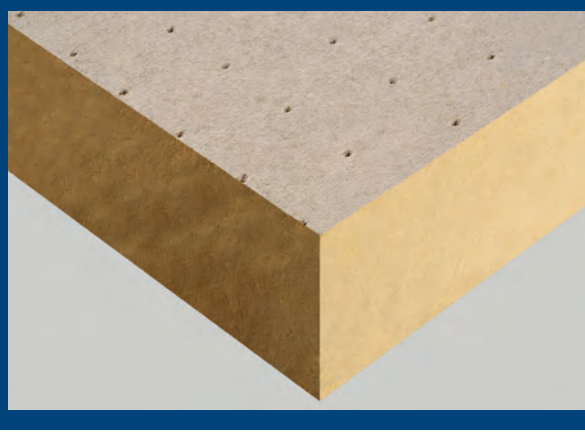
ENVIRONMENTAL IMPACT OF INSULATION

Kim Allbury and Jane Anderson



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GLOSSARY

Allocation: sharing the input or output flows of a unit process to the product system under study. This may need to be done where a manufacturing process results in products and co-products, for example, steel and slag.

Ecopoints: (as used in the BRE Environmental Profiles methodology) the normalised profile values are multiplied by weighting factors developed for each impact category and the results summed to give a single figure.

Environmental impact category: environmental issue being examined, eg climate change, acid deposition and human toxicity to air.

Environmental profile: the level of impact in each environmental impact category for the functional unit or product being studied.

Functional unit: a qualitative description of function specifically defined for the product/service under study and any alternative products/services to which it is compared. The use of a functional unit means that the alternative designs under study are, in theory, compared fairly. For example, a comparison of external walls may be based on every external wall design in the study achieving a U-value of 0.3 W/m^2K and compliance with building regulations.

Input: material or energy that enters a unit process (can include raw materials and intermediate products).

Intermediate products: material that has already been processed before being used to produce a product.

Life cycle: consecutive and interlinked stages of a product system from raw material acquisition or generation of natural resources to the final disposal.

Life cycle assessment (LCA): compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle.

Normalised profile: The characterised profile is referenced to the environmental impact for each category at the national or global level in one year (usually for one citizen), giving a 'normalised' profile; the values are directly comparable.

Output: material or energy that leaves a unit process (may include raw materials, intermediate products, products, emissions and waste).

Raw materials: unprocessed material that is used to produce a product.

1 INTRODUCTION

The thermal resistance provided by insulation materials used in the building fabric means that the energy savings from insulation made during the operation of the building far outweigh its embodied environmental impacts. Also, insulation products tend to have a very low density and, therefore, when reviewed in a building context, only relatively small masses of materials are used. However, if insulations are not assessed with a whole-building life-cycle approach they may not appear to be an inherently low environmental impact material, because of the resources and energy used during manufacture, the use of blowing agents and the lack of reuse/recycling at the end of life.

It is, therefore, important to take a whole-building life-cycle approach when looking at insulation materials, which is the approach that has been taken in BREEAM[1], where the benefits of insulation allow significant energy credits to be gained, and the use of low-embodied-impact insulation is covered by materials credits through the use of *The Green Guide*[2].

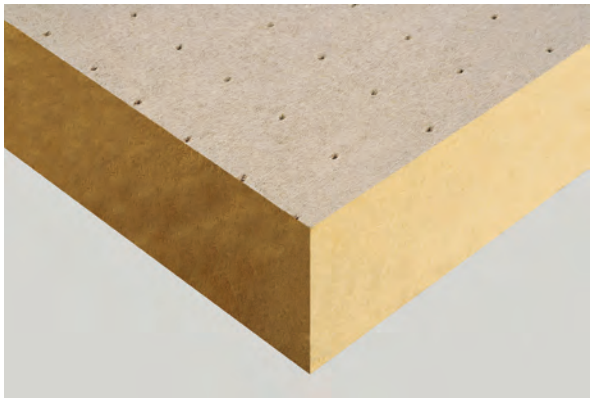
This report has been produced as part of a series on the environmental impact of materials and *The Green Guide to Specification*[3]. Many of the other reports in the series focus on particular materials, and provide more specific information in each case; these may also be of value when considering the environmental impact of insulation.

This report provides a review of how insulations have been assessed within the current *Green Guide*, including the application of the Environmental Profiles methodology[4] which underlies *The Green Guide*. The way in which insulation is addressed within building level environmental assessment schemes such as BREEAM and the Code for Sustainable Homes (CSH)[5] is also explained.

This report aims to provide manufacturers and specifiers with a general understanding of the significant benefits and impacts of insulation products over their whole life cycle and to identify opportunities for improvements to the environmental performance of insulation.

1.1 SECTOR OVERVIEW

The Green Guide aims to cover a range of the most common types of insulation used in the construction industry, and was based on the availability of robust Life Cycle Assessment (LCA) data at the time. The following insulation types are covered by *The Green Guide*.



Mineral wool insulation

- *Stone wool insulation: conductivity 0.035–0.045 W/mK, density 30–160 kg/m³*
  Stone wool is made from volcanic rock, typically basalt or dolomite, and a proportion of recycled post-production waste materials, which are melted, spun into fibres and then mixed with binder. Process waste can also be recycled back into the product. Stone wool insulation can be blown into a cavity, or installed as batts or within composite panels.
- *Glass wool insulation: conductivity 0.031–0.040 W/mK, density 10–80 kg/m³*
  Glass wool is made from sand, limestone and soda ash, with a proportion of recycled glass and other minerals. These are melted, spun into fibres, and mixed with resins which act as a binder before curing into products. Process waste can also be recycled back into the product. Glass wool insulation can be blown into a cavity, or installed as batts or within composite panels.

Other mineral-based insulation

- *Cellular glass insulation (foamed glass): conductivity 0.038–0.055 W/mK, density 100–200 kg/m³*
  Cellular glass insulation is manufactured from crushed glass that is mixed with carbon and heated to 1000 °C. The heat causes the carbon to oxidise to form the characteristic bubbles. Process waste can also be recycled back into the product. Cellular glass insulation is installed as slabs.

Non-renewable organic-based insulation

- *Expanded polystyrene (EPS): conductivity 0.034–0.038 W/mK, density 15–30 kg/m³*
  Expanded polystyrene (EPS) is a rigid, open cell form of

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ENVIRONMENTAL IMPACT OF INSULATION

This report reviews how insulation materials have been assessed within *The Green Guide to Specification*, including the application of the Environmental Profiles methodology which underlies *The Green Guide* data. The way in which insulation is addressed within building-level environmental assessment schemes such as BREEAM and the Code for Sustainable Homes is also explained.

The report will give manufacturers and specifiers a general understanding of the significant benefits and impacts of insulation products over their whole life cycle and help to identify opportunities for improvements to their environmental performance.

It is part of a series that provides comparable information on cladding, floor finishes, insulation, masonry and concrete, metals, timber and windows to assess the environmental impact of specific construction materials.

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