MPA UK Concrete submission

About UK Concrete and MPA

1. UK Concrete is part of the Mineral Products Association (MPA), the trade association for the aggregates, asphalt, cement, concrete, dimension stone, lime, mortar and silica, sand industries, and has been set up to represent the UK's concrete industry.
2. The Mineral Products Association (MPA) is the trade association for the aggregates, asphalt, cement, concrete, dimension stone, lime, mortar and silica sand industries. With the affiliation of British Precast, the British Association of Reinforcement (BAR), Eurobitume, MPA Northern Ireland, MPA Scotland and the British Calcium Carbonate Federation, it has a growing membership of 530 companies and is the sectoral voice for mineral products. MPA membership is made up of the vast majority of independent SME quarrying companies throughout the UK, as well as the 9 major international and global companies. It covers 100% of UK cement and lime production, 90% of GB aggregates production, 95% of asphalt and over 70% of ready-mixed concrete and precast concrete production. In 2018, the industry supplied £16 billion worth of materials and services and was the largest supplier to the construction industry, which had annual output valued at £172 billion. Industry production represents the largest materials flow in the UK economy and is also one of the largest manufacturing sectors.

Summary

3. A sustainable built environment, including housing but also all other forms of development including infrastructure, must be measured over the whole life cycle of structures, including end of life. Focusing too narrowly on embodied carbon to the isolation of other measures risks emitting more carbon dioxide over the long term, especially if materials with less resilience and longevity are selected, leading to shorter life spans. Heavyweight materials such as concrete have the benefits of excellent thermal mass, recyclability, carbonation[1], where the concrete absorbs carbon dioxide over its lifetime. Concrete is also a locally-produced construction material, responsibly sourced and with a sector roadmap to achieve beyond net zero by 2050.[2]

Introduction

4. The built environment – including housing, but also buildings for commercial use, industry and public services and the infrastructure on which all of us rely – is one of the most significant environmental impacts humans have. It is critical to reaching net zero. The built environment is inherently long term – almost everything built today will still be standing by 2050, and much will make it to the next century. Saving carbon throughout the lifetime of each structure is essential to getting to net zero overall.

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[1] The Concrete Centre (2016) Whole-life Carbon and Buildings, https://www.concretecentre.com/Publications-Software/Publications/Whole-life-Carbon-and-Buildings.aspx; see also The Concrete Centre webpage "Concrete carbonation", https://www.concretecentre.com/Performance-Sustainability/Circular-economy/Whole-life/Carbonation-of-concrete.aspx

[2] https://www.thisisukconcrete.co.uk/TIC/media/root/Perspectives/MPA-UKC-Roadmap-to-Beyond-Net-Zero_October-2020.pdf

5. We should as a society take the long view of sustainability, including environmental, social and economic considerations at all levels and geographic areas of the country, which must be viewed on a life-cycle basis. Much of the focus in this debate is on residential, which of course has both scale and political salience. But significant savings can be found from the commercial and industrial sectors and infrastructure as well.

6. Transport and energy infrastructure enable significant carbon savings which must be factored in – for example, the railway network or the energy network enabling remote renewables to connect are both essential for reducing carbon. The use and alternatives to any structure, and its performance in use, are all important parts of forming a judgement of sustainability.

7. Housing is essential for people, and as a society we are seeing a significant challenge to build more to meet demand. More housing requires more infrastructure, all of which has a sustainability impact but is essential for social and economic life.

8. There are several under-appreciated environmental contributions made by heavyweight building materials. Concrete absorbs a proportion (c.23 percent of process emissions) of the carbon dioxide emitted in the manufacture of the cement that goes into it.[3] It is also completely recyclable at the end of its life. Quarries that supply limestone for concrete products are remediated at the end of their life to some type of amenity, be it a natural habitat or reserve, public space or even farmland. By contrast, commercial timber production can and does lead to monoculture and the depletion of habitat and ecosystems.

9. While saving 'carbon now' has resonance and urgency, it should not come at the expense of total life-cycle impacts. The two considerations are not mutually exclusive, and both can be achieved if we are willing to set aside preconceived perceptions. For example, it would be a mistake to treat timber used for construction purposes is an unadulterated, natural product, when it is a manufactured product. Cross Laminated Timber, "glulam", and even sawn timber beams all go through a manufacturing process that uses energy, adds chemicals, and uses glues. Likewise, concrete is a construction material that uses naturally occurring rocks and sands, as well as limestone that is put through a manufacturing process to create cement. As such all construction materials have an environmental impact and a carbon footprint, and they should be judged on the basis of facts rather than perception. A true life-cycle assessment must include the end of life treatment, which can have significant carbon dioxide or even methane emissions.

10. There is a serious risk that policy set now on the basis of inaccurate information has the potential to lock-in less than optimum environmental, social and economic

[3] IVL (2018) "CO2 uptake in cement-containing products", https://www.ivl.se/download/18.72aeb1b0166c003cd0d64/1541160245484/B2309.pdf,; see also R. Andersson, H. Stripple, T. Gustafsson, and C. Ljungkrantz, 'Carbonation as a method to improve climate performance for cement based material', Cement and Concrete Research, vol. 124, p. 105819, Oct. 2019, doi: 10.1016/j.cemconres.2019.105819.

impacts that could go a long way to impeding our path to net zero and putting in jeopardy the security of supply of essential construction materials. A construction strategy that relies heavily on imports would be a threat to our ability to deliver a sustainable built environment and to add social value, and runs counter to the Construction Sector Deal which sought to reduce the trade gap in construction products and materials.[4]

11. It is our firm view that Government should put in place a framework that seeks to deliver the right outcome and not prescribe the route there, thereby allowing the market and innovation to find the optimal pathway. The built environment should be part of a sustainable economy and society. Responsible sourcing and well-designed, implemented, and managed procurement policies can help ensure delivery. Standards already exist for assessing sustainability performance and embodied impacts including embodied carbon and should be used.

Q1. To what extent have the Climate Change Committee's recommendations on decarbonising the structural fabric of new homes been met?

12. Decarbonising new homes is vital and our members are playing their part in reducing emissions, as evidenced by the UK Concrete and Cement Roadmap to Beyond Net Zero for the long term and a wide range of measures now including fuel switching and producing and promoting low-carbon concretes.

13. A fabric-first approach, where buildings are designed to maximise the performance of the building fabric before adding mechanical or electrical equipment, can do a lot to make housing and other buildings more energy efficient.

14. Concrete and masonry buildings can meet and exceed the performance requirements in Part L of the Building Regulations and the Future Buildings Standard. Setting a demanding standard and expecting all materials to reach it is a much more appropriate way forward than setting a preference for specific materials.

15. The target for increasing the proportion of timber buildings in the CCC's *Housing Fit for the Future* has not been met. This is not necessarily a problem, as it conflicts with other key aims of reducing overheating (and thus energy demand for cooling) and ensuring fire resilience. We have long criticised the CCC's inconsistency on building materials, which urges improved thermal efficiency only to recommend timber structure, which is significantly less efficient than heavyweight building materials. Given the importance of overheating in a warming climate, not least the Environmental Audit Committee's previous work on heatwaves, this enthusiasm seems ill-placed. We hope the CCC's thinking on this issue, and their advice to Government, evolves.

16. Increasing the take-up of timber would also add demand that may not be able to be supplied, as noted by the Construction Leadership Council:

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[4] HM Government (2018) "Construction Sector Deal", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/731871/construction-sector-deal-print-single.pdf

> *"Imports of timber will be an issue for the foreseeable future. Not enough timber is being produced to meet world demand."*[5]

This is before we factor in the time lag from planting new forests now and being able to harvest useful quantities of timber, which does not answer the question of tackling carbon emissions now.

17. There are also concerns around the environmental and ecological impacts of increasing forestry for timber, including the risk of monocultural plantations reducing biodiversity and soil disruption which can release significant carbon emissions.[6] Climate change and biodiversity policies need to be complementary and mutually reinforcing, rather than at odds.

18. Even if all the timber used in the UK is from well-run, ethical sources increasing global demand beyond capacity to supply risks environmental damage either in pressuring protected forests or in countries where corruption or weak enforcement make deforestation and consequent climate impacts more likely.[7,8]

Q2. 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?

19. It is important to compare buildings rather than materials, because the impact of any material is dependent on its use.

20. The whole life of a building, including its materials and construction, operation, demolition and recycling or disposal should be considered as one, and at the level of the building rather than the individual products that go together to build it. A disproportionate focus on embodied carbon can give an incomplete picture of a building's true impact, potentially leading to choices being made that deliver higher lifetime emissions. Where it is possible to reduce embodied emissions without compromising operational emissions (and vice versa) obviously it should be done.

21. Choice of materials is important but more so is how they are used. When comparing materials, it is important to compare functionally equivalent units; for example, one cubic metre of concrete will give far more strength, durability, resilience and thermal mass than the same volume of timber as well as being far safer in terms of fire. Concrete has other key properties such as flood and rot

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[5] Construction Leadership Council statement, 7 April 2021, https://www.constructionleadershipcouncil.co.uk/news/construction-product-availability-statement/

[6] International Institute for Sustainable Development (2019) "Emission Omissions", https://www.iisd.org/system/files/publications/emission-omissions-en.pdf

[7] Letter from Ukrainian Environmental NGOs to the European Parliament (2020): https://www.earthsight.org.uk/media/download/899 following the report from Earthsight (2020) "Flatpacked Forest", https://www.earthsight.org.uk/investigations/flatpacked-forests

[8] Dasgupta Review of the Economics of Biodiversity, p334 discusses timber demand and deforestation, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/962785/The_Economics_of_Biodiversity_The_Dasgupta_Review_Full_Report.pdf

resistance which will help extend the life of a structure, getting more value from the same material. Comparing construction solutions or products is the more useful, less abstract approach.

22. Once a material is chosen for a given product, how it is deployed can save significant emissions. The design of the concrete form can be used to minimise material requirements, or to optimise thermal mass, for example. Choosing the right type of concrete has a major impact depending on the structure, with reinforced, pre-stressed, ultra-high performance and high recycled/secondary content options all available. Selecting the right option for each structure is the key thing, rather than broad preconceptions about materials.

23. It is important that comparisons are made on the basis of data and evidence with sound, comparable methodologies. While concrete and steel's emissions are very well understood, there are gaps over many of the assumptions made in the assessment of timber:

> *"[Life Cycle Assessment] studies typically do not track biogenic carbon but simply assume that whatever carbon is harvested is replaced sustainably by new forest growth in the future (i.e., carbon neutrality). Criticisms of this assumption include that it ignores significant and measurable GHG emissions from soil disturbance, carbon losses from the conversion of old-growth primary forest and real-world silvicultural success rates than can be significantly less than 100 per cent. Previous studies have also found that as little as 15 per cent of the carbon stored in a standing tree is sequestered in the final wood product."*[9]

24. Specifying low carbon concrete can reduce the embodied carbon of a structure significantly while still meeting required performance in many structures[10]. There are a range of low carbon concrete that are already available in the UK market and many more in development. These low carbon concretes use lower carbon cements in the concrete mix. Public sector procurement policies would be a powerful tool to grow the market in low carbon concretes for suitable buildings including schools and hospitals, as well as infrastructure projects.

25. A fabric-first approach, stressing passive heating and cooling, is a key way to minimise energy demand. Concrete's combination of high thermal mass and low conductivity means that concrete absorbs heat during the day and slowly releases it in the cooler night, reducing the extremes of the natural temperature curve of the day. Decisions about the orientation of a structure and the dimensions of windows and ventilation can all be made with a view to maximising the thermal gain and dispersal of a structure.[11] Portcullis House in the Palace of Westminster is

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[9] International Institute for Sustainable Development (2019) "Emission Omissions", p.iv https://www.iisd.org/system/files/publications/emission-omissions-en.pdf

[10] https://www.concretecentre.com/Publications-Software/Publications/Specifying-Sustainable-Concrete.aspx

[11] The Concrete Centre (2019), "Thermal Mass Explained, https://www.concretecentre.com/Publications-Software/Publications/Thermal-Mass-Explained.aspx. See also the Concrete Centre webpage "How long is the CO2 payback for thermal mass?" https://www.concretecentre.com/Performance-Sustainability/Thermal-Mass/CO2-payback-for-Thermal-Mass.aspx

an excellent example of using thermal mass for efficiency, with its concrete columns helping to regulate the temperature.

26. As the climate heats over the coming decades, the cooling impact of this will become more important, with buildings made from heavy construction materials providing comfortable environments, becoming welcome refuges from more extreme heat as well as being cheaper to heat in winter. Buildings with a lightweight structure will require air conditioning sooner than those with heavyweight structures, increasing energy demand. Well-designed heavyweight buildings with suitable ventilation for night-time cooling will be particularly efficient and comfortable during the hotter years to come.

27. Finally, it is important to bear in mind end of life and recyclability. The UK leads Europe on the market share of secondary and recycled aggregates, which make up 28 per cent of supply[12] because of its success in driving the recycling of all suitable construction, demolition and excavation waste. The carbonation of concrete – the natural process by which concrete reabsorbs a proportion (c.23 per cent[13]) of the carbon dioxide emitted in its production- is also important here, in comparison to other materials that may emit methane if landfilled, or carbon dioxide if incinerated.

28. Assessments which only examine materials risk locking in higher-emitting buildings over their lifespan. Recyclability is an important point here, with concrete and other demolition waste routinely recycled, whereas some chemically treated timber products will require incineration. This also means that the carbon "saved" is only temporarily stored.

Q3. What role can nature-based materials can play in achieving the Government's net zero ambition?

29. Fundamentally all construction products are "nature-based" with the raw materials for concrete, bricks, mortar and aggregates sourced from quarries before processing. We would caution against simplistically equating wood with "natural." Many products used in modern timber construction such as Cross Laminated Timber or Glulam are subject to significant industrial processing in their production, such as kiln drying and using strong chemical glues and other additives. There are some questions over the end-of-life treatment of these products which need to be satisfactorily answered in a whole life cycle analysis. Many timber Environmental Product Declarations assume an ideal end-of-life treatment that is often not borne out in reality.

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[12] MPA (2020) " https:// The Contribution of Recycled and Secondary Materials to Total Aggregates Supply in Great Britain in 2018" mineralproducts.org/MPA/media/root/Publications/2020/Contribution_of_Recycled_and_Secondary_Materials_to_Total_Aggs_Supply_in_GB_2020.pdf

[13] IVL (2018) "CO2 uptake in cement-containing products", https://www.ivl.se/download/18.72aeb1b0166c003cd0d64/1541160245484/B2309.pdf,; see also R. Andersson, H. Stripple, T. Gustafsson, and C. Ljungkrantz, 'Carbonation as a method to improve climate performance for cement based material', Cement and Concrete Research, vol. 124, p. 105819, Oct. 2019, doi: 10.1016/j.cemconres.2019.105819.

30. In terms of reaching net zero, the impact of material choice on buildings' whole life performance is the important outcome, not the materials themselves. Looking over many decades, focusing too much on embodied rather than all carbon, and on saving carbon now rather than over the lifetime of a structure could lead to greater lifetime emissions if it produces a less efficient building, or one with a shorter lifespan.

31. Concrete's superior resilience to fire, flood and rot and its general durability means that structures last a long time and can be repurposed throughout their lives. Carbonation also means that at the end of its life, as the concrete is recycled it absorbs a proportion of the carbon emitted in the production of cement. By contrast, timber structures are unlikely to last as long, meaning the store of carbon is only temporary, especially for those more industrialised products that cannot be recycled.

32. In that same long view, production of materials must become net zero or even net negative. The UK Concrete and Cement Roadmap to Beyond Net Zero[14] sets out the path for the embodied carbon of these materials. With a 53 per cent reduction in emission from the industry between 1990 and 2018 and a clear plan to get to the point in line with the 2050 target where each tonne produced will actually remove more carbon dioxide than it emits, the long-term future of sustainable construction includes concrete. The plan includes seven technology levers, including Carbon Capture, Usage or Storage, fuel switching and low carbon concretes. This also means that long-term attempts to grow domestic timber will, even if successful, come to fruition around the time that concrete is decarbonised. The roadmap includes a number of essential policy steps for Government, which will ensure domestic supply to the highest standards of sustainability.

Q4. 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?

33. The recent Planning White Paper was almost entirely focused on housing, which is only one part of the built environment, albeit probably the most politically important. There are opportunities across the whole built environment for greater sustainability.

34. One key way to enable a more sustainable built environment is to encourage "long life, loose fit" designs, whereby a long-lived structure can be repurposed as the economy and society change over time. Concrete structures can last many decades, so are very suitable for repurposing without the need for demolition and reconstruction, thus getting maximum use from the same resource. If a building can be used two or three times for different purposes, it avoids a very large amount of construction- and demolition-related emissions. Encouraging this approach, and minimising the bureaucracy and costs of repurposing buildings,

[14] UK Concrete (2020) "UK Concrete and Cement Industry Roadmap to Beyond Net Zero", https://www.thisisukconcrete.co.uk/TIC/media/root/Perspectives/MPA-UKC-Roadmap-to-Beyond-Net-Zero_October-2020.pdf

would be an effective use of the planning system and especially permitted development rights.

35. It would be a mistake for regulations to focus on specific materials; it would be much better to drive outcomes such that the right material is chosen for the right job while fully and accurately measuring the carbon emissions to an agreed, preferably international standard. Carbon assessments could be a valuable contribution to planning so long as they assess the whole life cycle of a structure, including materials, construction, operation, repurposing, demolition and recycling or disposal.

36. All of these rules and regulations can push developers and property owners to make sustainable choices, but it is essential that any attempt to do so is based on sound methodology and data, as discussed above. There is a risk that well-intentioned but flawed policies could be introduced if this is not done; for example putting too much emphasis on embodied carbon of materials leading to buildings with shorter lives, higher operational emissions or unrecyclable demolition waste at the end of their lives.

37. The voluntary targets set by RIBA in their 2030 Climate Challenge and LETI in their Climate Emergency Design Guide are effective drivers for change, with many local authorities adopting them as local targets, or setting their own.[15] Likewise, the sustainability requirements in the National Planning Policy Framework and design Codes are useful. However, targets only have impact when they are measured, published and enforced. The industry is effectively self-policing, seeking ways to meet these targets. Public procurement could have a useful role to play here, encouraging sustainable, domestic production that meets high standards and encouraging innovation and investment in the UK, supporting levelling up.

38. The planning and permitting systems have a direct impact on the sustainability of the sources for mineral products, quarries. Over their lifetime, these sites make a significant contribution to the environment through biodiversity gain, with high-quality restoration of quarries creating 8,300 ha of priority habitat in the last decade.[16] The industry works with Wildlife Trusts, RSPB and other bodies to create and protect habitat that usually far exceeds the biodiversity value of the land's state before being quarried. We support biodiversity net gain, and already deliver huge benefits for nature.

39. Finally, adaptation as well as mitigation should be considered as part of sustainable design. There is a risk of rushing to lower embodied carbon materials resulting in overheating buildings in the future that may need to have air conditioning retrofitted, increasing their operational emissions. This difference comes from the materials' different thermal mass and conductivity, where concrete as well as stone and brick, has the ideal properties to protect from overheating - similar to going into an old church on a hot day. In the wider built environment, green

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[15] https://www.leti.london/
https://www.architecture.com/about/policy/climate-action/2030-climate-challenge
[16] MPA (2020) Biodiversity Strategy
https://mineralproducts.org/MPA/media/root/Publications/2020/MPA_Biodiversity_Strategy_2020.pdf

infrastructure and flood defences, which rely on heavy materials, are going to be increasingly important as the climate warms drawing on concrete's inherent resilience. Any resource efficiency and productivity targets introduced by DEFRA with powers that will be granted by the Environment Bill currently under parliamentary scrutiny must not discriminate against heavy materials.

40. A high-quality built environment relies on a well-managed natural environment as the source of the materials needed. In the latest MPA Sustainable Development Report, 99% of quarries that reported against the objective confirmed that they operated under the British Standard EN ISO 9001 Quality Management System. Other Member sites reported similar results with 97% of ready mixed concrete, 99% of asphalt, 95% of wharves and 100% of slag processing sites also covered by the Standard. Members also reported that for aggregates and asphalt 100% of reported production was certified to 'very good' or 'excellent' level under the Responsible Sourcing Standard BES6001. Similarly for ready mixed concrete Members reported that 85% of reported production was certified to 'very good or 'excellent'.[17]

Q5. What methods account for embodied carbon in buildings and how can this be consistently applied across the sector?

41. Everyone involved in the built environment should be using recognised, rigorous methods. We have concerns that in some parts of the construction industry, ad hoc methodologies, and carbon data developed without Environmental Product Declarations (EPDs), or even misleading EPDs with inaccurate assumptions are being used instead.

42. There are established methodologies and available data to ensure that the right decisions are made to guide material choice, design and sourcing. There is no single best answer in all cases, and each building should be considered individually at the building level, not at the product level, factoring in considerations including how long it is expected to last, its ability to be refitted and reused, and the expected carbon emissions in all phases of a structure's life. This analysis should make use of established and scientifically rigorous carbon assessment methodologies (EN 15978 or ISO 21930). As well as using an appropriate methodology, reliable, verified data sources must be used.

43. EN 15804 +A2 is the recognised methodology to calculate carbon footprinting. The RICS "Carbon Professional Statement" is a guidance document developed to offer further interpretation and guidance in accordance with EN 15804 (for products) and EN 15978 (for projects) to enable buildings' whole life carbon assessments in the UK. It includes UK specific data on buildings' End-of-Life scenarios, UK wastage rates on site, average material transport distances and impacts based on UK averages.

44. There is an issue with a lack of enough data on real buildings, feasible approaches to reduce embodied carbon within given design constraints and an understanding of the use data to be able to make meaningful comparisons. For whole life carbon

[17] MPA Sustainable Development Report (2020), https://mineralproducts.org/MPA/media/root/Publications/2021/MPA_SD_Report_2020.pdf, p6

assessments to become a standard part of developing a project will rely on digitised information being able to be used routinely at the building level.

Q6. 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?

45. Yes.

46. All relevant factors should be included in a carbon assessment where possible, including transport emissions, land use change and management, processing and disposal. The building products produced by MPA members are inherently local, with shorter average delivery distances than lightweight imported alternatives. For example, ready-mixed concrete travels an average of ten miles from source to site, with aggregates (23 miles) and asphalt (29 miles) similarly local.[18] This means they have resilient supply chains, with well-regulated and enforced standards, for example BES6001, as discussed above.

47. RICS quote typical transport figures for various materials as part of their carbon methodology, including European manufactured products such as Cross Laminated Timber as 1,500 km. This very significant difference to the figures for concrete, aggregate and other local products, which RICS estimate at 50km must be factored into any comparison.[19]

48. Other issues to consider include the sustainability of the resource being exploited and its impacts on the local environment and communities. The geological resources for local heavy materials are plentiful in the UK, with no conceivable need to resort to long international supply chains. The strength of regulation and its enforcement is highly relevant for imported materials, especially if coming from less developed countries. The UK imported over 82% of all wood used in 2017, for example, raising some of the same issues around the sustainability of the supply chain, and deforestation in other countries as bioenergy.[20]

49. The economic sustainability of communities matters, with our industry providing high-productivity, well-paid work in all parts of the UK including remote and more deprived areas. As the industry changes with new innovations and processes new skills will be needed, creating opportunities for new recruits.

Q7. How well is green infrastructure being incorporated into building design and developments to achieve climate resilience and other benefits?

50. The built environment is not just a collection of structures, but how they work together alongside each other. The importance of green infrastructure, especially

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[18] Ibid

[19] RICS (2017) "Whole life carbon assessment for the built environment", p18 https://www.rics.org/globalassets/rics-website/media/news/whole-life-carbon-assessment-for-the--built-environment-november-2017.pdf

[20] UK Government Forest Research; https://www.forestresearch.gov.uk/tools-and-resources/statistics/forestry-statistics/forestry-statistics-2018/trade/apparent-consumption-of-wood-in-the-uk/

in urban areas, is hard to overstate, providing resilience and amenity but also many significant services including flood management, air quality and habitat. Given the growing overheating and extreme weather risks we will face in a warming climate, green infrastructure will become even more important.

51. For buildings and structures of all types concrete's inherent stability, robustness and resilience to water makes it ideal to support all types of green walls and roofs. These solutions not only cool the environment and improve flood resilience by slowing the path of rainwater into the drainage system but also have been shown to improve the efficiency of roof top photovoltaic panels.

52. According to the Green Roof Code of Best Practice for the UK, where a flat roof is to act as a roof terrace or roof garden (i.e., an intensive green roof) they should only be used in conjunction with concrete decks.[21] In other words, concrete is essential for the creation of accessible roof gardens to provide the associated amenity, and physical access to plants and fresh air.

Q8. 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?

53. This is all covered by the relevant EN standards and will be built into the RICS Carbon Assessment as discussed above. These features will recoup any carbon emitted over time, so a whole life analysis is appropriate. Not all such features are primarily a carbon benefit, with sustainable urban drainage having significant benefits in terms of flood risk management, biodiversity, water quality and resource management.

Q9. How should re-use and refurbishment of buildings be balanced with new developments?

54. With a durable, long-life structure the first use of a building can be extended, as well as future adaptation for a second life. Our built environment is not a consumer good, it is an investment in a social outcome, or service that should be a positive legacy for generations to come.

55. Where possible, refurbishing existing structures is likely to be a very good option. On a per year basis, this minimises the carbon emissions from construction by getting the most use out of the materials and energy that were expended to create the structure in the first place. In many cases this is even lower carbon than design for disassembly.

56. Suitable buildings need a durable, resilient structure that can accommodate such changes, for which concrete and other heavy side materials are ideal. A "long life, loose fit" approach, as discussed above, is very appealing here, to get the most out of any structure.

Q10. What can the Government do to incentivise more repair, maintenance and retrofit of existing buildings?

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[21] GRO Green Roof Guide (2014) https://livingroofs.org/wp-content/uploads/2016/03/grocode2014.pdf

57. This could be incentivised through tax or other mechanisms, such as reducing or removing VAT on refurbishments, using council tax or business rates to incentivise efficiency improvements or adjusting consumer energy taxes or direct grants. It is also important to ensure that buildings are able to be repaired and retrofitted easily by designing them with resilient materials. Concrete and masonry can maintain its performance credentials over time and so is highly suitable for refurbishment. Given its durability and resilience against fire, flood and rot it is also more likely to last long enough to be worth refurbishing. The increasing use of Building Information Modelling, means in the future it will be even easier for designers to access original design and specification information to guide the retention and reuse of our built environment assets. This is key to a circular economy, which is also an approach to achieving net zero.

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