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Briefing: Resource efficiency in construction—a perspective from the waste resources sector

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1. INTRODUCTION

The introduction of the UK landfill tax credit scheme, alongside the landfill tax in 1997, was fortunate insofar as it provided the opportunity for Biffa to begin ploughing almost £11 million into resource flow input/output analyses in 60 different areas, grouped around geography, industrial activity or specific materials. Additionally, funding was made available to investigate and develop pilots for data capture and knowledge management systems that would be needed were the concept of resource efficiency to be adopted by the UK Government. In the construction sector, one such study was produced in 2003, utilising Viridis as the consultant working in conjunction with the Highways Agency, Laing Technology Group, WS Atkins, TRL, and Ciria.[1] In addition, funding for the Building Research Establishment (BRE) to develop Bremap and Sabre (see section 3) started a process whereby companies in the sector could begin to move along the road of resource efficiency.

Ten years on, the concept of resource efficiency is well established within the UK Department for Environment, Food and Rural Affairs (Defra), resulting in a number of government initiatives to grapple with the task of moving towards an online database capture system to record resource flows through the economy. The need for this is now subsumed within the wider debate around carbon, carbon dioxide (CO_2) emissions and global warming. The 2007 budget saw announcements from the UK Treasury outlining initiatives likely to be taken in the latter part of this government term, in relation to developing an 'environmental treasury' whose work would parallel the work of the 'financial treasury', which has dominated economic wellbeing for the last 50 years. With startling rapidity, switches are being thrown to create an alignment between input materials, waste, resource efficiency, carbon and energy and this is now rippling out on a sector by sector basis.

Construction and engineering will be (or is being) drawn inexorably into this debate and it is in the interests of all players within the sector to appreciate the breadth and depth of the implications arising from this process. The purpose of this paper is to outline the canvas on which these forward policies are likely to be painted. It would seem logical to think of these impacts around the following areas of context

(*a*) scale of impact
(*b*) current levels of adaptation
(*c*) product and output implications
(*d*) wider government initiatives and feedback effects
(*e*) structural and economic impacts on the sector.

2. SCALE OF IMPACT

Government attention has initially focused on the food sector because of its high profile with consumers and scale of impacts in terms of carbon and energy. Nevertheless, the construction, demolition and excavation (CDE) waste sector is not far behind. The last major survey (to end of 2005) identified an overall consumption profile for all construction in the region of 400 million tonnes of aggregate annually, of which almost 25% ends up being discarded as waste. This figure excludes significant quantities of additional materials ejected as waste in the form of contaminated land through dealing with the heritage of 200 years of industrial activity in the UK. Of around 90 Mt of waste streams arising in the sector, 20% ends up being used in exempt activities (farm tracks, etc.), 28% in landfills and a creditable 52% being re-utilised in situ. As with most things in life, this profile reflects the economics. This is particularly so in the congested south east, an area that has seen significant growth in in situ trommelling and reuse of created spoils for bunding, sound barriers and flood defence work. The other good news is that relating resource use and construction output, there has been a marked improvement from 1970 where mineral extraction for construction has stayed roughly constant, whereas output measured as gross value added has increased by 55% over the last 25 years.[2] Less comfortable is the top slice of the housing sector of the industry—Department of Trade and Industry (DTI) data suggest that around 40% of total greenhouse gas emissions are associated with the built environment. It is in this latter area that most structural and attitudinal changes will no doubt be triggered in relation to building specifications and the application of the (so-called) Merton rule, which will force greater and greater emphasis onto the whole-life carbon costs embedded in new construction. So what are the processes already in operation?

3. CURRENT LEVELS OF ADAPTATION

In terms of specific measurement and monitoring systems, the industry's reaction has been reasonably impressive. Reference

has already been made to a number of schemes that have been funded indirectly through the landfill tax credit scheme itself. Sabre is a BRE-designed software tool that can be loaded onto hand-held terminals and converts quantity survey data on site arisings of waste into tonnage mass; this tool has transformed managerial understanding of the profile of waste arisings. This was an essential prerequisite to the mundane need to separate (active) wastes from 'inactive' inorganics such as soils, concrete and aggregates. Long gone are the days when large projects co-mingled these materials, resulting in the entire weight of arisings being assessed at the 'active' landfill tax rate, which today stands at £24/t and will soon rise to £32/t (plus around £15/t for operator gate fees). Separation at source reduces that current tax burden by 90% (although there is now only a 50% probability that inert material will end up in landfill anyway). These sortation disciplines were formalised and accelerated by the emergence of the skip colour-coding system, originally developed by the Institution of Civil Engineers (ICE), in which inert, packaging material, metals, mixed wastes, gypsum, timber and hazardous materials can be managed more selectively and economically. This is important in a sector where, superficially, an 8 cubic yard (6·1 m^3) skip might cost £200–250 from a waste management perspective but can transport away over £1200 worth of embedded purchase costs for material and labour. Such disciplines have rightly reinforced management awareness that the economics, as well as the ethics, of improved resource efficiency make sense in terms of the bottom line. More recently, the successor funding bodies in receipt of landfill tax monies in the form of Waste and Resources Action Programme (Wrap) and Envirowise have been able to drive this message home by the development of the waste awareness certification (construction) scheme.[3] The foundation approach to resource efficiency in the sector is powered by site packaging waste management plans (SPWMPs), toolbox talk check sheets and case study reports available from Envirowise. SPWMPs appeared in 2004 on a voluntary basis but have quickly developed into a must-have for projects of value over £200 000. SPWMPs analyse the sequential tasks in construction (policy, procurement, project planning, site operations and post-completion) that, cumulatively, demonstrate to clients and regulators that an appropriate tracking system is in place to anticipate identified risks and opportunities logically and sequentially.[4]

As the industry gains more confidence on sortation standards and the quality of recovered materials, recovered material is increasingly being used in hydraulically bound working platforms, sub-bases and foamed bitumen asphalts. Parallel growth in facilities that accept recovered packaging and specialist materials has enabled the construction sector to take advantage of access to these sites, many of which are being captured by Bremap in a profile of properly consented local and regional facilities by material. The ICE demolition protocol also provides a structured approach that links contractors to developers by providing an index of demolition recovery and new-build re-incorporation, providing clients with an approximate indication of how much resource has been reused, in or ex situ.

Last, but by no means least, is Ceequal, the UK civil engineering environmental quality assessment and awards scheme developed by Ciria. Ceequal assesses environmental quality with regard to civil engineering projects covering 12 areas of environmental concern, albeit based on self-assessment by trained staff externally validated on these issues. Thus far, therefore, 'bottom-up' reactive issues to resource efficiency in the environment now exist in far more than embryonic form. Nevertheless, it could be argued that these basic initiatives are just a platform to drive forward far more significant cultural reform in the sector with regard to sustainability and resource efficiency on a 'top-down' basis.

4. PRODUCT AND OUTPUT IMPLICATIONS

External drivers on the industry from specifers and clients are moving ahead quickly. The forthcoming code for sustainable homes is laudable but, in reality, many in the industry recognise that the objectives are hardly demanding. Were that code to be effectively implemented, it would still only put us on a par with Scandinavian standards of 15–20 years ago. Energy use associated with households has increased by 20% in the last 17 years compared with a rise in housing stock of around 10%. In fairness, not all of this can be laid at the door of the built structure itself, given the multiplication of household appliances and issues associated with expansion of standby devices and energy consumption profiles of consumer electronic and electrical goods. Even so, CO_2 emissions associated with UK housing account for 27% of national emissions compared with only 5% in Sweden. Recent declarations from the UK government suggesting that all new homes need to be zero carbon emissions by 2016, backed by tighter and tighter standards on energy and resource efficiency in relation to large public infrastructure projects, provide the writing on the wall for the industry. The reality is that the 'general public' spend a lot of their time in a domestic environment and it could be argued they take their lead on environmental best practice from the way they see their own houses being constructed and operated. Forty million adults in the UK are all well-informed critics of building infrastructure!

These trends will no doubt blur the boundaries between the house building and construction sectors' responsibilities to provide an appropriate intelligent design for energy and electrical efficiency and the initiatives of producer responsibility in the electrical and electronics sectors. In consequence, the house building and commercial sectors would be well advised to up their game considerably in relation to incorporating distributed energy and micro-generation systems in their new-build plans (for emergent technologies such as solar heat panels, solar electrical, heat pumps, etc.). After all, 40% of domestic energy supply in Holland comes from micro-generation compared with a negligible amount in the UK. Other additional features likely to be demanded by future house buyers are smart meters (providing information on specific electrical consumption device by device), auto switches for lighting when rooms are not occupied, natural ventilation balancing systems, and so on. Recent studies in Germany suggest that passive heating standards have added 2% to the capital cost of a house but that such a building commands a premium purchase or rental price in the market place.

Just as many in the sector probably thought as recently as two years ago that waste would not be on the agenda and that

sustainability would be even further over the horizon, there are those today that probably think initiatives such as these will remain firmly in the 'daft ideas' box. Those attitudes prevail at their peril, however.

5. WIDER GOVERNMENT INITIATIVES AND FEEDBACK EFFECTS

One of the most recent significant levers for government policy was the publication of the report by Sir Nicholas Stern on the cost of global warming. Major companies operating in the construction sector would be well advised to familiarise themselves with the content of Stern's observations, the most important of which is that whilst the cost of CO_2 emissions to the atmosphere will be great in terms of consequent global warming, the cost of taking action sooner rather than later is relatively small compared with taking no action for a further 10–20 years. These recommendations have been taken on board so rapidly within Westminster that it is difficult to place a tissue paper between the environmental strategies of the main political parties. In effect, resource efficiency and carbon management are rapidly being embedded in the philosophy of the emergent 'parallel treasury' postulated by prime minister Gordon Brown. The construction and demolition sector is almost certain to be in the sights of government given that 80% of today's housing stock will still be in situ in 2030—by which time it is expected that the necessary structural changes in attitudes to carbon resource use will have been delivered to society as a whole. In a sector accounting for products that currently emit 40% of UK greenhouse gases, it does not take a mathematician to forecast the speed at which action will be needed on the 20% of stock extant in 2030 that will be built between now and then.

In January 2007, Defra consulted on the extension of the European trading framework in carbon certificates; current thinking is that this will come to apply to all companies spending more than £0·5 million a year on energy. Areas such as leisure centres, hotel chains, cinemas and the waste industry itself are all in line for inclusion in the carbon trading framework. It is probable that major players in the consolidating construction sector will be similarly affected.

The application of sustainable standards in public procurement will also drive this process, backed by the probability that renewable energy and renewable heat targets will have to be tackled with far greater vigour than has been the case in the past.

Spring 2008 sees publication of consultation on the energy white paper, the waste strategy review and the government's white paper in response to the biomass taskforce. As well as a local government review on planning, there are already clear indications from the DTI and Defra that energy, waste, agriculture and reform of local government planning will all share a common theme around resource efficiency and reduction in CO_2 emissions for the UK as a whole.

6. STRUCTURAL AND ECONOMIC IMPACTS ON THE SECTOR

Few would dispute the assertion that, compared with America, Australia and mainland Europe, the British construction sector (particularly in the high-profile area of housing) has been deeply conservative and fragmented. That picture is about to change, however, as the industry consolidates to take on future challenges. That consolidation process is driven by far wider initiatives than resource efficiency and sustainability but, nevertheless, it is likely that it is those trends that will provide a fertile area for developing brand identity and a competitive image in years to come. As this article is being written, there is talk of a £5 billion merger between construction giants George Wimpey and Taylor Woodrow. The house building sector has reduced from 30 to 10 major players in the last 10 years, including mergers and takeovers between Barratt and Wilson Bowden (£2·2 billion), part or whole acquisitions by H Boss of Crest Nickleson, and McCarthy and Stone (£1·8 billion), and Persimmon and Westbury becoming one company. Clearly, such moves drive out significant overhead costs and are indicative of forward trends to develop distinctiveness and profiling of larger brands in the market place. What might be the outcomes of this process?

For a start, one could expect supply chains to respond to efforts to achieve economies of scale by greater standardisation of products and probable growth in modular built manufacture in off-site factories. Such systemic changes to the manufacturing process will obviously reduce in situ waste on site and probably reduce waste generation per unit. Given that as much as 35% of UK electrical supply capacity will need to be replaced and rebuilt in the next 20 years (as nuclear and dirty coal come off line), the expectation is that energy prices will harden in real terms. Currently an average UK household spends just over £400 annually on energy (as electricity, gas and heat). One can thus expect increasing demand for energy efficiency from new-build buyers.

As the first public sector body to demand and enforce a 10% renewables target on all new-build, Merton Council has achieved lasting notoriety. By spring 2007, almost 20% of UK planning authorities had followed Merton's example with compulsory enforcement of this rule. As if these pressures were not enough, the enlarged corporate brands in the market are under tighter and tighter scrutiny in terms of corporate social responsibility reporting and a growing requirement to focus on their so-called carbon footprint. Anyone in the sector uncertain as to pace at which demands from government and the city can crystallise around this subject need only look at the food supply industry. Many in that sector would have dismissed outright as recently as summer 2006 the proposition that Tesco would be applying carbon labelling to the majority of its products, or that there would be an environmental arms race between the major retail brands to boost their sustainability credentials, with resource efficiency being key in that agenda. Given the significance of house purchase costs to individuals, it could be argued that it is only a matter of time before this revolution transforms expectations in the construction sector. Clearly, the pace of that change will be strongly influenced by government policy, trends in energy prices and consumer awareness.

The impact of these processes will go far beyond current efforts to recycle more from the skip. The industry should broaden its horizons and see these opportunities as forming a significant element of competitive edge—and seize that opportunity before becoming an unwitting victim of the process.

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