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BRE methodology for environmental profiles of construction materials, components and buildings





Sound insulation designs, materials & "green" relevance

Dr Robin Hall, BRE. 2007



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BRE methodology for environmental profiles of construction materials, components and buildings



Why it's important to quantify environmental performance of products as well as acoustic performance



Presentation overview:

- BRE in a nutshell
- What is an environmental profile?
- Importance of environmental profiles for business
- Acoustics and sustainability

Conclusion



BRE background



- Established 80 years ago
- Dedicated to all aspects of the built environment
- Growing focus on improving environmental performance of buildings



Drivers behind growth in LCA and EP?

- Clients want more sustainable buildings (BREEAM and EcoHomes)
- To be able to bid for large contracts (health care LIFT, Building Schools for Future BSF, MOD)
- To know how your product compares to industry average
- Independent third party certification to prove environmental performance
- Fulfils ISO14001 continual improvement requirements
- To improve your manufacturing processes environmental 'hot spots'
- To increase business



What is an Environmental Profile?

Measurement of the <u>environmental performance</u> of a material, product or system over its lifetime.

- Extraction of raw materials & transport ("cradle to gate")
- Production ("gate to gate")
- Transport, installation and end of life ("gate to grave")

Achieved using Life Cycle Assessment (LCA)



What is an Environmental Profile?

- ISO14020 Environmental labels and declarations
- Type I voluntary
 - widely recognised environmental labels e.g. Nordic Swan
- Type II self declared environmental claim
- Type III LCA approach
 - 'nutritional label'
 - quantified environmental data linkage to ISO14040 series & LCA
 - BRE Environmental Profiles Certification Scheme



Environmental Profiles Methodology in UK

- 1990s Gov sponsored project
- 26 industry partners
- Industry agreed Methodology for LCA
- Transparent approach
- "Level playing field"
- Database of LCA information
- ISO 14040 compliant

BRE methodology for environmental profiles of construction materials, components and buildings





Simple example of LCA thinking

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Extraction → Creation → Maintenance → Disposal

Life Cycle Analysis in Construction



Environmental Profiling measures

























Environmental Profiles 1999

- Climate Change
- Fossil fuel depletion 2.
- Ozone depletion 3.
- Transport congestion **4**.
- Low level ozone creation 5. 5.
- Air pollution (hum.tox) 6.
- Waste generation 7.
- Water extraction 8.
- Mineral extraction 9
- 10. Water pollution (hum.tox)
- Water pollution (eco.tox)
- 12. Eutrophication
- **13**. Acid deposition

Environmental Profiles 2007

- Climate Change 1.
- Fossil fuel depletion 2.
- Ozone depletion 3.
- 4. Nuclear waste
 - Low level ozone creation
- 6. Human toxicity
- 7. Waste generation
- Water extraction 8
- Mineral extraction 9

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- 10. Ecotoxicity to water
- 11. Ecotoxicity to land
- 12. Eutrophication
- **13**. Acid deposition

Derivation of Ecopoints

Impacts





Data -

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Weighting





E C O P Ν S

Characterised Profile

Approved environmental pro	ofile						
BRE Manufacture of 1 too Characterised & Normalised data for: Concrete Roof Tiles Quality of Data Start Date Jan-97 End Date Dec-97 Source of Data 2 Manufactures, 4 Sites Geography UK Representativeness Current Practice in the UK LCA Methodology BRE Allocation 100% to product by value Date of Data Entry Apr-99 Broundary Cradio to Gata	• Example: 1 ton	ne of concrete roof tiles					
Issues	Units	Characterised Data					
Climate Change	kgCO2 eq (100yr)	270					
Acid Deposition	kgSO2 eq	2.2					
Ozone Depletion	kgCFC11 eq	0.000001					
Pollution to Air: Human Toxicity	kg.tox	3.3					
Pollution to Air: Low Level Ozone Creation	kg ethene eq (POCP)	0.076					
Fossil Fuel Depletion and Extraction	toe	0.048					
Pollution to Water: Human Toxicity	kg.tox	0.0000058					
Pollution to Water: Ecotoxicity	m3 tox	1.1					
Pollution to Water: Eutrophication	kg.PO4 eq.	0.18					
Minerals Extraction	tonnes	1					
Water Extraction	litres	1500					
Waste Disposal	tonnes	0.11					

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Normalised Profile

BRE		Approved env	aronmentai prome
			Manufacture of 1 tonne
	Characterised 8	& Normalised data for:	Concrete Roof Tiles
			Quality of Data
	S	tart Date	Jan-97
	E	nd Date	Dec-97
	S	ource of Data	2 Manufacturers, 4 Sites
	G	eography	UK
	R	epresentativeness	Current Practice in the UK
	L	CA Methodology	BRE

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Compared to UK citizen & weighted

Issues	One UK Citizen	Normalised	Weighting	Ecopoints		
		Data				
Climate Change	12270 kgCO2 eq (100yr)	0.022	21.64	0.836		
Acid Deposition	58.88 kgSO2 eq	0.037	11.66	0.1887		
Ozone Depletion	0.28595 kgCFC11 eq	0.003	9.83	0.0246		
Pollution to Air: Human Toxicity	90.7 kg.tox	0.036	9.13	0.0936		
Pollution to Air: Low Level Ozone Creation	32.23 kg ethene eq (POCP)	0.0024	8.64	0.01968		
Fossil Fuel Depletion and Extraction	4.085 toe	0.012	8.59	0.144		
Pollution to Water: Human Toxicity	0.02746 kg.tox	0.000021	8.24	0.000147		
Pollution to Water: Ecotoxicity	837600 m3 tox	0.0000013	8.04	0.0000055		
Pollution to Water: Eutrophication	8.006 kg.PO4 eq.	0.022	7.69	0.0946		
Minerals Extraction	5.04 tonnes	0.2	3.28	0.7		
Water Extraction	417600 litres	0.0036	3.03	0.01944		
Waste Disposal	7.194 tonnes	0.015	0.2	0.0915		
			Total	2.22		

Cradie to Grave over 80 year Building Line

The EPD



Approved Environmental 1 Characterised and Normalised Data for: 1 equare metre of Installed External Wall: Cav 140mm Enviromacomy Cellular (Fairfoord) 9M Boundary .

. 6 . 6	 e e blookwork inner leaf placterboard 									
Quality of Data for Certil Start Date End Date	fied Material (Data for other cons 1 November 2004 30 November 2005	tituent materials are	available i							
Source of Data Geography	Sompany records UK									
Representativeness	1 site representing 100% of Er	oed/Split)								
LCA Methodology	BRE Environmental Profiles M 100% to Product	ethodology								
Date of Data Entry Boundary	28 January 2008 Cradie to installation on Site									
Comments										
Issue		Characterised Data	Unit							
Climate Change		41	kg CO2 et							
Aold Deposition		0.36	kg SO2 eq							
Ozone Depletion		7.8E-11	kg CFC11							
Pollution to Air: Human	Toxicity	0.48	kg tox.							
Pollution to Air: Photoe	hemioal Ozone Creation Potenti	al 0.025	kg ethene							
Pollution to Water: Hun	nan Toxiolty	0.000000018	kg tox.							
Pollution to Water: Eco	toxicity	4.8	m* tox.							
Pollution to Water: Eutr	rephication	0.031	kg PO4 eq							
Fossil Fuel Depletion		0.01	100							
Minerals Extraction		0.42	tonnes							
Water Extraction		320	litres							
Waste Disposal		0.034	tonnes							
Transport Pollution & C	Congection: Freight	77	torine.km							
Issue		Normalised Data	UK Cilizan							

Pollution to Water: Eutrophication	0.031	kg PO4 eq
Fossil Fuel Depletion	0.01	toe
Minerals Extraction	0.42	tonnes
Water Extraction	320	litres
Waste Disposal	0.034	tonnes
Transport Pollution & Congection: Freight	77	tonne.km
Issue No	ormalised Data	UK Citter/
Climate Change	0.0033	12300 kg
Aold Deposition	0.0061	68.9 kg (
Ozone Depletion	2.8E-10	0.288 kg
Pollution to Air: Human Toxioity	0.0063	90.7 kg t
Pollution to Air: Photochemical Ozone Creation Potential	0.00079	32.2 kg (
Pollution to Water: Human Toxiolty	0.0000014	0.0117 k
Pollution to Water: Ecotoxicity	0.000028	178000 r
Pollution to Water: Eutrophication	0.0039	8.01 kg i
Fossil Fuel Depletion	0.0025	4.09 toe
Mineraic Extraotion	0.083	6.04 ton:
Water Extraotion	0.00077	418000 I
Waste Disposal	0.0047	7.19 ton:
Transport Pollution & Congection: Freight	0.018	4140 ton
Primary Energy	0.45	GJ
BRE Ecopoints Score	0.68	Ecopoin

Comments		
Issue Ch	aracterised Data	Unit
Climate Change	64	kg CO2 eq. (100yr)
Aold Deposition	0.66	kg 8O2 eq.
Ozone Depletion	1.2E-10	kg CFC11 eq.
Pollution to Air: Human Toxioty	0.73	kg tox.
Pollution to Air: Photochemical Ozone Creation Potential	0.062	kg ethene eq.
Pollution to Water: Human Toxiolty	2.4E-08	kg tox.
Pollution to Water: Ecotoxicity	6.9	m ^a tex.
Pollution to Water: Eutrophication	0.047	kg PO4 eq.
Fossil Fuel Depletion	0.017	toe
Minerals Extraction	0.63	tonnes
Water Extraction	500	litres
Wacte Disposal	0.62	tonnes
Transport Pollution & Congestion: Freight	120	tonne.km
Issue No	rmalised Data	UK Ciltren's Impects
Climate Change	0.0052	12300 kg CO2 eq. (100yr)
Apid Deposition	0.0084	68.9 kg 8O2 eq.
Ozone Depletion	4.1E-10	0.288 kg CFC11 eq.
Pollution to Air: Human Toxicity	0.0081	90.7 kg tox.
Pollution to Air: Photochemical Ozone Creation Potential	0.0019	32.2 kg ethene eq.
Pollution to Water: Human Toxiolty	0.0000021	0.0117 kg tox.
Pollution to Water: Ecotoxicity	0.000038	178000 m ^a tox.
Pollution to Water: Eutrophication	0.0059	8.01 kg PO4 eq.
Fossil Fuel Depletion	0.0042	4.09 toe
Minerals Extraotion	0.12	6.04 tonnes
Water Extraotion	0.0012	418000 litres
Waste Disposal	0.072	7.19 tonnes
Transport Pollution & Congestion: Freight	0.028	4140 tonne.km
Primary Energy	0_76	GJ
BRE Ecopoints Score	1.3	Ecopoints

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 Appendix No:
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 Valid From:
 10/03/06
 Valid To:
 09/03/09

 Issue No:
 1

 Signed on behalf of BRE Certification:
 C K Beedel

BRE Certification Ltd., Gantton, Watford WD25 SIG: Tel 01923 054100 Fax 01923 054003 www.brecertification.co.uk

The Environmental Profile – An independent product declaration

ENVIRONMENTAL GUIDE sustainable roofing systems

I G VINI FLOOTING

Approved Environmental Profile



Kingspan Therma zero ODP ENVIRONMENTAL PROFILE A N







The Green Guides to Specifications

The Green Guide to Housing Specification



An Environmental Profiling System for building materials and components used in housing

Jane Anderson Nigel Howard

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Simple to use

- Element based
- Environmental impacts of building elements
- Based on LCA
- A,B,C rating

Commercial Green Guide



Domestic Green Guide

EcoHomes (). BRE

Functional unit: 1 m² to satisfy building regulations, in particular a U value of 0.45 W/m²K.

A B C ratings have been assessed across all External walls specifications. However for ease of use, this element has been split into two sections:

• framed construction, and

• cavity and solid walls.

External walls

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Functional unit: 1 m ² to satisfy building regulations, in particular a U value of 0.45 W/m ² K. External walls	External walls	Summary Rating	Climate change	Fossil fuel depletion	Ozone depletion	Freight transport	Human toxicity	Waste disposal	Water extraction	Acid deposition	Ecotoxicity	Eutrophication	Summer smog	Minerals extraction	Cast	Typical replacement interval	Recycled input	Recyclability	Currently recycled	Energy saved by recycling
Annual Ratio	Framed wall construction																			
	Brickwork outer leaf, insulation,	Α	А	А	А	А	А	В	A	А	А	А	А	А	£50-£70	60	С	Α	А	А
Framed wall construction	steel frame, plasterboard, paint																			
Brickwork outer leaf, insulation, A A A A A A A	Brickwork, timber frame with insulation,	Α	А	А	A	А	A	В	A	A	Α	A	А	А	£50–£68	60	С	A	A	А
Brickwork, timber frame with insulation, A A A A A A A	plasterboard, paint																			
Canadian Cedar weatherboarding, timber B A A A C A	Canadian Cedar weatherboarding, timber	В	Α	Α	A	С	А	А	A	A	Α	Α	А	А	£52–£72	30	С	В	В	В
Clay tiles, battens, timber frame with A A A B A A	frame with insulation, plasterboard, paint																			
Concrete tiles, battens, timber frame A A A A A A A A A A A A	Clay tiles, battens, timber frame with	Α	Α	А	В	А	А	А	A	A	А	Α	А	А	£60-£79	60	C	A	С	А
Painted, pre-treated softwood weather A A A A A A A A A A A	insulation, plasterboard, paint																			
plasterboard, paint	Concrete tiles, battens, timber frame	Α	А	А	Α	А	А	А	В	А	Α	А	А	А	£67–£81	60	С	Α	С	А
with insulation, plasterboard, paint	with insulation, plasterboard, paint																			
aluminium framework, insulation, asrated blockwork wall	Painted, pre-treated softwood weather	Α	А	А	Α	А	А	А	Α	Α	Α	С	С	А	£43-£62	30	С	В	С	В
plasterboard/plaster, paint	boarding, timber frame with insulation,			~~~																
	plasterboard, paint																			
	PVC weatherboarding, timber frame	С	С	С	С	А	С	А	A	С	С	А	А	Α	£57-£82	30	С	С	С	С
	with insulation, plasterboard, paint			0.000		262.22				, n.,	<u> </u>		20241							
	Terracotta rainscreen cladding,	Α	В	А	Α	А	В	Α	Α	В	А	Α	Α	Α	£155–£220	30	Α	Α	Α	А
	aluminium framework, insulation.																			
E	aerated blockwork wall.																			
	plasterboard/plaster, paint																			



Ecopoints

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Environmental impact of constituent materials (Ecopoints) in a roof element

The use of the Green Guides: rating

- Demonstrates whole building performance at design stage
- Ranks on scale:
 - –Pass
 - -Good
 - -Very Good
 - Excellent





The Use of the Green Guides

- Architects and building specifiers
- Integral part of BRE's environmental assessment methods for buildings (BREEAM & Ecohomes):
- Government estate
- Housing Corporation
- English Partnerships
- Schools for the Future
- WDA

Very Good

Excellent

Code for Sustainable Homes

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BRE Certification: Environmental Profiles

- Sister company to BRE
- Data verification process evidence
- Supports external claims
- Profiles valid 3 years

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- Profile and Ecopoint Score
- An independent environmental product declaration



- Environmental Profiles Database
- Red Book www.redbooklive.com
- Envest2
- BREEAM & EcoHomes

The Certificate

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BRE Certification Ltd

CERTIFICATE

This is to certify

Rockwool Ltd Wern Tarw, Pencoed, Bridgend CF35 6NY

has complied with the requirements identified in the

Scheme Document SD 028

and is authorised to use the BRE Certification Mark on publications related to the Environmental Profiles of the following products;

Rockwool Stone Wool Insulation

Rockwool Cladding Roll, Rockwool Flexi and Rockwool Cavity

See appendix a - f for further details

Certificate No. ENP 356 Issue 1 Valid from 13 November 2006 Valid Until 12 November 2009 Signed on behalf of BRE Certification

Chris Beedel BRE Certification List Alfahree, Watcher/Upps SAX, Tai D1525 654105 Per D1825 654600 www.breestification.co.uk This certificate property of BVC Certification. List and in its and subject to levers and certificate, it is maintained and reid in force through annual invitient and writing and invitient and writing or central us.

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Green Guide and Robust details

- BRE and RDL working together on Green Guide update
 - RDL separating wall and floor constructions will be incorporated
- Future possibilities for collaboration
 - environmental profiling on new Robust Details as they're adopted
- Potential benefits for Industry, Clients, RDL and BRE

Acoustics & sustainability

- LCA: balance of social, economic and environmental criteria
- Acoustic performance of buildings has to be appropriate for their intended use
 - A school who's fabric has a low environmental impact is not sustainable if poor acoustics means communication is difficult and, as a consequence, pupil attainment is poor



UKAS accredited laboratories

- UKAS accredited laboratories and test procedures (floor and roof elements)
 - ISO 140-3 Airborne sound insulation
 - ISO 140-6 Impact sound insulation
 - ISO 140-8 Reduction of impact sound transmission from floor coverings and floating floors
 - ISO 140-18 Rain noise on roofs











Material properties – dynamic stiffness

- Wall ties
 - measurement standard in BRE IP 3/01 quoted in Approved Document E



- Resilient materials used under floating floors
 - BS EN 29052-1
 - BS EN 29053 (airflow resistance)







Summary

- Advantages in quantifying performance of buildings and building elements
- Important to demonstrate performance complies with regulatory and/or design specification
- Environmental profiling is becoming essential for business growth

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Conclusion

- Robust and scientifically grounded approach
- Environmental profiles & LCA growing recognition
- Benefits for manufacturers
- Used by architects, specifiers, BREEAM & the Code
- Moving from voluntary schemes to mandatory

Further information

Acoustics

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Environmental Profiles

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Thank You