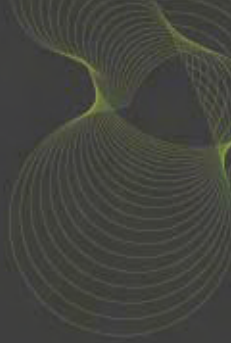


Replacing Other Construction Materials with Wood

Katie Livesey
Senior Consultant, BRE

Building Research Establishment



Centre of expertise for construction, the built environment, sustainability, energy, fire and many associated issues

- We provide integrated '**one-stop**' solutions for the whole life cycle of a structure covering:
 - *design*
 - *construction*
 - *management and use*
 - *demolition and re-use*

The Construction industry

Demand is outstripping supply

- The UK Government pledged decent homes ‘for the many, not the few’
- 3m new homes to be built by 2020 (2m by 2016).

Statistics

- 10% GDP and 1.4m people
- 420m tonnes materials used (10m tonnes timber)
- Timber frame 20% new housing market
- 50% of all energy generated is operational energy for buildings

Timber in construction

- Renewable and lightweight
- Thermal insulator and high aesthetics
- Versatile and adaptable
- Energy recovery at the end of life

Renewable resource and the sequestration of CO₂

‘...substituting 1m³ other building materials with wood stores on average 0.8 tonnes of CO₂...’

‘...timber buildings achieve negative net CO₂ emissions...’
(EC 2003)

The others - Improving their profile

Concrete

- Energy efficiency
 - 1990 - 1750kWh/t
 - 2005 - 1250kWh/t
- Reduce CO2 by 40% per tonne

Steel

- Ultimate recyclability
- >97% steel in UK construction recovered
- Energy to produce 1 tonne of steel down by 11% since 2000 (half of the 1960s level)

Material Profile: Steel

Embodied Energy (EE) Database Statistics - MJ/Kg

| Main Material | No. Records | Average EE | Standard Deviation | Minimum EE | Maximum EE |
|-------------------------------|-------------|------------|--------------------|------------|------------|
| Steel | 180 | 31.25 | 16.50 | 6.00 | 95.70 |
| <i>Steel, General</i> | 154 | 29.36 | 13.45 | 6.00 | 77.00 |
| <i>50% Recycled</i> | 2 | 32.75 | 20.86 | 18.00 | 47.50 |
| <i>Market Average</i> | 11 | 25.68 | 5.92 | 18.20 | 36.00 |
| <i>Other Specification</i> | 2 | 19.40 | 0.71 | 18.90 | 19.90 |
| <i>Predominantly Recycled</i> | 33 | 13.60 | 4.86 | 6.00 | 23.40 |
| <i>Unspecified</i> | 49 | 31.96 | 10.61 | 12.50 | 77.00 |
| <i>Virgin</i> | 57 | 37.48 | 12.07 | 12.00 | 63.42 |
| <i>Steel, Stainless</i> | 21 | 45.68 | 28.84 | 8.20 | 95.70 |
| <i>Market Average</i> | 3 | 48.36 | 6.22 | 40.20 | 51.48 |
| <i>Predominantly Recycled</i> | 2 | 11.00 | 0.00 | 11.00 | 11.00 |
| <i>Unspecified</i> | 8 | 43.10 | 32.21 | 8.20 | 95.70 |
| <i>Virgin</i> | 8 | 57.80 | 28.76 | 12.00 | 81.77 |
| <i>Steel, Structural</i> | 5 | 30.91 | 3.74 | 25.50 | 35.90 |
| <i>Unspecified</i> | 2 | 28.67 | 4.48 | 25.50 | 31.83 |
| <i>Virgin</i> | 3 | 32.40 | 3.10 | 30.00 | 35.90 |

Material Profile: Timber

Embodied Energy (EE) Database Statistics - MJ/Kg

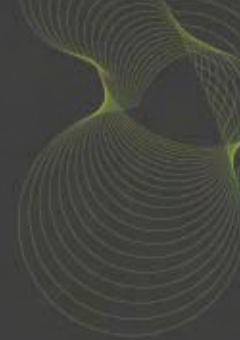
| Main Material | No. Records | Average EE | Standard Deviation | Minimum EE | Maximum EE |
|-------------------------------|-------------|--------------|--------------------|-------------|--------------|
| Timber | 162 | 9.36 | 8.19 | 0.30 | 61.26 |
| <i>Timber, General</i> | 63 | 7.75 | 4.81 | 0.72 | 21.30 |
| <i>Unspecified</i> | 38 | 6.78 | 3.58 | 0.72 | 14.85 |
| <i>Virgin</i> | 25 | 9.29 | 6.07 | 1.33 | 21.30 |
| <i>Timber, Hardboard</i> | 12 | 21.54 | 15.84 | 3.43 | 61.26 |
| <i>Predominantly Recycled</i> | 1 | 3.43 | 3.43 | 3.43 | - |
| <i>Unspecified</i> | 8 | 17.85 | 8.78 | 4.00 | 31.70 |
| <i>Virgin</i> | 3 | 37.42 | 22.68 | 16.12 | 61.26 |
| <i>Timber, Hardwood</i> | 12 | 4.59 | 4.47 | 0.33 | 16.00 |
| <i>Predominantly Recycled</i> | 1 | 0.33 | 0.33 | 0.33 | - |
| <i>Unspecified</i> | 10 | 5.15 | 4.68 | 0.50 | 16.00 |
| <i>Virgin</i> | 1 | 3.30 | 3.30 | 3.30 | - |
| <i>Timber, MDF</i> | 4 | 11.02 | 1.40 | 8.96 | 11.90 |
| <i>Unspecified</i> | 3 | 10.72 | 1.55 | 8.96 | 11.90 |
| <i>Virgin</i> | 1 | 11.90 | 11.90 | 11.90 | - |
| <i>Timber, Particle Board</i> | 23 | 12.48 | 10.14 | 2.00 | 36.29 |
| <i>50% Recycled</i> | 1 | 5.10 | 5.10 | 5.10 | - |
| <i>Other Specification</i> | 1 | 10.22 | 10.22 | 10.22 | - |
| <i>Unspecified</i> | 16 | 11.41 | 9.41 | 2.00 | 36.00 |
| <i>Virgin</i> | 5 | 17.82 | 13.35 | 4.60 | 36.29 |
| <i>Timber, Plywood</i> | 12 | 13.58 | 6.34 | 7.58 | 27.60 |
| <i>Unspecified</i> | 7 | 14.33 | 4.92 | 8.30 | 21.40 |
| <i>Virgin</i> | 5 | 12.53 | 8.48 | 7.58 | 27.60 |
| <i>Timber, Softwood</i> | 33 | 5.55 | 3.26 | 0.30 | 13.00 |
| <i>Unspecified</i> | 24 | 5.42 | 3.43 | 0.30 | 13.00 |
| <i>Virgin</i> | 9 | 5.88 | 2.92 | 2.80 | 9.70 |
| <i>Timber, Woolwool</i> | 3 | 11.98 | 7.50 | 5.13 | 20.00 |
| <i>Unspecified</i> | 3 | 11.98 | 7.50 | 5.13 | 20.00 |

Making choices in construction

- Design and functionality
- Cost and whole life cost
- Energy and sustainability credentials

Decision making tools

- The Code for Sustainable Homes
- BREEAM (domestic version EcoHomes)
- The Green Guides based on Life Cycle Assessment



What is BREEAM?

- BRE Environmental Assessment Method
- **EcoHomes** – BREEAM version for Housing

What does BREEAM do?

- Measures the environmental performance of a building throughout its life.

Home

BREEAM: BRE Environmental Assessment Method

The BREEAM family

[Learn more about BREEAM](#)

BREEAM Buildings



breeam:buildings

BREEAM assessment organisations



training

Training & Events



breeam:tools

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[BREEAM versions for buildings](#)

[How to become an assessor](#)

[LCA Environmental Profiles](#)

[Getting a building BREEAM assessed](#)

[Training options](#)

[The Green Guide](#)

[List of assessors](#)

[Training and events calendar](#)

[Invest](#)

[Use the Pre Assessment Estimators](#)

[The Code for Sustainable](#)

[Smartwaste](#)

[Homes Explained - free seminar](#)

[BREEAM Developments](#)

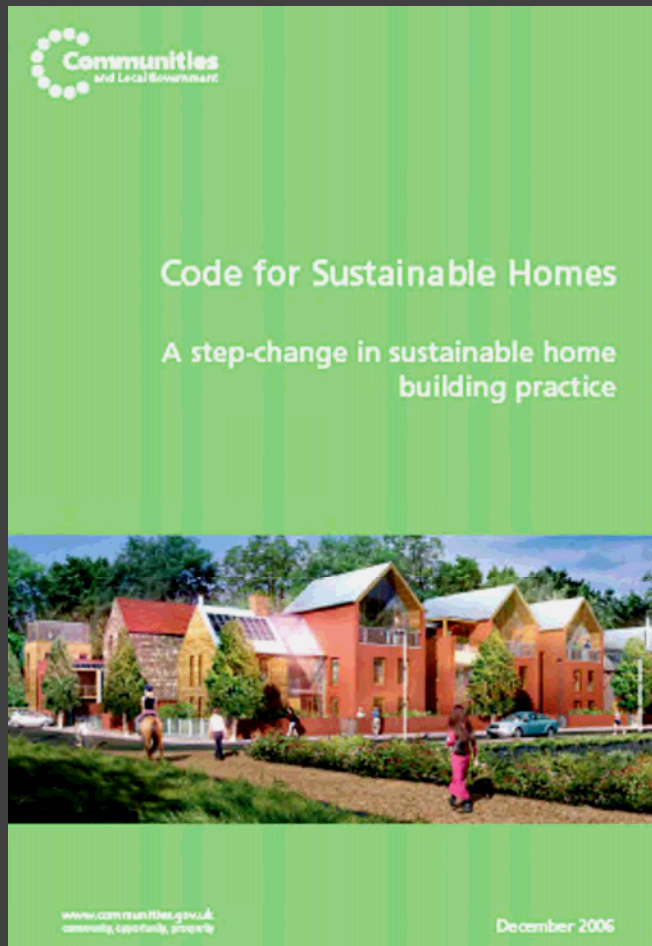
[BREEAM International: for buildings outside the UK](#)

[An introduction to BREEAM - free seminar](#)

Latest news from the BREEAM team...

- [Download your free BREEAM fact file](#)
- [BRE welcomes the Code for Sustainable Homes](#)

The code for Sustainable Homes



- Single national standard for England
- Industry guide for design and construction for new homes
- Driving continuous improvement
- A mark of quality

Assessment categories



- Energy



- Water



- Materials



- Water



- Waste



- Pollution



- Health



- Management



- Ecology


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 Category > [Landscaping](#)

 Sub-category > [Surfacing for Pedestrian Areas](#)

| | Element number | Summary rating |
|-----------------------------------------------------------------------------------------------|----------------|----------------|
| Asphalt paving over prepared recycled sub-base | 824130029 | A+ |
| Asphalt paving over prepared sub-base | 824130001 | A |
| Cement mortar wet laid clay setts (50mm) laid over prepared recycled sub-base | 824130027 | A |
| Cement mortar wet laid clay setts (50mm) laid over prepared sub-base | 824130014 | A |
| Cement mortar wet laid Granite or Whinstone setts (100mm) with no sub-base | 824130023 | E |
| Cement mortar wet laid Indian sandstone paving flags (29mm) with no sub-base | 824130021 | B |
| Cement mortar wet laid reclaimed stone setts (100mm) with no sub-base | 824130013 | A+ |
| Cement mortar wet laid UK sandstone paving flags (29mm) with no sub-base | 824130012 | A |
| Cement mortar wet laid wet cast replica sandstone (35mm) with no sub-base | 824130020 | A+ |

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CONTACT

E: Green Guide Helpdesk
T: +44 (0)1923 664 462
or via one of our [local offices](#)

Please select an element

Upper Floor
Construction

Insulation

Party Wall

Ground Floor
Construction

Party Floor

Landscaping

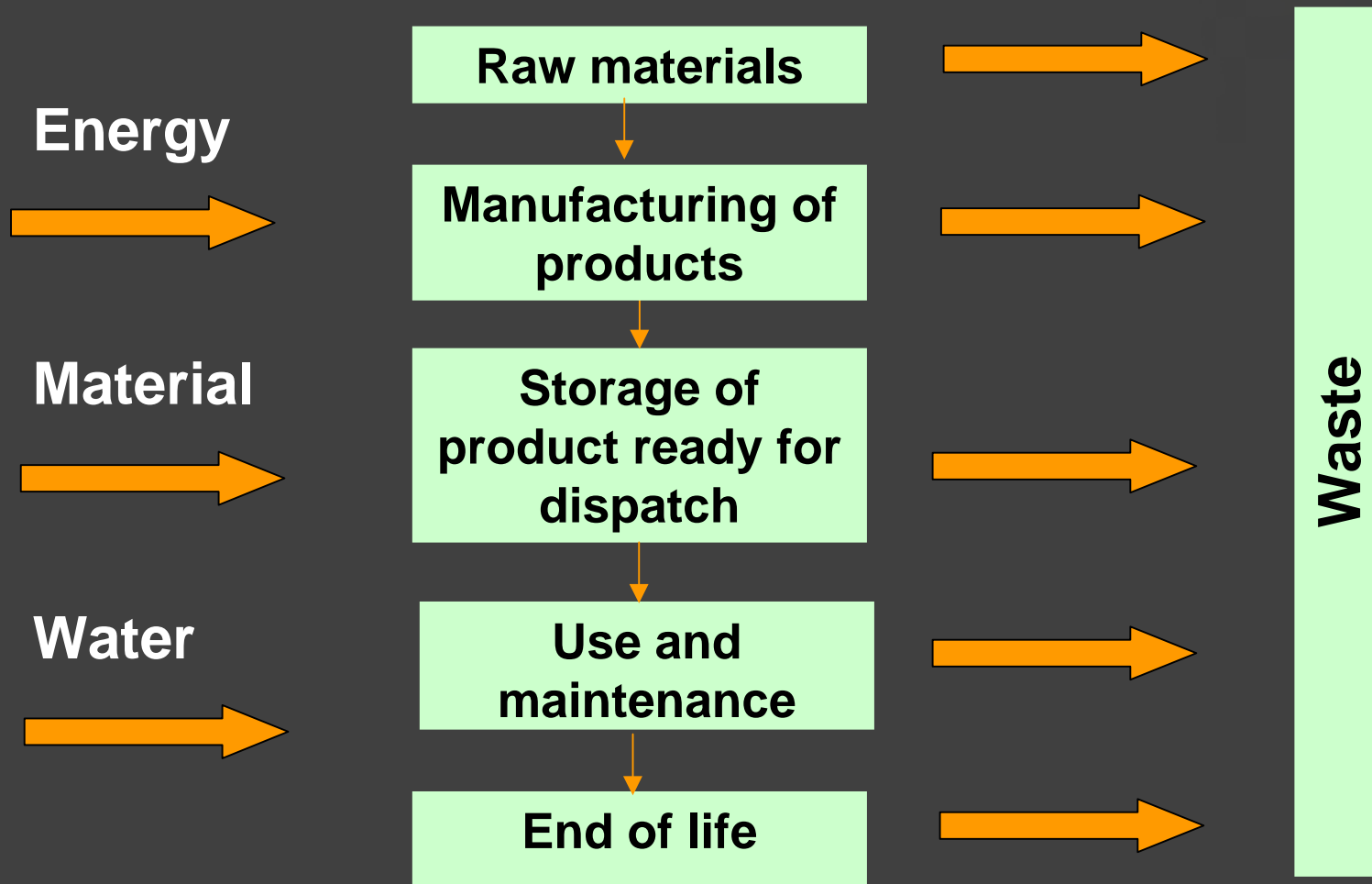
Internal Wall

Life Cycle Assessment (LCA)

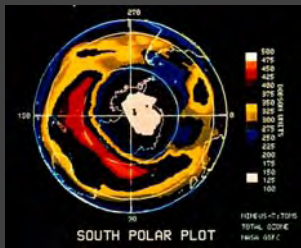
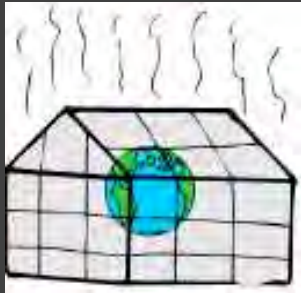
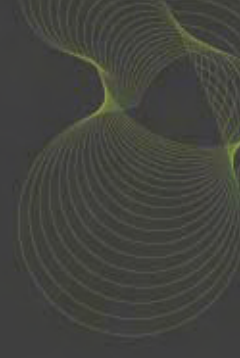
What is it?

A method to measure and evaluate the environmental burdens associated with a product system or activity over the entire life cycle (cradle to grave)

Life stages for LCA study



What is an environmental profile?

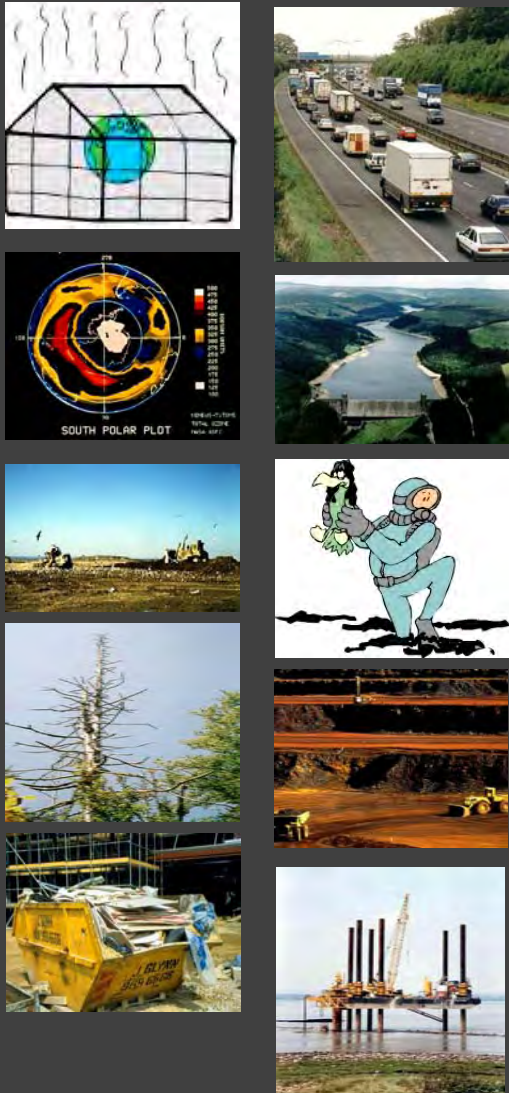


| | |
|-----------------------------|-------|
| Global Warming (GWP100) | 21.6% |
| Water Extraction | 11.7% |
| Minerals Extraction | 9.8% |
| Ozone Depletion | 9.1% |
| Human Toxicity | 8.6% |
| Freshwater aquatic toxicity | 8.6% |
| Nuclear Waste | 8.2% |
| Terrestrial Ecotoxicity | 8.0% |
| Waste Disposal | 7.7% |
| Fossil Fuel Depletion | 3.3 |
| Eutrophication | 3.0% |
| Photochemical Oxidation | 0.2% |
| Acid Deposition | 0.05% |

Environmental profile

Impacts

Data →



Normalised



Weighting



E
C
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S

Certification results

- Certificate shows impact of certified product according to various categories
- Environmental Profiles valid 3 years
- An independent environmental product declaration
- Publication in Red Book



bre



Approved Environmental Profile

Characterised and Normalised Data for:

1 square metre of Installed External Wall: Cavity Wall Construction: 140mm Enviromasonry Cellular (Fairfaed) 8N, Insulation, dense blockwork inner leaf plasterboard on dabc and paint

Quality of Data for Certified Material (Data for other constituent materials are available from BRE)

Start Date 1 November 2004
 End Date 30 November 2006
 Source of Data Company records
 Geography UK
 Representativeness 1 site representing 100% of Enviromasonry (Fairfaed) production
 LCA Methodology BRE Environmental Profiles Methodology
 Allocation 100% to Product
 Date of Data Entry 23 January 2008
 Boundary Cradle to installation on site
 Comments

| Issue | Characterised Data | Unit |
|----------------------------------------------------------|--------------------|--------------------|
| Climate Change | 41 | kg CO2 eq. (100yr) |
| Acid Deposition | 0.88 | kg SO2 eq. |
| Ozone Depletion | 7.8E-11 | kg CFC11 eq. |
| Pollution to Air: Human Toxicity | 0.48 | kg tox. |
| Pollution to Air: Photochemical Ozone Creation Potential | 0.026 | kg ethene eq. |
| Pollution to Water: Human Toxicity | 0.00000018 | kg tox. |
| Pollution to Water: Ecotoxicity | 4.8 | m³ tox. |
| Pollution to Water: Eutrophication | 0.051 | kg PO4 eq. |
| Fossil Fuel Depletion | 0.01 | toe |
| Minerals Extraction | 0.42 | tonnes |
| Water Extraction | 320 | litres |
| Waste Disposal | 0.054 | tonnes |
| Transport Pollution & Congestion: Freight | 77 | tonne.km |

| Issue | Normalised Data | UK Clären's Impacts |
|----------------------------------------------------------|-----------------|--------------------------|
| Climate Change | 0.0033 | 12300 kg CO2 eq. (100yr) |
| Acid Deposition | 0.0081 | 68.9 kg SO2 eq. |
| Ozone Depletion | 2.8E-10 | 0.288 kg CFC11 eq. |
| Pollution to Air: Human Toxicity | 0.0063 | 80.7 kg tox. |
| Pollution to Air: Photochemical Ozone Creation Potential | 0.00078 | 32.2 kg ethene eq. |
| Pollution to Water: Human Toxicity | 0.0000014 | 0.0117 kg tox. |
| Pollution to Water: Ecotoxicity | 0.000028 | 178000 m³ tox. |
| Pollution to Water: Eutrophication | 0.0038 | 8.01 kg PO4 eq. |
| Fossil Fuel Depletion | 0.0025 | 4.09 toe |
| Minerals Extraction | 0.083 | 6.04 tonnes |
| Water Extraction | 0.00077 | 418000 litres |
| Waste Disposal | 0.0047 | 7.18 tonnes |
| Transport Pollution & Congestion: Freight | 0.018 | 4140 tonne.km |
| Primary Energy | 0.45 | GJ |
| BRE Ecopoints Score | 0.58 | Ecopoints |

Appendix No: 345bo Valid From: 10/03/06 Valid To: 09/03/09

Issue No: 1
 Signed on behalf of BRE Certification: C K Beedle

BRE Certification Ltd, Garston, Watford WD25 9JX, Tel: 01923 964100 Fax: 01923 664833 www.brecertification.co.uk

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| Category > | <u>Landscaping</u> |
| Sub-category > | Surfacing for Pedestrian Areas |

| | Element number | Summary rating |
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| <u>Cement mortar wet laid Granite or Whinstone setts (100mm) with no sub-base</u> | 824130023 | E |
| <u>Cement mortar wet laid Indian sandstone paving flags (29mm) with no sub-base</u> | 824130021 | B |
| <u>Cement mortar wet laid reclaimed stone setts (100mm) with no sub-base</u> | 824130013 | A+ |
| <u>Cement mortar wet laid UK sandstone paving flags (29mm) with no sub-base</u> | 824130012 | A |
| <u>Cement mortar wet laid wet cast replica sandstone (35mm) with no sub-base</u> | 824130020 | A+ |

Major changes to methodology update

- Change of impact categories (no transport, added nuclear waste, revise toxicity)
- Characterisation factors changed (Briefing Note 3a full details)
- Normalisation from 1 UK citizen to 1 European citizen
- New weightings set
- New energy models
- New reference service lives
- Update to the end of life and waste models

Consultation Group representatives

1. Miles Watkins Aggregate Industries
2. Ian Stares Baxi Potterton
3. Tom de Saulles British Cement Association
4. John Nelson BPB
5. Mercia Gick British Plastics Federation
6. Christopher Stride BPF EPS Construction Group
7. Martin Clarke British Precast Concrete Federation
8. John Garbutt BRUFMA
9. John Hedgecock British Woodworking Federation
10. Andrew Gill Celotex
11. David Westburgh Corus Construction
12. Nick Avery Corus R&DT
13. Justin Ratcliffe Council for Aluminium in Building
14. Denis Higgins CSMA
15. Sophie Read Egger (UK) Ltd
16. Peter Trew/Mark Harris EPIC
17. Carol Houghton Eurisol
18. Adrian Bold Knauf
19. Paul Franklin Flat Roofing Alliance
20. Peter Stuttard Glass & Glazing Federation
21. Peter Hazael H+H Celcon
22. Ray Doughty Hepworth Building Products
23. Martin Althorpe H W Plastics / BPF – Windows
24. Ieuan Compton – Chairman Kingspan Insulation
25. Rebecca White Marley Building Materials
26. Stuart Bell Marshalls
27. Pete Thomas Tarkett-Marley Floors
28. John Hannah Quarry Products Association
29. Nick Ralph Rockwool
30. Andrew Schofield Roof Block
31. Mark Harris Sarnafil
32. Gunther Hentschel Timber Trade Federation
33. David Duke-Evans Wood Panel Industries Federation
34. Rita Singh Construction Products Association
35. Kristian Steele BRE
36. Paul Thistlethwaite BRE

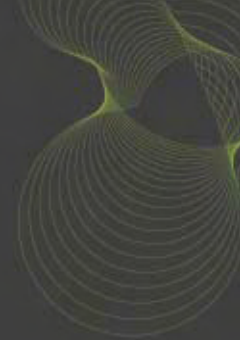
Opportunities

Begging of the life cycle (forestry)

- UK and European practice (species)
- Up to date model needed
- All wood based products would include forestry LCA

End of the life cycle (demolition/waste/landfill)

- 'Old' timber (hazardous waste?)
- How much of what
- Producer's responsibility (WEEE, etc)



Thank you

Further information:

Katie Livesey

Tel 01923 664127

liveseyk@bre.co.uk

www.bre.co.uk