre for Sustainable Products, states 'In addition to providing an industry benchmark, Green Guide to Specification ratings also enable credits to be gained within current BREEAM schemes, such as BREEAM UK New Construction 2014' (page 2, available [here](#)), and J. Mundy (2015), 'The Green Guide Explained, BRE guidance for use of Green Guide in the BREEAM programme' highlights 'The document will be particularly useful to those who use the Green Guide as part of BREEAM (BRE Environmental Assessment Method) or as a part of their selection of specifications in design. It will also be useful for construction product manufacturers whose materials are included in the specifications of the Green Guide' (page 2, available [here](#)).

5. Sources to corroborate the impact

1. *Green Guide* is currently part of the BREEAM programmes; see, for example, Taylor, T. (2015) 'Assessing Carbon Emissions in BREEAM' ([Briefing Paper](#)). BRE; Soulti, E. & Leonard, D. (2016) 'The value of BREEAM A review of latest thinking in the commercial building sector' ([Briefing Paper](#)). BRE Global Ltd.; Gumra, S, & Abbe, O. (2017), 'Green Guide to Specification, Certified Environmental Profiles and BREEAM' ([Briefing Paper](#)). BRE Centre for Sustainable Products; Green Book Live (<https://www.greenbooklive.com/>) and BRE. Materials brochure, http://www.greenbooklive.com/filelibrary/environmental_profiles/KN4791_-

[Materials Brochure.pdf](#)

2. Used as a design guide by UK Green Building Council UKGBC (2019) see [http://pinpoint.ukgbc.org/resource/7679-the-green-guide-to-specification.php?tag\[0\]=construction-impacts](http://pinpoint.ukgbc.org/resource/7679-the-green-guide-to-specification.php?tag[0]=construction-impacts)
3. Used by the UK Steel Construction Industry, Insulation and Concrete manufacturers as key text on environmental impacts of materials (2019); see, for example, MPA The Concrete Centre, <https://www.concretecentre.com/Concrete-Design/Environmental-Assessment/Green-Guide-to-Specification.aspx>, MW Insulation Ltd, <http://mwinsulation.co.uk/news/january-2017-technical-update/> and Steel Construction https://www.steelconstruction.info/Sustainable_construction_legislation_regulation_and_drivers.
4. Greater London Authority (GLA), (2016). Housing Supplementary Planning Guidance (SPG). London Plan 2016 Implementation Framework. GLA. It states that the environmental impact of building materials is a specific consideration in Plan Policy 5.3 Sustainable Design and Construction. *Green Guide* is cited as key measure in selecting environmentally sensitive materials, see page 94 (available [here](#)). It is also cited in the GLA Design Guide (April 2014 – still current) and identified as a Mayor's Priority, see pages 60-62 of [Sustainable Design and Construction SPG](#)
5. International Energy Agency's (IEA) Energy in Buildings and Communities Programme, 2016. See IEA (2016). *Basics for the Assessment of Embodied Energy and Embodied GHG Emissions for Building Construction. Guideline for Designers and Consultants – Part 1*. IEA EBC Annex 57. Page 45 – *Green Guide* is a key text and design tool in this European design guide (available [here](#)).
6. London Borough of Camden Planning Guidance. Energy efficiency and adaptation (2019). *Green Guide* is referenced as a key source of guidance for developers when considering the environmental impact of the materials used within development, see page 44 (available [here](#)).
7. The UK Construction Products Association (2016); *Green Guide* is a key text, see pages 12-14 (available [here](#))
8. National Building Specification (NBS, 2018) identifies *Green Guide* as key source of information for the industry and provides updates on its development: <https://www.thenbs.com/news/the-road-to-breeam-uk-new-construction-2018>
9. The Crown Estate currently uses *Green Guide* as a design guide for both its office and retail developments: see page 7 of [Sustainability Fit Out Guide: Offices](#) and page 7 of [Sustainability Fit Out Guide: Retail and Leisure](#) (2019)
10. Better Buildings Partnership, La Salle and Morgan Lovell; *Green Guide* used as a key source of guidance: see, for example, BBP News 'Shaftesbury's Sustainable Refurbishment at 39 William IV Street' (01/12/2016, available [here](#)) and 'Two Sustainability World Firsts for Hammerson's Elliott's Field' (17/05/2018, available [here](#)); pages 12 and 20 of [LaSalle Sustainable Development and Refurbishment Standards](#)
11. Code for Sustainable Homes: see, for example, Department for Communities and Local Government (DCLG). Code for Sustainable Homes. Technical Guide (available [here](#)) and DCLG Code for Sustainable Homes Statistical Release, February 2015 (available [here](#))