Be Aware: Built environment action on waste awareness and resource efficiency

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ABSTRACT:
The aim of this project is to reduce waste and resource use across the whole life cycle of any given construction product. The project objectives include researching the viability of modifying product design, manufacture, packaging/distribution, application, maintenance and end of life management to maximise resource efficiency. This integrated approach to considering the whole life cycle of construction products will be enhanced by conducting pan-industrial waste exchange analysis, characterisation, testing and evaluation providing opportunities for knowledge transfer. The project will model scenarios for improving resource use throughout the whole life cycle by re-engineering processes. Project web site: www.beaware,org.uk.

1 INTRODUCTION

Construction, demolition and refurbishment accounts for around 100 million tonnes of waste in the UK each year. About half of this waste is recycled, from the demolition sector and parts of the construction sector. Around 380 million tonnes of resources are also consumed by the construction industry each year, suggesting that greater scope for waste reduction, reuse and recycling exists.

Construction and demolition waste (including asbestos) is the largest component of hazardous waste in England and Wales, constituting 32%, nearly 1.7 million tonnes. Nearly all of this goes to landfill, but although arisings increased sharply in 2004 as developers sought to beat the co-disposal ban, the trend is downwards.

2 PROJECT OVERVIEW

The Department for Trade and Industry funded project is called BE AWARE – Built Environment Action on Waste Awareness and Resource Efficiency. This project aims to help construction product manufacturers to make more efficient use of materials and processes by investigating their products' design, manufacture, installation, use and eventual disposal. There are 2 main workstreams:

- supply chain resource efficiency
- cross sector recycling opportunities

BE AWARE is looking at the wastes created at each stage of a product's life cycle in order to find other uses for them.

The 30-month project is being undertaken by an industry consortium led by the Construction Products Association, and is managed by BRE. Others involved in developing, manufacturing, using or disposing of construction product are involved with the project.

BE AWARE will look in detail at around 40 products to see whether waste can be reduced and resource efficiency improved. BRE believes that the research will show that the project's approach could bring industry savings of up to 25%.

Direct help for organisations engaged in construction product design, manufacture, installation, use and end-of-life, is possible by becoming involved in the BE AWARE project,

The project will create publicly available guidance and case studies to illustrate how adopting efficient practices in product design and manufacture can help. There will also be a series of workshops during the project to discuss findings and invite further input.

The BE AWARE project's industry consortium is led by the Construction Products Association, which represent the construction product manufacturing sector. Other participating associations/groups with manufacturing members include plastics (British Plastics Federation), concrete (British Precast Concrete Federation), composites (NetComposites) and wood (Wood Panel Industry Federation, British Woodworking Association).

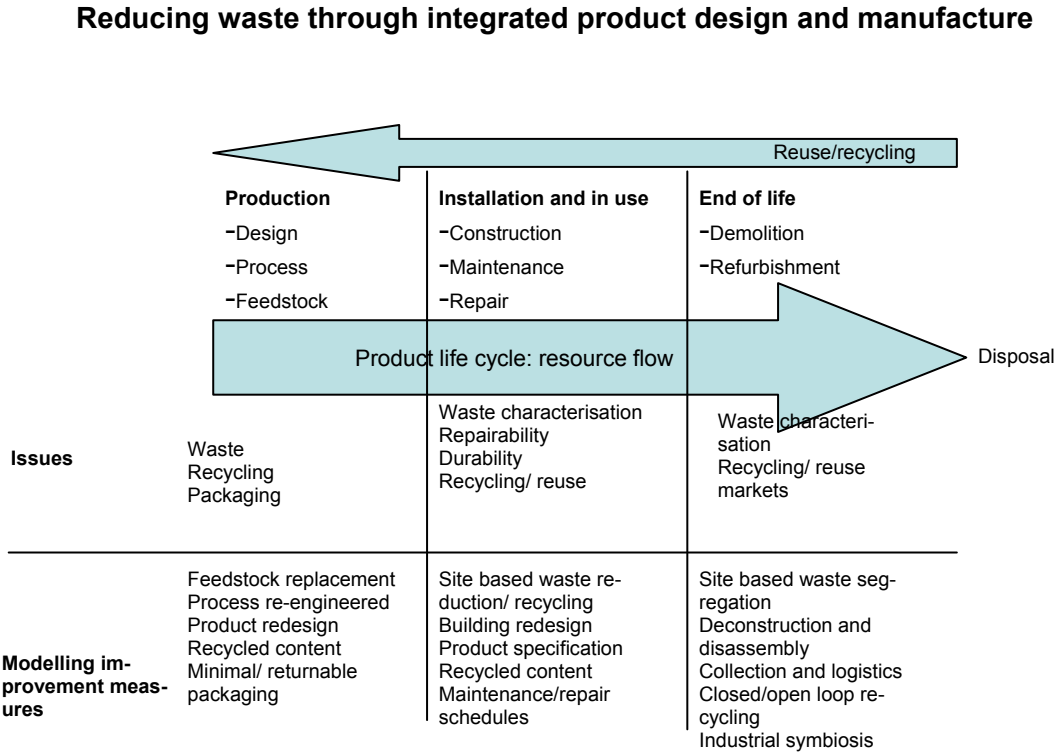
Modular buildings are represented by the Modular & Portable Building Association. Key clients/advisors include Charnwood Borough Council and National House Builders Council. Biffa Waste Services and the National Federation of Demolition Contractors provide guidance on the end of life stages.

Partners from the packaging (Packaging and Industrial Film Association), agriculture (Agrifibre Technologies Ltd) and solid timber (UK Forest Products Association) provide opportunities for pan-industrial knowledge transfer. Loughborough University bring their technical expertise with regards to cross-cutting industry waste mapping. Associated parties include Resource Efficiency Knowledge Transfer Network and National Industrial Symbiosis Programme (NISP). BRE provides overall project management from its Centre for Resource Efficiency.

3 OBJECTIVES

This project will reduce waste and resource use across the whole lifecycle of any given product. Research objectives include:
a) Mapping a product's resource profile and highlighting where improved resource use is possible through reduction, reuse, recycling, recovery and end of life recyclability. These include design (e.g. primary feedstock substitution with recycled materials), manufacturing process (e.g. cost v. benefit of changing practices), packaging (e.g. design for minimal packing) and end of life considerations (e.g. maintenance, recyclability/ retrieval arrangements),
b) Simulating reduced resource use through the whole life cycle by modelling a re-engineering of processes and changing, for example, the design, distribution, packaging and end of life recovery options,
c) Creating a pan-industrial waste exchange process through researching waste mapping, characterisation, testing and evaluation.
d) Marketing and disseminating the results to wider industrial audiences.

Figure 1: Diagram explaining project scope



3 BENEFITS

Lifecycles will be modelled rather than individual industry interests. This involves combining perspectives and data from over 50 companies to develop the results of the project; the manufacture around 40 products will be improved as a consequence. Results will reveal the extent to which input resources can be minimised and, through tests, characterisation and optimisation of waste materials, identify what can be put back into construction and other product manufacture.

Specific outputs will be full accounts of resource flows throughout a product lifecycle, contrasted against alternative methods of manufacture, installation and end of life treatments to create more sustainable manufacturing practices. Generic industry guidance will promote wide scale uptake of the approach/findings. The waste characterisation process effectively matches supply and demand in materials output from all stages of product lifecycles. Results will also optimise resource use between different industry sectors. Commercially, manufacturers need to be more resource efficient due to rising disposal costs; corporate social responsibility and preparing for legislative change. e.g. extension of the EU Eco-design Directive.

Companies participating in the project will be provided with the necessary knowledge to change processes, design and feedstock to reduce waste and save money. Obviously, the whole construction products sector will not adopt the research findings, but the key trade bodies are committed to the project and the requirement to disseminate the results/ encourage uptake. Additional exploitation derives from where product redesign would reduce environmental impact. This will inform policy makers, e.g. the Market Transformation Programme. Wider exploitation and dissemination are inextricably linked; the launch, web presence, seminars, press releases, guidance documents, industry workshops, advisory groups and task groups will all serve to engage potential users of the results and ensure the outputs are fit for purpose.

4 PROGRESS TO DATE

Supply chain resource efficiency

The objective is to reduce resource use across the supply chain withour increasing other impacts. This involves finding out detailed data on resource use for energy, water and materials at several stages, including manufacture, installation and demolition. A questionnaire to capture this data has been developed, along with a process for quantifying the impact reduction for any interventions or changes to the process.

Figure 2-4 shows how resource impacts can be broken down for a composite product.

Figure 2: Overall impact

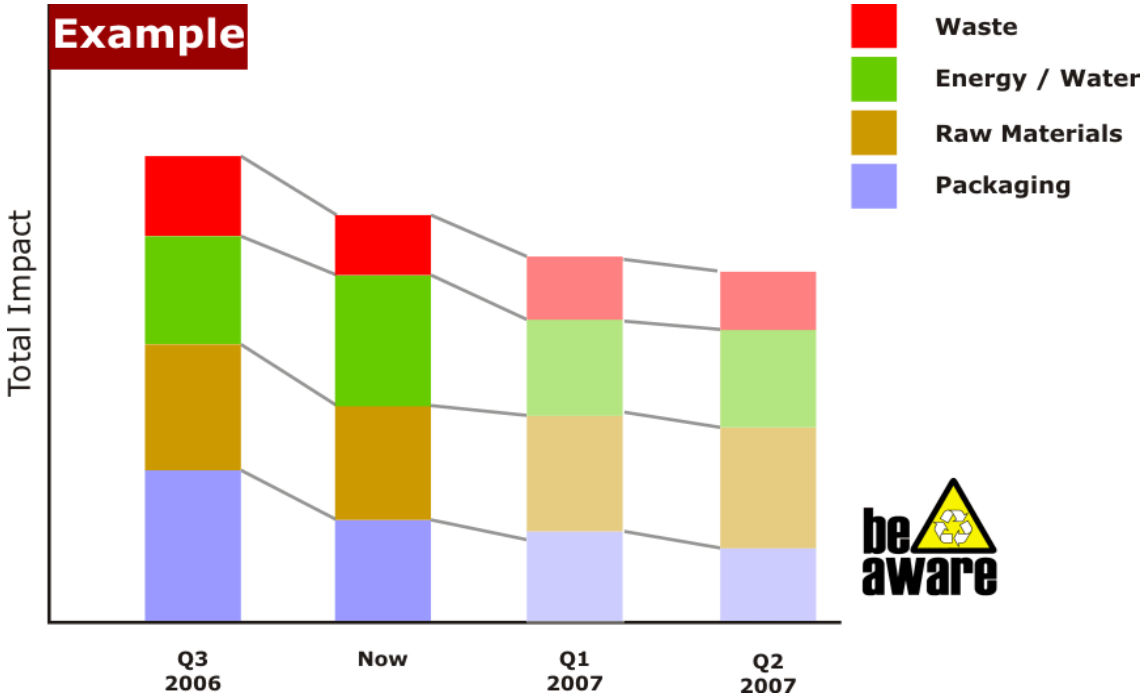


Figure 3 Impact of raw materials

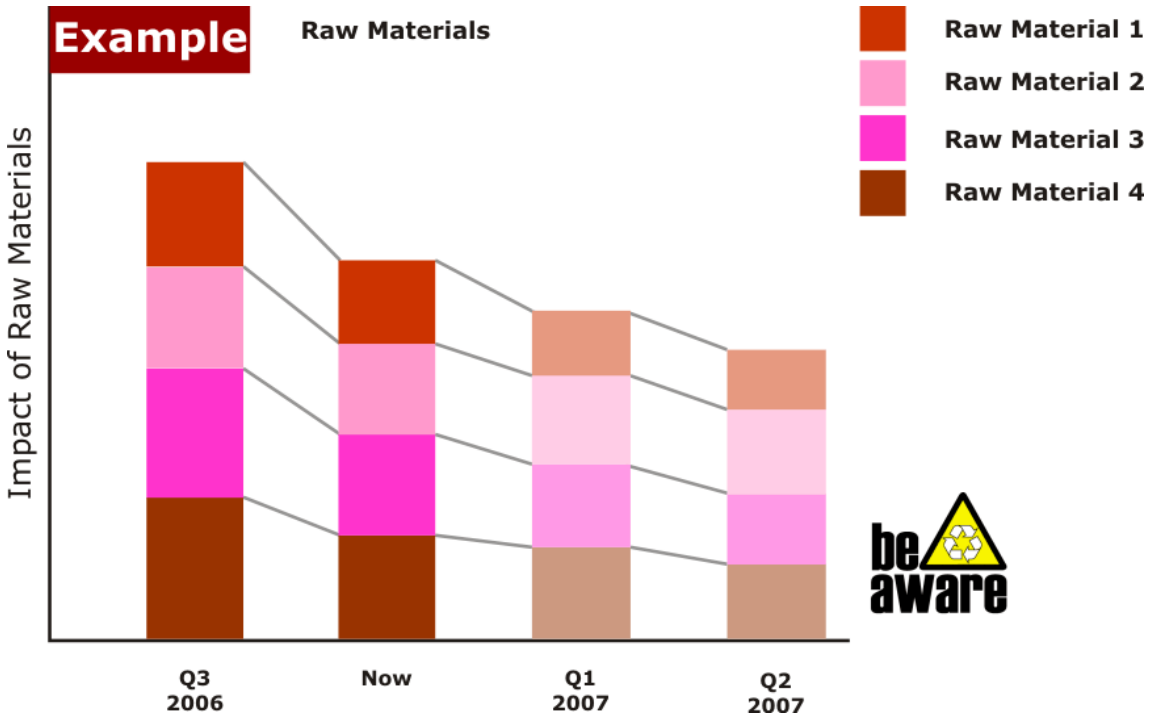
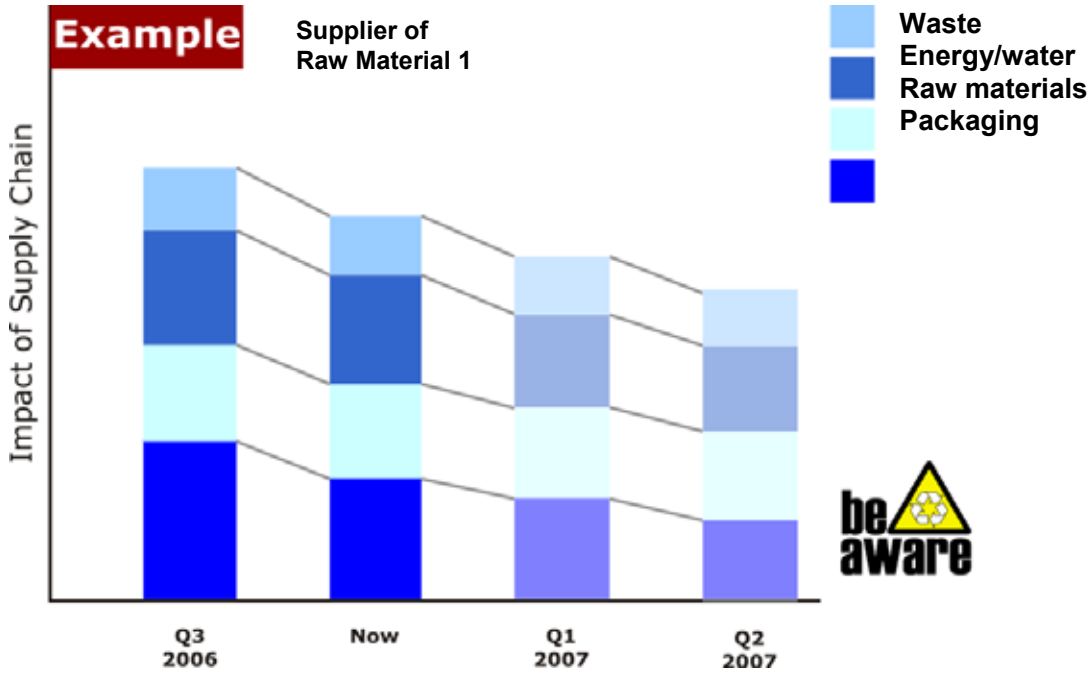


Figure 4 Impact of raw material 1



By having the ability to see each impact of each raw material, it is possible to model the effect of changes in feedstock and suppliers upstream of the product manufacturers. This aspect of the project is continuing to be developed with a series of construction products and their supply chain.

Cross sector recycling opportunities

A waste characterisation literature review was conducted to examine existing waste characteristics, approaches, technologies and methodologies. The main findings were as follows:

Waste characteristics approaches
Waste materials are classified into groups of similar items, such as plastics, wood and bricks. Waste streams and materials are quantified through onsite observation, sampling, interviews or questionnaires. Waste materials are generally studied for their chemical or physical composition, in order to identify and hazardous chemicals or contamination, or to assess their suitability for recycling. The viability of recycling a waste material is affected by financial costs, including haulage, capital costs (e.g. purchase of equipment), market value and environmental taxes. Finally, the potential for recycling a waste material is also governed by its performance related properties, including durability, purity, safety and physical stability.

Waste characterisation technologies
Waste characterisation depends on the use of technical tools, including databases, models and laboratory equipment. Computer databases can be used to assemble and organise extensive data which can be altered and updated. Computer modelling can be used to map complex processes such as the transfer of materials and wastes within an industry sector in order to predict different waste management scenarios. Assessment of waste materials can involve the analysis of hazardous chemicals in samples and comparing results against environmental legislation.

Waste characterisation methodologies
Waste characterisation methodologies including sampling, analytical techniques and the marketing of recycled products. Sampling involves collecting waste samples, or gathering information through interviews and questionnaires. The accuracy of data collected through sampling will be limited by time, cost and accessibility to information or the materials. Possible contamination of laboratory equipment and the precision of the data produced are the key issues to consider when analysing waste materials. Marketing a recycled material includes surveying customer's opinions, establishing a market value, assessing the level of competition in the market and examining all the costs involved in producing and selling the material.

Industry workshops
Be Aware recently organised and held the project's second workshop on cross sector recycling opportunities. Attended by delegates from a range of sectors in the construction industry, this successful workshop set out to identify the factors which currently inhibit waste recycling and reuse, and to subsequently propose solutions for addressing such limiting factors.

Representatives of construction product manufacturing companies, demolition/refurbishment contractors and consultancies worked together to consider the limiting factors within both an economic and a material performance-based context.

Waste materials considered during the workshop included by-products which are currently being recycled or reused to a certain extent, as well as residues being sent to landfill.

The data collected during the workshop will be used to develop a methodology for selecting a number of waste materials, which in turn will be tested further in the laboratory in order to optimise their recycling potential.

5 INTERIM CONCLUSIONS

The companies working with the Be Aware project are already seeing benefits of involvement through identifying quick wins in terms of waste reduction and recycling actions.

A stronger linkage across the supply chain in terms of defining the resource and waste issues sends a powerful message. Everyone involved with the construction supply chain has some form of accountability and potential to influence resource use outside of their immediate control.

There are still technical issues for key wastestreams and recycling opportunities that need to be set alongside the financial viability and technical performance requirements of the construction products sector. These form the basis of a cost benefit evaluation that will determine if recommendations are able to be implemented.