Co-author **Simon Sturgis** reviews the recently published RICS *Whole life carbon assessment for the built environment* professional statement

The whole picture

The RICS *Whole life carbon assessment for the built environment* professional statement provides comprehensive practical guidelines to enable reliable and consistent measurement of emissions during the entire lifecycle of built projects (*www.rics.org/wholelifecarbonps*).

It is not only the day-to-day energy use of built assets – their operational emissions – that generates sizeable carbon emissions, but also material sourcing, fabrication, construction, repair, replacement and final disposal: in other words, buildings' embodied emissions.

The built environment industry has to date focused mainly on reducing operational emissions, through Part L of the Building Regulations, local authority planning requirements and sustainability rating schemes such as BREEAM and LEED, with embodied carbon emissions not being fully addressed. Reducing such emissions could contribute to limiting resource depletion and pollution, however.

Whole-life carbon

To acquire an overall understanding of a project's total carbon output and avoid any unintended consequences from focusing on operational emissions alone, it is necessary to assess both the anticipated operational and embodied emissions through the entire life of the asset. This is known as the whole-life carbon approach.

BS EN 15978: 2011 Sustainability of construction works sets out the framework for the whole-life assessment of the environmental impacts for the built environment following lifecycle assessment principles (*http://bit.ly/2yfz7gK*).

However, this standard does not go into any great detail, so the problem has been that the varying interpretations and scopes by practitioners and clients, when undertaking assessments in accordance with the standard, have led to unreliable and inconsistent results.

In 2015, after a successful bid for InnovateUK funding, Sturgis Carbon Profiling (SCP) led an industry-wide team to resolve this problem. The team included SCP, Arup, Atkins, Faithful+Gould, the Sustainable Business Partnership, Landsec, Laing O'Rourke, the University of Cambridge, RICS and the UK Green Building Council.

Google's London HQ at King's Cross, London, under construction. The company has included whole-life carbon as a key performance indicator

Following months of detailed discussions among the team, Athina Papakosta and Simon Sturgis of SCP authored the professional statement. This was then subject to peer review and subsequent consultation with the membership of RICS.

Objectives

The specific objectives of this professional statement are to:

- provide a consistent and transparent whole-life carbon assessment implementation plan and reporting structure for built projects, in line with EN 15978
- ensure whole-life carbon assessments have coherent outputs to improve the comparability and useability of results, thus providing a rigorous source of reference for the industry
- increase the understanding of the relative impacts and the interrelationship of embodied and operational carbon emissions to optimise overall reduction
- make whole-life carbon assessments more mainstream by enhancing their accessibility, and therefore encourage greater engagement and uptake by the built environment sector
- promote consideration, at the design stages, of impacts after a project's completion, including maintenance, durability and adaptability of building components and the project as a whole
- promote circular economic principles by quantifying the recovery, re-use or recycling potential of building components and the project as a whole
- encourage better, more considered building designs, with greater attention to the sourcing of materials and products in the design process.

Building life stages

The professional statement is structured in accordance with EN 15978, as a series of modules – A, B, C and D – that cover all stages of a building's life from the sourcing of raw materials through construction, use, repair or replacement to their ultimate disposal and their potential for recycling.

Module A covers the first stages from the sourcing of raw materials through fabrication, transport and construction to practical completion. Reducing carbon emissions in this module concentrates on the choice of materials, the use of recycled content, reducing travel distances with local sourcing, more efficient construction methods – including off-site and modular fabrication – and reduction of waste through recycling.

Module B covers the in-use stage of the building over a given period, typically 60 years. This is where the maintenance regime, durability, flexibility, in-use efficiency and future adaptability of the design will all have a bearing on the resources the building consumes during its life.

Module C covers the dismantling, demolition and disposal of the building.

Module D is then reported separately, as it assesses the potential carbon benefits that might come about through reuse or recycling of a building after demolition, whether as components or as a whole.

Taken together modules A, B and C represent the whole-life carbon emissions cost of the building. The three modules are interrelated in such a way that if, for example, you are considering a choice between double and triple-glazing, the latter will have significant operational carbon benefits but also, importantly, quantifiable embodied carbon costs.

Whole-life assessments enable the costs and benefits to be assessed and compared, so, in the example given, we have found that in a number of cases double-glazing can be more efficient than triple because the latter's carbon costs outweigh its benefits.

In essence, this is a simple carbon cost–benefit analysis, which has not usually been part of the industry's thinking given that regulations and standards focus on the carbon benefit of an action rather than the cost. This inevitably gives a distorted picture.

If building designers consider all four modules together in detail, they will not only ensure a better building at practical completion but also one that will be better thought-through and understood in its future life. With a more comprehensive, reliable and consistent approach to carbon assessment, it follows that benchmarking and target-setting also become more achievable and relevant.

The professional statement encourages all modules to be assessed. But to enable easy uptake by industry, it has a reduced mandatory scope that covers module A to practical completion, module B4, which includes the replacement of superstructure – external walls, windows and doors – and module B6, energy in use. This ensures that architects and structural engineers engage not only with carbon reductions to practical completion, but also through the design of external walls, windows and doors with the implications of lifecycle thinking.

Services engineers already consider lifetime energy use, but the professional statement will ensure they think about the interrelationship between the operational benefits and the embodied costs of the external skin design as well.

Developing the statement

During the early stages of developing the professional statement, it became clear that there were a number of issues the interpretation of which can give rise to significant differences in results.

These include the definitions of spatial boundaries, a building's physical characteristics, quantity measurement and the units used, and particularly carbon data sources, carbon sequestration in timber, carbonation or absorption of carbon dioxide by cementitious materials, and grid decarbonisation, the national transfer from fossil fuels to renewables.

Individually, each of these makes a difference to any assessment; however, some such as grid decarbonisation, have a major impact. Collectively, they can contribute to hugely varying results. The statement therefore gives guidance on all of these points to help reduce variation, and improve the credibility of results.

Evolving areas

It should be noted that some areas such as carbon data sources are still evolving, and therefore the professional statement identifies, in order of preference, acceptable data sources based on environmental product declarations, thus allowing for future improvements.

Although grid decarbonisation is part of UK legislation, EN 15978 does not allow for it. This seems illogical and unrealistic: therefore, the statement requires calculations to be consistent with the standard but also asks for a second figure that takes account of grid decarbonisation. This ensures consistency with the standard while correctly representing the UK position.

The statement therefore provides a basis for more accurate and consistent carbon reporting across the UK. This in turn will lead to greater uptake of carbon reporting, and thus increase carbon reduction across the built environment.

The success of current standards has led to buildings being operationally far more efficient. Looking for further reductions in this area, however, can prove difficult or expensive. For many building types today, lifetime embodied emissions not only outweigh operational ones, but can also be cheaper. A whole-life carbon approach additionally makes plain the value of retaining and reusing a structure as a whole, or as recycled components.

The Paris Agreement of 2015 commits the UK to significant carbon reductions and builds on its low-carbon transition plan of 2009. The whole-life approach to emission reductions will allow the built environment industry to maximise carbon reductions across all building types, avoid the unintended consequences of assessing buildings on operational emissions alone, and increase its contribution to UK carbon targets.

21 Moorfields, London. The project, by developer Landsec for occupier Deutsche Bank, includes detailed whole-life carbon assessments of design, supply chain and construction

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Related competencies include
Legal/regulatory compliance, Sustainability