Written evidence from The Alliance for Sustainable Building Products (ASBP)

The ASBP is a non-profit organisation formed in 2011 with a mission 'to lead the transformation to a healthy low carbon built environment by championing the understanding and use of demonstrably sustainable building products'. Since 2011, we have grown to over 80 members of forward-thinking companies and institutions from across the built environment sector.

We take a holistic approach to sustainability through our 'Six Pillars of Sustainable Construction' that includes a commitment to whole life carbon minimisation, resource efficiency, health & wellbeing, ethics & transparency, technical performance and social value. Our activities include research, awareness raising, guidance and training to improve understanding and aid implementation. We welcome the EAC's inquiry into the Sustainability of the Built Environment and have prepared this evidence following consultation with our members and wider stakeholders. Our evidence places particular emphasis on the importance of embodied carbon within the building fabric and the circular economy.

1. To what extent have the Climate Change Committee's recommendations on decarbonising the structural fabric of new homes been met?

There is no national policy to encourage the use of low embodied carbon materials within the context of whole life carbon. The policy focus is on operational carbon despite embodied carbon representing more than 50-70% of a new building's lifetime emissions[1]. As operational carbon reduces, the importance and impact of embodied carbon increases which is why a greater focus on embodied carbon is needed.

Interest in the use of natural materials has grown in the last 18 months, but progress remains stubbornly slow. Established low embodied carbon solutions are being overlooked whilst barriers to their greater use are forming, such as insurance difficulties, and misunderstandings surrounding fire behaviour for timber products in particular.

The recently published Construction Playbook recommends whole life carbon assessments that include embodied carbon are undertaken as part of government procurement, but these lack benchmarks or targets. This is also a requirement within the London Plan.

Better data is required for the sector to monitor the materials used in the structural fabric of homes and other buildings. Best estimates indicate the proportion of timber frame construction varied between 15% to 30% of all new UK housing in 2016[2]. The English House Condition Survey is limited by sample size and CCC data varies widely. The ONS Construction Product Statistics do not provide clear data to aid decarbonisation.

2. How can materials be employed to reduce the carbon impact of new buildings, including efficient heating and cooling, and which materials are most effective at reducing embodied carbon?

[1] See Figure 1 in RICS (2017) Whole life carbon assessment for the built environment; https://www.rics.org/globalassets/rics-website/media/news/whole-life-carbon-assessment-for-the--built-environment-november-2017.pdf

[2] All-Party Parliamentary Group for the Timber Industries – How the timber industries can help solve the housing crisis; https://ttf.co.uk/how-the-timber-industries-can-help-solve-the-housing-crisis/

The answer is fourfold:

1. Materials that have lower embodied carbon, or which can be used efficiently together to provide low embodied carbon solutions
2. Materials that sequester carbon over the building's life and beyond.
3. Materials that reduce operational carbon in terms of heating and cooling.
4. Materials that can be used within a circular economy minimising the use of virgin materials and maximising the durability of both materials and products.

Good, resource efficient building design is key to the successful employment of any material. The intrinsic benefits of any material mean little without good building design, workmanship, installation or maintenance. The greatest opportunity for reducing embodied carbon is at the very start of a project, with the setting of a target/benchmark as part of project brief development and support during concept and developed design. This includes measuring embodied carbon within a whole life carbon framework throughout each stage.

As well as natural materials, other materials can have a lower embodied carbon, such as those with high re-use capacity or levels of recycled content. A willingness to consider substituting with innovative technology is key. For example, there is enormous potential to reduce the amount of embodied carbon found in the foundation of buildings by using Fibre Reinforced Polymer to displace high embodied carbon content products like concrete and steel in the industry, with the case study of the Kiss House showing a 70% embodied carbon reduction; this could equate to 1 million tCO_2e annually if used on all residential new builds[3].

A truly sustainable building can only be created by considering the building as a whole for its lifetime rather than focusing purely on individual components. Initial impacts occurring before the building's practical completion can never be reduced after construction. Carbon released now acts in the atmosphere for the next 100 years[4] so the sooner the carbon is reduced the greater the benefit. A focus on upfront carbon reduction (most of which is embedded in materials) is key.

3. What role can nature-based materials play in achieving the Government's net zero ambition?

Nature-based materials can play a significant role. They often require less energy to process and lock up more than their own mass of sequestered CO_2. The CCC[5] has indicated that increasing timber frame construction in new homes from around 27,000-50,000 to 270,000 annually could triple the amount of carbon stored in UK homes to 3 Mt every year, a significant contribution to the UK's net zero carbon target and our annual accounts if the timber arises from UK forests.

Natural materials can be extremely durable and lend themselves to re-use and recycling, ensuring their sequestered carbon remains locked up for many decades within a circular system.

The CCC[6] believes that we cannot achieve net zero without changing the way we manage our land, including a programme of afforestation and agroforestry with the planting of 30,000 hectare of broadleaf and conifer woodland. The fertility of our land means we can grow a huge variety of crops, many products/by-products of which can be used in construction. For example, sheep's wool, straw, wood fibre and hemp fibres are being used in insulation and composite applications in buildings and have great potential beyond their current levels of utilisation.

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[3] Information available on request

[4] *Ürge-Vorsatz, D. et al. (2018)* 'Locking in positive climate responses in cities Adaptation-mitigation interdependencies', Nature Climate Change, 8(March), pp. 174–185. Available at: https://www.nature.com/articles/s41558-018-0100-6

[5] Committee on Climate Change (2018) UK Housing; Fit for the future; https://www.theccc.org.uk/publication/uk-housing-fit-for-the-future/

[6] Committee on Climate Change (2020) Land Use: Policies for a Net Zero UK; https://www.theccc.org.uk/publication/land-use-policies-for-a-net-zero-uk/

There are also other benefits such as the quick growth cycle of hemp, which in building block form has excellent airtightness and thermal performance. Pittau et al (2019)[7] shows that straw used in construction could remove 3% of the CO_2 emitted by the entire construction sector in Europe. There are other nature-based materials such as cork, bioplastics, cob, etc. which may also be advantageous to use.

4. What role can the planning system, permitted development and building regulations play in delivering a sustainable built environment? How can these policies incentivise developers to use low carbon materials and sustainable design?

All three can and must play a role. There is no policy or regulation to address embodied carbon. In 2019, a report to the CCC[8] showed how embodied and sequestered carbon could be considered in the new build standards framework, providing three options – 1) Government could monitor embodied carbon and lead with mandatory reporting and reduction through its own procurement, 2) that "whole life carbon intensity limits" be set in Building Regulations for relevant elements, product types and materials, or 3) a "scheduled introduction of whole building lifecycle carbon intensity targets in building regulations could be considered. The Low Carbon Route Map[9] produced by the Green Construction Board in 2013 suggested that declarations of embodied carbon for construction products and reporting of embodied carbon for public buildings should become mandatory. However, no action towards this has been taken.

Local authorities should adopt the requirements for whole life carbon assessments following the GLA's London Plan S12 policy (pre, full and practical completion). The Building Regulations should be developed with a new Part Z: Embodied Carbon Emissions, as outlined in our response to Q6. Regulatory targets should follow once more data is gathered to set robust benchmarks for building types[10].

A freely accessible database, or adoption and update of existing freely accessible database[11,] for anonymised Whole Life-Cycle Carbon Assessment data of new buildings is important. Supporting all of this is the establishment of an Embodied Carbon Hub to provide guidance, training and support best practice in embodied carbon assessment so that embodied carbon lessons are widely learnt (this has been done in Finland for example). Lastly, the Government should build on the requirements in the Construction Playbook to create a preference for sustainable construction with low whole life carbon within UK Government procurement.

[7] Pittau F, Iannaccone G, Lumia G, Habert G. 2019. Towards a model for circular renovation of the existing building stock: a preliminary study on the potential for CO2 reduction of bio-based insulation materials. IOP Conf. Ser. Earth Environ. Sci. 323:0121176

[8] https://www.theccc.org.uk/publication/options-for-incorporating-embodied-and-sequestered-carbon-into-the-building-standards-framework-aecom/

[9] https://d7.ciob.org/sites/default/files/GCB_Carbon_ROUTEMAP_1.pdf

[10] These support the findings of the independent Architects Climate Action Network (ACAN) in their report 'The carbon footprint of construction'. Available at: https://www.architectscan.org/embodiedcarbon

[11] e.g. the RICS Building Carbon Database https://www.rics.org/uk/products/data-products/insights/rics-building-carbon-database/ previously developed by UKGBC and WRAP.

5. What methods account for embodied carbon in buildings and how can this be consistently applied across the sector?

Since 2011, European standards have been provided to ensure a level of consistency in the assessment of environmental impacts for construction products and buildings. BS EN 15804:2012 covers the assessment of embodied impact at product level, incorporating a number of impacts, as well as embodied carbon used as the basis of Environmental Product Declarations (EPD). There are now over 10,000 EPD available for construction products[12,13]. BS EN 15804:2012+A2:2020 has recently been updated with new indicators and some additional, more transparent, reporting requirements.

The building level assessment standard, BS EN 15978:2011, provides the methodology for life cycle assessment and other quantified environmental information, to assess the environmental performance of a building, and gives the means for the reporting and communication of the outcome of the assessment.

The RICS Professional Statement on Whole Life Carbon provides guidance on how to assess embodied carbon in the UK context according to EN 15978 in a way which will bring about more consistency for UK assessments. BRE also has its own LCA methodology, IMPACT, though this is not publicly available.

There are various tools available to undertake embodied carbon assessments and life cycle assessments at both product and building level but there is no standard industry tool for the UK. In countries where there is regulation at building level (e.g. the Netherlands, France, Finland, Sweden), a national methodology is provided in line with EN 15978. IN the UK, there can be variation between outputs depending on which tool is used, largely due to the different data sources and approaches that are used to underpin the tools.

6. Should the embodied carbon impact of alternative building materials take into account the carbon cost of manufacture and delivery to site, enabling customers to assess the relative impact of imported versus domestically sourced materials?

Yes, the European standards mentioned in the Q5. response take into account the impacts of manufacture and delivery to site, which should be included for all building materials. Whether the carbon impact of delivery to site has a bearing on import/export decisions depends on the proximity of the factory to the site. For example, a site in South East England may be closer to factories in Belgium than Scotland.

Manufacturing impacts are often much higher than transport impacts. The balance varies depending on the nature of the product or material. It is always sensible to compare the manufacturing impacts alongside the transport impacts of a product to ensure that the optimal solution is obtained. For example, the impact of producing 1 tonne of steel section from British Steel in Scunthorpe is 2450 $kgCO_2e$/tonne[14], whilst World Steel give the average impact for a steel section produced in Europe as 1550 $kgCO_2e$/tonne[15]. The impact of transporting steel 1000 km by road in an averagely laden articulated truck (GLW 33+t) would be 78 $kgCO_2e$/tonne[16], so a product with 10% lower emissions could travel over 3000 km and still have a lower impact.

Its important that the EAC recognise that although the standards EN 15804 and EN 15978 measure carbon impacts irrespective of location, this is not the case for the UK Government. The impacts of

[12] https://bit.ly/2021-EPD
[13] See ASBP Briefing Paper (https://asbp.org.uk/briefing-paper/epd-where-to-find).
[14] British Steel EPD https://britishsteel.co.uk/media/342251/british-steel-rails-sections-epd.pdf
[15] Circular Ecology Inventory of Carbon and Energy v3, 2019 https://www.circularecology.com/ice-database.html
[16] BEIS/DEFRA UK Government GHG Conversion Factors for Company Reporting, 2020.

extracting and manufacturing imported construction materials are not considered in our national greenhouse gas accounting in relation to the Kyoto Protocol and Paris Agreement. In looking to achieve the UK target of net zero by 2050, based on the UK's current measurement system, importing construction products rather than producing them in the UK would appear more beneficial. However in reality, importing is likely to increase the embodied impacts of buildings, especially for products like brick and concrete due to the increased impacts of transport.

7. How well is green infrastructure being incorporated into building design and developments to achieve climate resilience and other benefits?

Green infrastructure is being incorporated very well into building design but not often enough, which is largely due to cost. There is the need to ensure that the skills and funding are in place to adequately maintain these systems. Planning policy is a key driver - London installs 42% of all green roofs in the UK due to their planning requirements[17]. Other levers could include providing fiscal incentives by using proven technologies. Benefits of including green infrastructure within buildings are clearly documented; a 50% reduction in absenteeism has been shown in offices[18] and nearly a quarter improvement in satisfaction of the work environment[19]. ASBP has long championed the use of healthy products, some of which emanate from green infrastructure. A key message stemming from our most recent conference is that health must be added into our definitions of sustainability[20].

8. How should we take into account the use of materials to minimise carbon footprint, such as use of water harvesting from the roof, grey water circulation, porous surfaces for hardstanding, energy generation systems such as solar panels?

According to the UK Rainwater Management Association (UKRMA), there is a lack of coherent policy for the reuse of water, with Government unclear in its position due to the different priorities within departments (the need for water re-use versus the commercial implications of meeting that need). All building integrated infrastructure should be accounted for in the whole life carbon assessment of buildings.

9. How should re-use and refurbishment of buildings be balanced with new developments?

The re-use and refurbishment of buildings saves resources and provides large embodied carbon savings compared to new build. For example, at 100 Liverpool Street, British Land have more than halved upfront carbon against industry benchmarks, with the main reduction coming from retaining 50% of the existing structure[21].

Buildings become obsolete for many factors. Many buildings are built with commercial lifetimes of around 30-40 years (even though the structures can last over a hundred years). Other reasons could include a changing demographic and needs, the building being in the wrong location for its function or poor maintenance resulting in technical failure. When making a decision to re-use/refurbish a building or, demolish and build new, building owners should be obliged to understand what materials are in their buildings, the equivalent embodied carbon impact of them and their financial value. This information should be mandated for buildings, as part of the Golden Thread and material passports.

[17] https://asbp.org.uk/wp-content/uploads/2018/04/Peter-Wootton-Beard-Aberystwyth-University-HealthyBuildings18.pdf
[18] https://asbp.org.uk/wp-content/uploads/2016/12/Alan-Fogarty-Cundalll-ASBP-Expo-17-Well-CPD.pdf
[19] https://asbp.org.uk/wp-content/uploads/2017/02/Zoe-Young-MS-ASBP-Health-and-Wellbeing-Slides2.pdf
[20] https://asbp.org.uk/asbp-news/hb21-report-kate-de-selincourt
[21] https://www.britishland.com/sustainability/our-views/halving-embodied-carbon-scale-100-liverpool-street

Any existing development which is in danger of being demolished should have to undergo a refurbishment assessment, which as well as cost implications, should also consider the embodied carbon implications from retaining versus new. A decision tree type analysis is required as part of the GLA's London Plan circular economy statement[22], with an explanation required of why refurbishment is not feasible. Some developers, such as British Land are now putting a price on tonne per embodied carbon, which can be factored in as part of the value of a building. There is an important role to address how sustainability is addressed and communicated within the ongoing leasing arrangements for buildings, making sure that initial efforts are not wasted; this requires active engagement and incentivisation of managing agents and in the residential sector, residential management companies.

10. What can the Government do to incentivise more repair, maintenance and retrofit of existing buildings?

A key incentive is to level up the playing field regarding financial mechanisms. Many organisations have called for the removal of VAT on repair and retrofit, making it comparable to a new development. Requiring the measurement of whole life carbon in regulation and setting targets will also encourage retrofit. Other incentives could come from the planning system, such as being able to increase height or floor areas for buildings that are being retrofitted.

There is an increasing drive to retrofit our buildings to ensure a pathway to net zero, with recommendations from the CLC on a National Retrofit Strategy[23]. This clearly outlines the need for a Retrofit Delivery Agency, a fabric-fist approach and various types of support. From an embodied carbon perspective, consideration needs to be given on the types of materials that are used for retrofit, including their durability, longevity and circularity.

We fully support the EAC's recommendation[24] '*Sustainable building materials are not being utilised to anywhere like their full potential in the UK. The use of natural fibre insulation could have significant benefits for the UK's older housing stock*'.

We also need to think about how we build our buildings for low maintenance. Studies in Denmark have shown that a house with long life components needing few or no replacements over the building lifetime, can save 30% embodied carbon; and a house which is easy to adapt and extend, and designed for disassembly, can have a 17% saving in embodied carbon[25].

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[22] https://www.london.gov.uk/publications/circular-economy-statement-guidance
[23] Construction Leadership Council (2020) Greening Our Existing Homes - National retrofit strategy; a consultative document https://www.constructionleadershipcouncil.co.uk/wp-content/uploads/2020/12/CLC-National-Retrofit-Strategy-final-for-consultation.pdf
[24] Environmental Audit Committee (2021) Fourth Report – Energy Efficiency of Existing Homes; https://committees.parliament.uk/work/309/energy-efficiency-of-existing-homes/publications/
[25] Rasmussen, F. N., Birkved, M. and Birgisdóttir, H. (2020) 'Low- carbon design strategies for new residential buildings–lessons from architectural practice', Architectural Engineering and Design Management. Taylor & Francis, 0(0), pp. 1–17. doi: 10.1080/17452007.2020.1747385.