Construction materials: balancing cost and carbon choices on projects – Q&A

On 29th February 2024, BCIS held a webinar entitled 'Construction materials: balancing cost and carbon choices on projects'. During the webinar, attendees had the opportunity to submit questions, but the webinar team were unable to answer all questions due to time constraints. Below is a selection of the questions that were submitted, with answers from BCIS.

What are LCA and EPD please?

LCA is the abbreviation for Life Cycle Assessment and is a complete study of the environmental impacts of a product over its lifetime. An EPD (Environmental Product Declaration) is a report based on data results from the LCA.

What is BOQ?

A BoQ is short for a bill of quantities - a document used in tendering in the construction industry in which materials, plant, and labour (and their costs) are itemised.

What does A1 to A3 mean?

A1-A3 refers to the material life cycle stages of the manufacture of a product, commonly termed 'cradle to gate'.

What is the measurement you are using, is it CO2 equivalent as the unit?

Yes, the unit taken from the EPD is kgCO2e.

Hi, what are 'units' referred to in carbon estimating?

The GWP Total (A1-A3), representing the carbon associated with manufacture of a product, which is measured in kgCO2e.

Is it your mission to provide embodied carbon measure through the whole LCA of the building from A to D?

Why is it only Mandatory to declare your production phase A1-A3 in an EPD? Surely all fields need to be declared including B5 RE-USe potential?

The BCIS carbon data relates to A1-A3. As the material database evolves will it take a more holistic approach and include A4-A5, Module B and C data?

An EPD does not provide the user any LCA. A poor quality product that is light weight could actually have a better EPD reading than a product that is heavier and lasts for up to 20 years....

The A1-A3 is only the beginning. It should be mandatory for all to declare everything. As suggested a poor quality product with low life span could have a better kg/CO2 than a quality product purely because of its weight!

One issue we have with EPDs is the lack of standardisations in underyling assumptions. I work in electrical networks industry and it is nearly impossible to do a direct comparison between different pieces of equipment.

Yes, we agree and empathise on these points, and our mission is to provide data to support assessments across the whole life of a construction project. Unfortunately, due to the inconsistencies in assumptions made in EPDs, we need to be selective in terms of the data we use. It is our belief that we should use the A1-A3 number from the EPD (along with aspects of C and D), and model transport, construction, replacements and maintenance activities separately to align with the assumptions made for the purpose of costing. The BCIS Cost and Carbon Materials Database therefore focuses on the A1-A3 number and all other aspects are modelled in our component / activity libraries available in our forthcoming cost and carbon service.

In the Cost & Carbon database - whilst you're only stating A1 to A3 could you add service life?

The life expectancy fields look empty in the example, isn't that important for replacement costs over the lifecycle of the building? (£ and CO2).

We do look to include that data when available in the EPD. However, it should be noted that service life is strongly linked to the use case of the material. BCIS separately surveys professionals on service life and our preference is to use this data due to its trusted and independent nature. Our forthcoming cost and carbon service draws upon this source and gives the user the ability to adjust the values to identify the cost and carbon impacts over the life of the building.

There seems to be still a strong focus on costs in the market rather than focusing on sustainable materials along with EPD / LCA's. What time frame do you think we are seeing when better materiality will be selected regardless of costs etc?

I think what we are developing here is the first step of at least understanding the trade-offs of cost and carbon. Which takes priority is very client / project specific at the moment. I am sure in the near future we will see mandates / targets and financial penalties in place for higher carbon - and therefore the pendulum will swing further in the favour of carbon reduction solutions.

What about composite items - Nobody has time to calculate the mortar separately from the blocks in a block wall for example?

Blockwork will comprise mortar, is this part of the 1990kg CO"e per m3?

Noting your calculation for the carbon in the blocks per m2 - what degree of accuracy is needed in the calculation of carbon. for example, what about the mortar, any sundries or fixings etc.

As well as conversions into the correct unit measurement to align with cost estimates, is the database going to address composite items as well as individual items, e.g. floor slabs (concrete formwork & rebar), partitions (studs, plasterboard, insulation etc.) on a per m2 basis?

The BCIS Cost and Carbon Materials Database focuses on basic individual materials. These materials are then used by our component and activity databases, which include all of the predetermined build-ups. Please stay tuned for our forthcoming cost and carbon service webinar, where we'll be able to show you how it's already done for you.

How do you determine the baseline while balancing cost and carbon choice please?

At the moment there are not baseline targets at a granular level, only at a building level. The baseline would need to be calculated by looking at alternatives and developing a range.

For operational carbon, are you taking into account the future energy demands of cooling buildings during heatwaves if they are not well adapted to overheating linked to climate change and heatwaves?

This is the type of activity that the design team for the project would be considering and would be able to model in our forthcoming cost and carbon service. If you haven't already, register for our Carbon Newsletter, which will include developments on this.

Have you managed to do cost comparison using cost plan examples so as to estimate percentage difference?

We are at an early stage of understanding the correlation between cost and lower carbon construction material choices. We are hoping our forthcoming cost and carbon service will enable users to model this for their projects.

Featured in the database, is there much in the way of components and items that are required for the delivery of infrastructure works? (i.e. telecoms)

We are at an early stage of capturing and gathering data, especially for mechanical and electrical type items. We would be delighted to engage with yourselves to help drive decarbonisation in this essential sector.

Does the database capture carbon for construction activities not including materials e.g. cut/fill earthworks, trenching, etc?

The BCIS Cost and Carbon Materials Database focuses on the basic individual materials during manufacture. Activities such as those from construction plant usage are available in the component / activity data available in our forthcoming cost and carbon service product.

How is site waste going to be integrated into these calculations?

The BCIS Cost and Carbon Materials Database focuses on the basic individual materials during manufacture. Site waste is measured and modelled as part of an activity and is included in our upcoming cost and carbon service.

Presumably EPD data only covers the embodied carbon in manufacturing process. Is there standardised data to cover carriage to site, wastage plus carbon in plant and labour to construct on site or does it all need to be specific to each site for plant, labour and logistics?

The RICS whole life carbon assessment standard provides some generic defaults but these are only to be used in the absence of calculating something specific for your project.

Will you also be documenting other environmental / sustainability metrics of materials other than carbon?

CO2e is a measure that includes all global warming potential impacts. We will explore the inclusion of other environmental data when the industry is ready.

Are you measuring items for their whole life carbon, operational carbon, upfront carbon, or other?

Our mission is about the whole life impacts of both cost and carbon, but our forthcoming cost and carbon service allows you to model just the upfront impacts if you wish.

Is the carbon value of water in products included in GWP3?

It is always best to look at the EPD of the product to understand what has been included.

I assume this will be relevant to building maintenance in terms of planned preventative maintenance surveys and replacement building elements at the end of lifecycle etc.

Yes, data on all activities undertaken on a component are included and available through BCIS.

I think there should be an onus put on manufacturers to enter their latest product carbon data on this system... It would be impossible for BCIS to continually update their database?! If we are really passionate for this to work - a bit like car manufacturers with Co2 emissions...

Many thanks for the comment - and we completely agree. We have hopefully set up the mechanism in the Built Environment Carbon Database (BECD) to encourage the manufacturers to do this, but all help is appreciated!

At what stage will a main contractor need to start recording embodied carbon?

This will vary depending on the client / funder and type of project the contractor is working on. We strongly advocate that everybody in the construction industry should be doing this now.

While some low-carbon construction methods may have higher initial costs, can they lead to significant operational cost savings over the building's lifespan, making them cost-neutral or even cost-positive in the long run?

Yes! This is why we advise that whole life cost and carbon assessments are undertaken.

Is there an approximate margin or range of accuracy associated with using this tool for project material cost estimation?

The margin of accuracy is more likely to be influenced by other aspects, such as quantity accuracy. BCIS is confident in the quality and accuracy of the database, and it is also updated monthly.

Does the panel feel that there will need to be a move away from traditional construction methods and materials to a more prefabricated approach using modern methods of construction? To enable the control of carbon emissions etc.

We don't feel that a one size fits all solution would work in the construction industry and that all possible design solutions should be appraised on their whole life cost and whole life carbon impacts

Should we focus on the elements we know are the largest contributors to climate change? Data on things used in small quantities does not move the needle...where should we be most transparent in EPDs?

The RICS whole life carbon assessment standard identifies the elements of a construction project that needs to be appraised.

Do you think all design disciplines recognise that the QS is best placed to undertake the carbon and cost calculations?

To be honest, no, but I think QS's need to stand up and explain the efficiency and accuracy that comes about if they do. I think in the absence of anyone taking responsibility for reporting we have seen it being done by many different professions, all making different assumptions in the process! I think up until now most QS's haven't had the data, the tools or the knowledge to do it confidently - and this is where we hope what we are doing can make a real difference to the profession and the wider industry.

Do you think we will start to generate approx benchmarking data for various building classifications?

Yes, we are starting to do this through our work on the Built Environment Carbon Database (BECD) and the development of generic models in our forthcoming cost and carbon service. Watch this space and - if you can - reach out and help as it will mean we can all get there quicker.

Is the BCIS Cost & Carbon materials database ready and available to use now with a BCIS Account?

Yes, the service is live and our team would be delighted to set up a demonstration if you'd like to see it in action. You can contact us here.

We currently subscribe to the indices data, is it possible to add access to the materials carbon database to this? If so, what is the cost for this? Who do we speak to about this?

Yes, please contact us here.

Will the BCIS materials database (and carbon data) be freely available for use in other tools? e.g., via an API

The BCIS Cost and Carbon Materials Database is available by subscription to a module on our BCIS Online platform.

Is this cost and carbon database public accessible?

The BCIS Cost and Carbon Materials Database is available by subscription to a module on our BCIS Online platform.

Are there any free Software products available (eg. online) you can recommend to assist with Carbon quantification?

Due to the complex and large amount of work required to compile and normalise the data involved in these types of products, it is unlikely that a 'free' product would provide any reasonable answers.

Please could you summarise the names and links to the different current and future databases you have mentioned in the chat. Thank you

The Built Environment Carbon Database
The BCIS Cost and Carbon Materials Database
Upcoming BCIS Cost and Carbon service

Great information presented thanks, just wondered if you had any recommendations for the best estimating software to use for loading all EPD info into?

We are not able to endorse any calculators / software other than our own but, as stated in the webinar, we are working with software vendors such as Sterling to get our data integrated. We'll show this integration working in a future webinar, so stay tuned.

The example from the Cost & Carbon Database has inconsistent units of measurement.

The BCIS Cost and Carbon Materials Database does not restrict the materials the user is able to compare and therefore it is perfectly possible to compare a material with different purchased (collected) units or from completely different material categories. The product aims to rationalise the units between the measured unit and the declared unit in the EPD to benchmark the data for estimating. These materials would then be rationalised further at the activities stage via the build-up recipes to comply with a particular method of measurement.

Presumably where we need to look at the total make up of all components for a concrete block wall, in addition to the blocks themselves, it gets even more complicated

It does, but luckily BCIS has modelled all of the materials needed for a wide range of components. Please stay tuned for our forthcoming webinar which will show this.

There is limited value in comparing insulation of similar thicknesses on a m2 basis without factoring the relative performance. The products achieve different U values with different thicknesses.

The thermal performance of a product and subsequent comparison is beyond the current scope of the BCIS Cost and Carbon Materials Database and is generally the domain of the specifier and design team. However, we do see that this type of information may prove useful and may provide routes to future enhancements.

Are sterling going to include A5, B1 to 5, C1 to 4 & module D?

Yes we understand that this is due for release at the end of 2Q2024. We will be running a Sterling and BCIS webinar to cover this in more detail soon.

Interesting to hear the work Sterling do. Is Sterling's software (and reporting) in accordance with ICMS3 and RICS WLC Professional Statement? I head up our Carbon Advisory service at Henry Riley (a QS firm originally, which has expanded into different service lines, and now includes The Footprint Calculator), and it's refreshing to hear that the issues we are experiencing in the industry are being replicated on a wider scale.

Yes, we understand that the software is. We will be running a joint Sterling and BCIS webinar to cover this in more detail soon.

Is / will the BCIS Carbon data information be presented in accordance with the ICMS (International Cost Measurement Standard) so as to ensure global consistency in terms of units of measurements etc?

Answered during the webinar, the outputs align with the RICS whole life carbon assessment standard and cost measurement standards (NRM1 and NRM3). These align to ICMS.

Will the life cycle cost and calculator comply with sustainable certification schemes such as BREEAM?

Will the product align to BREEAM and other accreditation requirements?

I understand from the standards body that there is an alignment between the RICS whole life carbon assessment standard that our upcoming cost and carbon service complies with, and an element of reporting required for BREEAM.

Will BECD, BCIS, NBS & BIM eventually be linked so that when a project is fully designed reports can be produced for embodied and operational carbon, and total costs?

I really hope that the general mundane measurement and quantification can be made easier in the future.

How does the BECD data compares to data/conversion factors issued by ICE/BEIS? Is there a right and wrong?

The right data is the data you can evidence.

This is a similar tool to OneClick, what advantage does this have? As majority of BECD data comes from carbon assessment done in OneClick... which means that One Click also have this data, if not more?

To my understanding the forthcoming BCIS cost and carbon service is the only one that reports capital cost, life cycle cost, and whole life carbon for buildings.

Brilliant presentation, thank you very much. What separates your material database from others, for example: OneClick LCA's? Their library claims to boast over 35,000 materials however I've found that most products which our practice specify are not included in their library. How long will it be before sufficient products are available on BECD to use this as a sole resource in referencing material information for conducting building LCAs?

Many thanks, our database includes cost and carbon values as opposed to just carbon. Users of the BECD database also get to feedback and request items for future releases.

We have epc ratings for carbon for residential propoerties, does this conflict with rics metrics or does it support

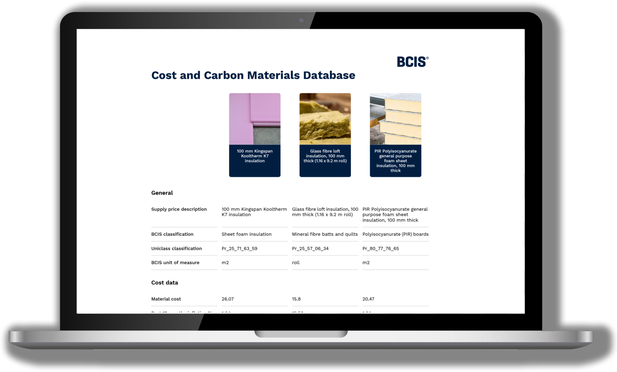
I would need to bow down to RICS for a definitive answer on this one - sorry!

Legislation wise - is it still just operational carbon that needs to be calculated?

Some companies will have ESG reporting for Scope 1 and 2 emissions, so it really depends on where you are in the supply chain. Certainly operational has always been a big focus in the past - often at the expense of embodied carbon so that is why we must model and report whole life (embodied and operational)!

To support the smaller businesses in their supply chains who maybe don't have the finance or resource to do this; e.g. should any purchase of materials be the responsibility of the purchaser - to work with the 3rd party to ensure appropriate material carbon information is continuously created and updated? e.g. don't purchase without the EPDs being available; or take responsibility. Thanks

I think there is a risk that offloading the responsibility to the supply chain would result in a lack of an incentive to reduce emissions. I certainly believe that we should be working with the product manufacturers to get decent data available - and one way to encourage this is to decline to buy if the data isn't there. I also empathise with manufacturers that it's costly and time consuming to do - so we need to find a way to help them. In some countries this is subsidised by government.



DOWNLOAD A SAMPLE REPORT FROM THE BCIS COST AND CARBON MATERIALS DATABASE