

<p>Institution: Oxford Brookes University</p>
<p>Unit of Assessment: 16 - Architecture, Built Environment and Planning</p>
<p>Title of case study: The Green Guide to Specification – An Environmental Legacy. Reducing the Environmental Impact of Buildings</p>
<p>1. Summary of the impact (indicative maximum 100 words)</p> <p>The Green Guide to Specification is an environmental profiling system that enables designers and constructors to select building materials and components which have the lowest environmental impact. Designed and developed at Oxford Brookes University, the Green Guide methodology provides the construction industry with reliable environmental evaluations based on quantitative Life Cycle Assessment (LCA) data. Now in its 4th edition and part of the BREEAM and Code for Sustainable Homes programmes, Green Guide has been used to reduce environmental impacts for over 230,000 recorded construction projects, with a further 1.07 million projects registered awaiting certification worldwide. In 2009, the Green Guide was adopted as the official design standard for all construction materials used in the London 2012 Olympics.</p>
<p>2. Underpinning research (indicative maximum 500 words)</p> <p>David Shiers of Oxford Brookes is the originator and developer of the methodology, author and project co-coordinator in all the four editions of Green Guide. Prior to his work, no reliable method existed to evaluate and compare the environmental impacts of construction materials. The Green Guide measures the environmental impacts of each material or component, in terms of their effect on climate change, resources use, water extraction, wastes created, toxicity, ozone depletion, acidification and Eutrophication. The quantitative ‘cradle-to-grave’ Life Cycle Assessment (LCA) data for each impact and for each material is collated by dividing the overall range of values by six. The data is then translated into an easy-to-use A* to E rating system where A* is the best environmental option and E the worst. The first edition of Green Guide (using an A to C scale) utilised data from the Davis Langdon environmental data base, augmented by industry data available in the public domain at that time.</p> <p>The underpinning research consisted of two main elements:</p> <ul style="list-style-type: none"> • the collection of the required LCA data into an environmental database and • the design and development of the methodologies used to analyse and present the findings in a form which would be accessible and easy-to-use by researchers, product manufacturers, designers and property professionals. <p>The research, carried out in collaboration first with Davis Langdon and later with the Building Research Establishment (BRE), has been funded and supported throughout by UK Government departments and agencies including the Department for the Environment, Food and Rural Affairs (DEFRA), the Department of Business Innovation & Skills (BIS), the Department for Business, Enterprise and Regulatory Reform (BERR), the Office of Government Commerce (OGC), the Waste Reduction and Processing (WRAP), private sector property owners and constructors, the Construction Products Association (CPA) and the Higher Education Funding Council for England (HEFCE).</p> <p>Whilst the first and second editions of Green Guide predominately utilised UK environmental data gathered from industry and UK Government sources, over time, the international nature of many environmental concerns (including resources use and atmospheric emissions) has been increasingly accounted for in the Green Guide data collection and analysis. Green Guide now utilises a range of data sources and analytical models including:</p> <ul style="list-style-type: none"> • the Swiss database EcoInvent, • data and analytical factors developed by the UN’s Intergovernmental Panel on Climate Change (IPCC), • the Total Material Requirement (TMR) data used by the European Union and analytical models developed by the Wuppertal Institute. • Eurostat data covering imports of materials and resource use • models developed by the World Meteorological Organisation (WMO) defining the ozone depletion potential of different gases, • USES-LCA; the EU’s toxicity model. <p>After Green Guide was adopted as the materials profiling system for both the Code for Sustainable Homes (a legal requirement for all new homes in the UK from 2008 onwards) and the BREEAM programme (in 1998), the methodology was further refined and developed. In two studies</p>

Impact case study (REF3b)

produced in 2007; 'Creating Environmental Weightings for Construction Products' and "Environmental weightings in environmental assessment" (both by Hamilton, Edwards, Shiers et al), the system of environmental weightings used in the methodology was reviewed and revised in collaboration with an independent international expert panel, including representatives from; Sustainable Europe Research Institute in Vienna, WWF, UK Environment Agency, United Nations Environment Programme (UNEP) and the Society for Environmental Toxicology and Chemistry (SETAC) LCA policy units (see references to the research below).

As part of Green Guide's mission to improve the environmental performance of buildings and to encourage manufacturers to be more environmentally responsible, the latest (4th edition) of the Green Guide has also been made available as an on-line, accessible tool. This facility enables environmental assessors to up-load details of bespoke or innovative specifications in order to obtain their own green ratings using the Green Guide database. The current edition of the Guide contains some 19,000 individual results; profiling and comparing over 1200 materials and component combinations against sixteen different environmental parameters including climate change, resources use, etc. water extraction, wastes created, toxicity, ozone depletion, acidification and Eutrophication.

The evidence gathered over the years has enabled Green Guide to provide advice on the best environmental choices, supported by quantitative, verifiable data. This has encouraged many changes in practice including the use of materials from sustainably managed and renewable sources; the use of recycled materials and the use of materials which utilise fewer high-intensity industrial processes.

3. References to the research (indicative maximum of six references)

- Anderson, J., Shiers, D., & Steele, K. (2009) "The Green Guide to Specification" 4th Edition, Blackwell-Wiley & IHS, (226pp). ISBN: 9781848060715. (Peer reviewed by international expert panel). Also;3 previous Editions of Green Guide (1996 – 2001)
- Shiers D.E., Rapson D. et al (2006) "Sustainable Construction: the Development and Evaluation of an Environmental Profiling System", Construction Management & Economics, Vol 24, Numbers 10-12. (Refereed journal paper). DOI:10.1080/01446190600892987. Submitted to RAE2008, Oxford Brookes University, UoA31-Town and Country Planning, DE Shiers, RA2, Output 2.
- Hamilton L., Shiers D., et al (2007) "Creating environmental weightings for construction products" BRE Research Study 493; IHS/BRE ISBN: 9781860819681
- Aizlewood C., Edwards S., Hamilton L., Shiers D. and Steel K. (2007) "Environmental weightings; their use in environmental assessment" BRE Information Paper IP 4/07. IHS/BRE (Both reporting on the methodology developed by the international peer review experts). 9781860819674
- Dixon, T., Colantonio, A. Shiers, D. et al (2007) "A Green Profession? An Audit of International Sustainability Tools". RICS Research Report 39094 & Dixon, T. Colantonio, A. Shiers, D. et al (2008) "A green profession?: A global survey of RICS members and their engagement with the sustainability agenda", Journal of Property Investment & Finance., Vol 26, Number 6. (Refereed journal paper) DOI: 10.1108/14635780810908352
- Shiers D, (2000) "Green Developments: environmentally responsible buildings in the UK property sector", Journal of Property Management, Vol. 18, No 5. (Refereed journal paper). DOI: 10.1108/02637470010360650. Submitted to RAE2001, Oxford Brookes University, UoA33-Built Environment, DE Shiers, RA2, Output 4.

4. Details of the impact (indicative maximum 750 words)

Since its introduction in 1996, Green Guide has become the industry and legislative standard for the selection of lower environmental impact construction materials. From 2007 onwards, Green Guide rated materials have had to be specified as part of the Code for Sustainable Homes standards which are now required in order for any new residential development in the UK to be granted Planning Permission. Green Guide is also cited in the UK Government's Homes and Communities (HCA) Quality Standards (2007) and is the official UK Government Buying Standard for all construction products.

Government Buildings

Impact case study (REF3b)

In 2009, the Government stipulated that all of their publicly owned property should attain maximum Green Guide materials credits in order to achieve the BREEAM 'Excellent' standard required of all new government buildings.

UK Local Authorities

Greener construction materials offer many human health and welfare benefits in terms of using safer, less polluting, lower atmospheric emission producing materials. As a result of Green Guide being able to measure and compare materials against these issues, many UK Local Authorities have published design guides using Green Guide as a green standard for all housing and commercial construction projects requiring Planning Permission and Building Regulations. For example, in the London Mayor's, Greater London Authority (GLA) Planning Guidance notes, it is stated that that no high embodied impact materials shall be used "...as defined by the summary ratings set out in The Green Guide to Specification." (GLA, 2006; pp 37-38). The GLA design guide also uses Green Guide to set standards for the use of timber, insulation and the use of recycled materials. Similarly, Green Guide is the key reference text for materials selection in many commercial developments such as the 1.9 million sq ft Westfield Shopping Centre in East London and other UK Local Authority design guides including those cited below in Section 5: the Borough of Islington, 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 (Urban Design Guidance, 2010), Staffordshire, Glasgow, Edinburgh and Oldham & Rochdale.

International Standards

Green Guide has also provided a model and source of information across many international jurisdictions as other countries have sought to develop their own international standards for greener construction. BREEAM and Green Guide ratings are used in many countries worldwide including France, Belgium, Holland, Sweden, Poland and Germany and BREEAM is available in an international version to meet this demand.

Materials Producers

Once Green Guide began to rate materials using an A* – E scoring system, enabling property professionals to see and compare the environmental impacts of products, it became possible (and a commercial imperative) for materials producers to improve their environmental performance in order to enhance their social and green credentials. For example, 2011 data shows that the energy use for concrete production has fallen by around 11% compared to the 2008 baseline. The concrete industry has become increasingly active in the use of by-products, secondary materials and material diverted from the waste stream to reduce its demands on primary raw materials. The 2012 energy use target was achieved in 2010 when a quarter of the energy used in the concrete industry came from material derived from the waste stream (CPA, 2012). Although such behaviour change is also attributable to rising energy costs and more stringent legislation, the impact of Green Guide's rating system cannot be underestimated as it has become a key part of their marketing campaigns. Evidence of this can be seen in marketing material from the concrete industry, roofing materials producers, aluminium manufacturers and the producers of insulation materials (see Section 5 for examples).

A lasting legacy

The authors of Green Guide have produced a number of academic papers and reports, helping to broaden the research community's understanding of the environmental impacts of construction products. As stated in the London Olympic Development Plan in which Green Guide was used as the key text in determining the selection of construction materials, the challenge is to continue to "identify, source, and use environmentally and socially responsible materials... a key aspect... of delivering sustainable developments" in order to leave "a lasting social, economic and environmental legacy..." (ODA, 2007 & 2009)

5. Sources to corroborate the impact (indicative maximum of 10 references)

1. UK Government (2008 & 2011); The Strategy for Sustainable Construction. Section 13; Materials. Green Guide cited as the key reference text for the procurement and use of lower environmental impact materials in buildings in the UK. Department for Business,

Impact case study (REF3b)

Innovation and Skills (BIS). (Copies of the Strategy are available at: <http://www.bis.gov.uk/files/file46535.pdf> or <http://www.bis.gov.uk/policies/business-sectors/construction/low-carbon-construction-igt/sustainable-construction-strategy> and follow pdf link)

2. UK Government (Department of Environment, Food and Rural Affairs; DEFRA) Sustainable Development; the Official Government Buying Standard (2012). Uses Green Guide as the key reference in the Government Buying Standards for construction projects. (see: <http://sd.defra.gov.uk/advice/public/buying/products/buildings/>)
3. UK Government (Department of Communities and Local Government; CLG) (2006, 2010) Code for Sustainable Homes (CSH), Category 3 – Materials pages 92-123. Green Guide is the designated standard for lower impact construction materials as part of the CSH standard – now a planning permission requirement for all UK residential construction. (see: CLG PPS 22 & Planning Portal: http://www.planningportal.gov.uk/uploads/code_for_sust_homes.pdf and Technical Guide at: <http://bit.ly/16TDn3z>)
4. Olympic Delivery Authority (2007 & 2009) Sustainable Development Strategy for London 2012. All construction materials to achieve Green Guide standards Section 3: pp22-24 (See <http://www.strategicforum.org.uk/pdf/ODASDSfullpolicy.pdf>).
5. Waste Recycling and Processing programme (WRAP) Sustainability Tools and Approaches: Green Guide identified as key source of guidance on Aggregates use and Resource Efficiency. (See http://aggregain.wrap.org.uk/sustainability/sustainability_tools_and_approaches/green_guide_to.html)
6. The environmental performance of construction products in Green Guide is used by many materials manufacturing sectors in the UK as the standard method of measuring their products green credentials (See examples: Roofing materials; <http://www.marleyeternit.co.uk/Roofing/Concrete-Tiles/Modern-Interlocking-Tile.aspx> Concrete blocks; http://www.tarmacbuildingproducts.co.uk/products_and_services/blocks_and_mortar/blocks/aggregate_blocks/hemelite_standard.aspx; Insulation; <http://www.celotex.co.uk/Corporate/Sustainability/Celotex-Green-Guide-Rating-Explained>). See also UK Construction Products Association involvement: as a conduit of data from and to the materials producer. (see <http://www.constructionproducts.org.uk/sustainability-new/products/bre-green-guide/>)
7. Green Guide as a design standard and source of information on best environmental practice for many UK Local Authorities and other institutions and agencies. For examples see design guides from: Glasgow City Council: <http://www.glasgow.gov.uk/index.aspx?articleid=6280> ; the University of Cambridge see; <http://www.admin.cam.ac.uk/offices/em/sustainability/environment/guidance/building.html> : English Partnerships Quality Standards & Homes and Communities Agency (2007) p.7 & 25 specifying only A, B or C rated Green Guide materials to be used (see www.homesandcommunities.co.uk/download-doc/6437/10970)
8. Cited by the USA Green Guide to Health Care recommended as a source of environmentally responsible design practice (see <http://www.gghc.org/resources.greendesign.guidelines.php>). Also influenced the design of the Athena Institute's Eco Calculator as used in LEED and Green Globes schemes (see <http://www.athenasmi.org/our-software-data/ecocalculator/>).
9. British Standards Institute (BSI) (2012) PAS 82:2012. Green Guide as source of guidance and standards: 5.1.d / 8.5 .2 & BS 8905. (See <http://www.grantwestfield.co.uk/PDFs/PAS82.pdf>).- as used at the Westfield Retail Centre, London; for ALL tenant fit-outs.
10. UK Government Department for Education; Design Guide p.16 (see <https://www.education.gov.uk/publications/eOrderingDownload/28831%20SSLD%20Stairways%20lowres.pdf>)