HOUSE OF COMMONS

Environmental Audit Committee

Oral evidence: Sustainability of the built environment, HC 76

Wednesday 17 October 2021

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Watch the meeting

Members present: Philip Dunne (Chair); Duncan Baker; Barry Gardiner; James Gray; Helen Hayes; Caroline Lucas; Cherilyn Mackrory; Jerome Mayhew.

Questions 111 - 180

Witnesses

I: Professor Michael H Ramage, Director, Centre for Natural Material Innovation, Department of Architecture and Professor of Architecture and Engineering, University of Cambridge; Louisa Bowles, Representative at LETI (London Energy Transformation Initiative) and Head of Sustainability at Hawkins Brown Architects LLP; Dr Joe Jack Williams, Associate, Researcher, Feilden Clegg Bradley Studios; and Elaine Toogood, Head of Architecture at MPA The Concrete Centre and Representative, Mineral Products Association.

II: Will Arnold, Head of Climate Action, The Institution of Structural Engineers; Sam Liptrott, Director, OFR Consultants, Fire and Risk Consultants; and Rhian Williams, Principal Strategic Planner (London Plan), Greater London Authority.

Written evidence from witnesses:

- Centre for Natural Material Innovation
- London Energy Transformation Initiative
- MPA The Concrete Centre
- Institution of Structural Engineers

Examination of witnesses

Witnesses: Professor Michael H Ramage, Louisa Bowles, Dr Joe Jack Williams and Elaine Toogood.

Q111 **Chair:** Welcome to the Environmental Audit Committee for our hearing into the sustainability of the built environment. We have two panels today. We have industry experts across both panels and we will be discussing the sustainability of the different building materials on offer to contractors at present in the first panel. In the second panel we will be looking at the planning system and how building regulations can help facilitate a more sustainable built environment.

I would like to welcome our first set of panellists. As I mention your name, if you would kindly say what you do and the relevance to this inquiry of the work that you do. We will start with Louisa Bowles from the London Energy Transformation Initiative; welcome.

Louisa Bowles: I am here representing LETI, the London Energy Transformation Initiative. We are a network of over 1,000 multi-disciplinary professionals and we have been working together for three to five years producing guidance for the industry on reaching net zero by 2030. I am also a practising architect, a partner and sustainability leader at Hawkins Brown, an architectural firm.

Chair: Thank you very much, Louisa. Next to you is Elaine Toogood, who is from The Concrete Centre and representing the Mineral Products Association.

Elaine Toogood: That is right. I am an architect as well. I am head of architecture at The Concrete Centre, which is part of the Mineral Products Association. I am also representing UK Concrete, which is also part of the Mineral Products Association. The Concrete Centre provides technical guidance on the use of concrete to construction professionals.

Chair: Thank you. Next to Elaine Toogood is Dr Joe Jack Williams, who is a researcher at the Feilden Clegg Bradley Studios. Could you explain what that is?

Dr Williams: I am an associate at Feilden Clegg Bradley Studios, which is an architectural practice. We work across many regions and for 40 years have been pushing the sustainability agenda. I am also representing the Embodied Carbon Group, which is a cross-industry academic impartial group providing advice for those who are interested in pushing forward the embodied carbon agenda.

Chair: Thank you. To your right is Professor Michael Ramage from the Natural Material Innovation Centre at the University of Cambridge.

Professor Ramage: I am the director of the Centre for Natural Material Innovation and I am a professor of architecture and engineering at

Cambridge University. I am also trained as an architect and a chartered structural engineer.

Q112 **Chair:** Terrific. Thank you very much for joining us this morning. I will kick off our questions with a fairly general question. In our earlier discussions we had some evidence that the picture is quite confusing, certainly for consumers, probably for contractors and slightly less so for architects and designers of buildings today. It would be very helpful—perhaps if I ask Louisa to start—if you could give us your thoughts on how the Government can encourage industry to focus on the issue of sustainability of buildings that are being designed and constructed now and in particular the materials that are being used.

Louisa Bowles: We have had some very positive feedback and evidence in our practice and certainly from our experiences with LETI as well in terms of what the London Plan has integrated into it recently with the whole life carbon reporting method, the template and encouraging reporting at early stages and right through up to the planning and then post-completion. We have found that to be a very positive experience because it encourages, first, the tracking of the numbers through the design process, and secondly it has a knock-on effect of making sure that the conversations are being had about materials and their impact on carbon emissions across the lifecycle of the building. Previously those conversations were either not being had at all or were being had in a minor way on a small percentage of projects. Certainly in our London projects we have found it to be a positive experience and I think rolling it out more broadly would be a key part of driving the agenda forward nationally.

Chair: Dr Williams, as another practising architect, what is your perception of what the Government should be doing?

Dr Williams: I agree with Louisa. We are seeing a groundswell within the industry looking at the issue of whole life carbon and embodied carbon and recognising that an urgent response to climate change is required.

There are a number of different standards out there and we are trying our best to align them. They have been written for specific purposes and there is a natural difference between them. What would be helpful from Government is a line in the sand to say, "This is the standard approach" and that is what we are asking for in many ways. Louisa mentioned the GLA's standardised approach, which is very useful as a leveller across the industry. People understand it and it is starting to filter through.

Q113 **Chair:** Elaine Toogood, are there enough tools available for you to be able to understand the carbon impact of materials that are being commissioned, used or deployed? Is the picture clear enough or is it still as confusing in terms of embodied carbon within the materials and potentially whether there is carbon leakage from their use within a building?

Elaine Toogood: I was at a meeting recently, asking some architects what tools are needed for the practitioner: free tools and more skills to use them to be able to assess carbon right the way through the process. The standards are already there to measure carbon from a materials point of view; there are verified tools. The MPA has just invested in a tool, working with One Click to create it, to enable manufacturers to speed up their provision of data, their environmental product declarations. That is there. What is needed is the environment to recognise the need. Not enough of them have been produced across the board for all materials.

Data are the key. There needs to be more data, more transparent data at three levels. First, the product sector level. The concrete industry has been measuring for over a decade and publishing annually. That is useful for national accounting, to be able to show progress. At sector level there needs to be data for more generic environmental products from each sector. That could be used by designers at early stages to plug into the tools to be able to make those lifecycle assessments. Then there is an even more granular level, more EPDs, verified EPDs, verified tools to enable architects to make informed decisions and provide more informed benchmarks for targets.

For me it is about collecting the data—it is all there—and the incentive to collect it, be transparent and publish it. I think the Government could show leadership in their procurement practices.

Q114 **Chair:** Michael, do you have a similar perception, that the tools are there and the data are becoming more standardised or do we still have a long way to go?

Professor Ramage: Yes and no. There are good tools. There are good data. I would say that we need more skills. I think we can agree on how to use them and that is at all levels of education, so tradespeople as well as designers. Those who build buildings as well as those who design them need to be trained in how to do this, how to build lower carbon buildings.

As for a line in the sand, the Government setting a maximum embodied carbon per square metre, per building type, would be incredibly helpful. We are on a road to net zero. It would be good for that standard to be diminishing over time. We already see industry leading the Government in many ways and it will be industry leaders who get to net zero soon. They will see it as a competitive advantage and I think the Government should encourage that.

Q115 **Chair:** Have any other countries developed similar standards or building regulation equivalents?

Professor Ramage: There are some. The Dutch have some embodied carbon regulations. If you look around, you find them in cities often, more so than nationally. Copenhagen has zero emissions construction policy; construction sites need to be zero emissions. All its JCB

equivalents are electric and that is a very interesting way to move forward.

Chair: Thank you. Joe Jack, can you answer the same question? Do you agree with Michael?

Professor Ramage: Sorry, I think it is Oslo, not Copenhagen.

Q116 **Chair:** Oslo, okay. Do you think the Government should be doing more? Would you support the suggestion that Michael made, that there should be an amount of embodied carbon per square metre or cubic metre or however you measure these things?

Dr Williams: Yes, completely. Within the industry we are getting to a point where the tools are there and the data are there. It is still in its infancy, but it is good enough to give us a robust number to work against. Certainly within the LETI guidance we have embodied carbon benchmarks and targets that we set that have been adopted by the RIBA 2030 challenge. We cannot see any reason for not being able to achieve those things.

In terms of achieving a target, the calculation for embodied carbon is relatively straightforward and the data are already there. There are very few barriers and we see that the industry is already starting to do this.

As Michael pointed out, there is a requirement for upskilling throughout the supply chain. It is not just for us, the consultants and designers, we need the people on the ground to get to it.

I have released a free tool within FCB, which is doing particularly well, and I know Hawkins Brown has also released a free tool to measure embodied carbon. Most of the barriers are starting to erode. What we want now is that fixed line, that fixed target.

Chair: Louisa, were you indicating that you wanted to come in on this? Say what you want to say and then I will come back and ask you another question.

Louisa Bowles: I wanted to add to Joe Jack's comment. We have also had the experience of developing our own free tool and we are seeing more and more data as more and more companies and product suppliers are realising that having an EPD to report your data is a competitive advantage.

A barrier we have found is that at the moment there is no centralised national database of these EPDs. You have to ring up individual suppliers and ask for the information. It is a quite time-consuming process. Practices of our scale might have the resources to do that, but smaller practices will not. Somehow we need to collate the data and the evidence into something that is free and much more accessible. The skills to read the data are there, but you need to get it.

Another piece we find is that whereas we, as a practice, try to measure the whole lifecycle of a building, a lot of the data are limited at the moment to what we call upfront carbon. It is the carbon that gets you to building the building, but does not take recognition of the impact of maintenance or replacement or what you do with the material at the end of life. Ideally the database should stretch across the lifecycle of a product or a material so that we have the whole picture when we are specifying.

Q117 **Chair:** Thank you. Is any of this likely to be included in the Future Homes Standard? Do you think the Government have this on the agenda or not?

Louisa Bowles: From what I have read initially—it might have changed since I last read it because I think there have been two consultations and there has presumably been some rewriting—I don't think so.

Chair: Maybe we will get to that in the next panel.

Elaine Toogood: I want to add that I totally agree. The whole life is the important metric. One of the industry's recommendations to the Government is that the first step before we get to that target is that there needs to be a very quick period during which we can measure whole life carbon to be able to inform what the appropriate benchmarks are. The industry, with the best will in the world, has attempted to create them. We know there is still some more alignment to be done, setting the boundaries of what is included and what is not. Those targets have been incredibly useful in pushing the agenda forward, but there is still another hurdle in terms of the measurements to be able to gather that benchmarking. Asking for that first I think is a useful and good first step so that the work of setting appropriate targets is more informed.

Chair: End of life of concrete is quite a big issue. Caroline might want to raise that with you now or shortly.

Q118 **Caroline Lucas:** A question for Elaine and Louisa in the first instance, if that is all right. Emission reductions in the manufacture of concrete and cement have slowed since 2008 and some CO_2 emissions in the manufacturing process appear unavoidable. How achievable is net zero for the concrete industry?

Elaine Toogood: I say that it is entirely achievable but challenging. I hope you are aware of the industry's roadmap. It is a revised roadmap that was published at the end of last year. What is good is that it is not a standing start. The industry in the UK has been decarbonising for decades and is already at a 53% absolute reduction in carbon emissions since 1990. That is clearly not the end of the story. An enormous amount still needs to be done, but the point there is that the industry understands what needs to be done and recognises the challenges and the opportunities.

Just recently, after the submission, we put together a summary of industry asks in this document, which I can send you after this. I am

happy to list the top five policies now, but I suggest that you look at the summary.

The industry cannot do this alone. There are many things outside its influence. What is important is to be able to create an environment within which there is confidence in the market and public investment, hand in hand with confidence—maybe led by the Government—that there is a level playing field for materials. There is no one single solution. We need concrete and we need cement. We need to make sure that we are dealing with carbon leakage. We do not want to be exporting the problem. That is not solving the problem.

Q119 **Caroline Lucas:** How much heavy lifting do you think the little word "net" is doing when we talk about becoming net zero? I notice that when it comes to carbon capture and storage, in a sense one could argue that concrete and steel are incredibly over reliant, one might say, on CCS. I think the projections were that it would be using around 61%, which as we know is not entirely functional at the scale necessary.

Elaine Toogood: You are right. CCS is part of the roadmap.

Caroline Lucas: It is more than a part. It is 61%, isn't it?

Elaine Toogood: I have been talking to the colleagues who wrote that and I challenged them on it as well. They said they had been quite conservative. Just to be clear, the CCUS there is not offsetting, it is abatement that happens within the plant. It is not extracting it from the atmosphere afterwards. It is part of the process of making of the cement. The carbon is captured at that point. International initiatives have established the technology; what is needed now is the scaling. There are many different innovations. One cement plant is already in the first tranche of CCUS within the UK. Other innovative solutions are coming through. One that won an award at COP26 is putting carbon dioxide into the concrete as it is made, taking the carbon from the capture in the making and putting it straight into the concrete. There it is mineralised and stored for a long time.

Q120 **Caroline Lucas:** I read something about that. Just out of interest, what happens at the end of the life of the building made with that concrete? What happens if you disaggregate it?

Elaine Toogood: You would like to think that the building would last for more than 100 years. When a concrete frame is designed, it is designed for 50 to 60 years; it has a service life of 100 years. We should be keeping our buildings standing and reusing them. Much more of that is happening today, thankfully. That is what needs to happen for sustainability. We need to be reducing the amount of new stuff that everybody is building. The benefit of a concrete frame, as proven over centuries, is that it can last for a very long time with very little maintenance.

The lowest carbon form of reusing anything is to reuse it in situ in the form it was made, to reuse a structure again and again and to breathe new life into it. At the end of its life, it is just used again. There are lots of examples of that. Then eventually at the end of end of life, it would be crushed and become an aggregate that could be used for concrete again. It is still mineralised. The carbon dioxide is not released and concrete absorbs carbon dioxide throughout its life anyway.

Caroline Lucas: I am going to come to Louisa and then Michael.

Louisa Bowles: I can talk about this issue more from the point of the designer and how we would go about reducing the carbon through the use of concrete and the same principles would also apply to other materials.

If the Government were able to get behind this idea of mandating whole life carbon reporting, leading to the point we would have defined targets for building types and different scales, that would enable us, as designers, to spend the time that is needed at the beginning of the design first to rationalise the design. A lot of reducing embodied carbon is having the time to think about how you rationalise what you are doing, spatial efficiency. With concrete, for example, it is inherent in the size of the grid. If you squeeze the size of the grid, you can cut the volume of material by 30%. We can employ mechanisms without even needing to resort to how much cement replacement we specify, which are embedded in the design. They are not necessarily going to be engineered out later.

There was a piece of text in the LETI evidence about a trend that we recognise across the industry: designers know what they need to do, we specify what needs to be specified, we put the legwork in and we do what needs to be done. Sometimes, because of procurement routes and contractual arrangements that define them, it is very difficult for us to be in a position of authority to make sure that what we have designed and specified is what gets built and delivered. That is where the targets could be helpful because then it is not voluntary, it is mandatory and we have to do it.

Q121 **Caroline Lucas:** Michael, I want to come to you on the CCUS issue. Isn't there a danger that dependence on CCS and other offsetting is seen by emitters as a way of delaying real reductions?

Professor Ramage: Absolutely. Achieving net zero in concrete is a specious argument. I think it is absolutely impossible. I think concrete has its place as a material, particularly in foundations, heavy civil infrastructure, but anywhere else in the built environment concrete should not be used. There is no need to use it. The very process of creating cement from limestone emits carbon dioxide and the reversal of that, carbonation, is extremely slow. The mortar in Canterbury Cathedral is still carbonating. It is about 1% over 30 years. It is a tiny, tiny amount. It is an argument that should not be relied on.

Carbon capture and storage has recently been hailed in Iceland. We have managed to put 4,000 tonnes of CO_2 in the ground. The Palace of Westminster stores more than 4,000 tonnes of CO_2 in its timber and has done for hundreds of years. It is an industrial process that has not been shown yet to work at scale. It is not one that we can rely on at very high percentages. If it were 10% of concrete's emissions towards 2050, I would feel comfortable. At 50%, it is not a sane argument.

Caroline Lucas: That is clear.

Elaine Toogood: Can I come in?

Caroline Lucas: Very briefly.

Elaine Toogood: That is fine. I wanted to be clear that the CCUS within the roadmap is seen as mopping up what is left at the end. It is not the only factor.

Caroline Lucas: But 51% cannot be mopping up, can it?

Elaine Toogood: It is not necessarily going to be that. There are technologies that could be employed to reduce carbon and which are already happening, switching away from fossil fuels, for example. There was a wholly net zero fuel day in a cement plant recently.

Caroline Lucas: I am going to move on, if that is okay.

Elaine Toogood: This has not been done lightly. There is an enormous amount of investigation. The third party who has looked at this has worked with BEIS to develop this. It is shown to work. It needs to be scalable and that is where help is needed.

Q122 **Caroline Lucas:** I am going to stop you there. I am so sorry, but I do have some questions to get through. We have a lot more to do.

Dr Joe Jack, one of the benefits of using concrete in construction is said to be the reduction of energy use in buildings because it increases the thermal mass. To what extent can the thermal mass contribute to the energy efficiency of buildings in the UK?

Dr Williams: I could not put a figure on it overall, but it does have a role in non-domestic buildings in particular. We see it used in domestic buildings where it is perhaps less useful. What we are looking for when we use thermal mass is bringing in cool air at night when the building is unoccupied; you can help cool it down the next day, so you store it in. We only need about 50 to 70 millimetres of concrete to mitigate temperature swings over the course of a day.

It is not exclusive. Back in 2011, we delivered a building called Woodland Trust Headquarters, which was CLT and timber throughout. We installed concrete panels on the inside of the soffit and that, coupled with a natural ventilation system, helped to reduce some of the excess heat that would

have been there during the day. It has been very well studied. It was funded by Innovate UK and we went back and reviewed it.

I think there is a place for concrete. I do not quite agree with Michael that concrete is a big no-no. I think every material has its place, we just have to use it in the right kind of way. There is no evil or sainted material, it is just about using it when it is quite correct.

Q123 **Caroline Lucas:** Michael, what is your view on the thermal mass argument? In the past we have received evidence that suggests there isn't great scope for it in the UK.

Professor Ramage: Thermal mass is particularly useful in hot and dry climates, which we are not in. Parts of the southern UK will get there probably by 2050 but in general, over the lifetime of a building, the embodied energy of a large-scale concrete building is far higher than the savings you get from the thermal mass. The thermal mass of concrete can have a place and as Joe Jack has just pointed out, it is only 50 to 70 millimetres. No structural concrete is that thin. You can add it as a flooring. There are plenty of ways you can add this thermal mass, but it does not need to be the structure. In fact, when it is the structure it is often not exposed to the room that it is cooling.

Q124 **Caroline Lucas:** Elaine, are there ways in which the Government ought to be promoting and supporting the development of more sustainable cement production that we have not already covered?

Elaine Toogood: As Louisa pointed out, there are significant ways that everybody can save carbon using concrete today. It does not rely on innovation. Showing leadership in that regard is important and that is in both sharing the knowledge that low carbon concretes exist out there.

Q125 **Caroline Lucas:** I am thinking about whether there are legal frameworks that we have not touched on yet that the Government could be introducing to shift in a more sustainable direction.

Elaine Toogood: Carbon accounting measures, taking responsibility for emissions, creating the environment for development and finance for innovation to be able to push through and deploy the innovation that already exists. There are plenty of things in the wings. As an architect in The Concrete Centre I spend pretty much all my day giving advice to industry. They need to know that low carbon concrete exists right now and ask for it.

Q126 **Caroline Lucas:** If we want to speed this up, which we do, simply knowing about it is not going to be enough, is it?

Elaine Toogood: Yes, okay. I guess I was working on the basis that once there is a requirement to measure carbon, so everybody knows they need to do it and knows to ask for low carbon concrete, it becomes part of the parlance of people requesting it at the early stages of design, engaging with suppliers, not just ordering concrete—"It's all the same,

isn't it?"—but saying, "What is the lowest carbon concrete you can give me, please?" The industry is absolutely there and able to give that advice, which will also create an environment in which people recognise that this is something that is needed, which will create a virtuous circle for investors to invest in the newer forms that are starting to come through.

Caroline Lucas: The legal requirements obviously need to be there.

Elaine Toogood: Yes, it is what Louisa and we have all agreed on. We need to be measuring whole life carbon and to make it a legal requirement, for it to be something in the industry.

Q127 **Caroline Lucas:** My very last point is to Joe Jack. Is there a trade-off between operational emissions from concrete and the embodied carbon of buildings? If so, how do we manage them?

Dr Williams: It is a big topic. I prefer to think of operational energy slightly separately from embodied carbon. There an importance to comparing the two. They are not mutually exclusive. As this is a maturing industry, we are still trying to work out what the balances are. When we talk about things like thermal mass, there can be a huge raft of benefits, particularly in non-domestic buildings, and certainly we see it in our projects. They are not mutually exclusive. We can have low embodied carbon targets and low operational carbon or energy. Things like timber slip systems for smaller buildings, where we have timber panels and it is structurally insulated, work incredibly well, tend to be incredibly low carbon and have incredible air tightness and insulation.

Chair: Now some questions from Jerome Mayhew as we move on to steel.

Q128 **Jerome Mayhew:** I want to get the argument started now in the comparison between steel and concrete as a construction material. We have heard that there are essentially two ways in which you can manufacture steel. This takes me back to primary school, by the way, so it is a trip down memory lane. There is a blast furnace, which still requires coking coal in commercial applications, and then an electric arc furnace. Depending on where you get your electricity from, it is now possible to make steel in a very low carbon process and it is without process CO_2 emissions. Does this make steel a more sustainable option than concrete now?

Louisa Bowles: For me, it is wrong to compare a material directly because it depends what you are applying it for and it depends on the purpose for which you are using it. I think that is where the overarching targets will come in very useful because there is a flexibility there for a design team to use their intelligence and experience to balance out the best outcome for a particular scenario. I wouldn't say flat out that steel is the best compared to concrete because it depends on the context, the type of building, the spans you are trying to achieve, the lifespan of the

building you are trying to create, for example. There is a whole range of decisions that we talk about often early in the projects.

We have had experience of specifying steel pretty recently on projects where we have looked at, for example, the low carbon options on the electric arc furnace. There is not a huge availability in the UK as far as we can find at the moment, so we ended up looking at a European manufacturer. Our client then said, "I would rather go for the higher embodied carbon and open up the supply chain. I don't want to be locked in at this very early stage".

If we are going to pursue the balanced material pallet available to us and pursue low carbon options in all of them, for what is available in the UK we need to be investing in those types of manufacturing processes. There is obviously the end of life argument for steel as well, that when it comes to the end of life it is easier to recycle. That involves the network being set up to salvage it, clean it, take it to the plant, recycle it and reuse it.

Jerome Mayhew: I will come on to that second very important point in a minute.

Dr Williams: I think Louisa said it all very eloquently. The steel market is very risky and very volatile compared to something like concrete, so we do see a lot of market pressures. I am thinking of China selling steel very cheaply recently. That can affect these kinds of markets. Steel has a much clearer reuse and recycle policy, which is a bit easier to understand than say concrete and it is a bit easier to design too. When we look at things like demolition and engage with demolition contractors, simply taking the bolts off a steel frame building is much easier to do than understanding how casting concrete will work. It is a bit of an easier answer, but unfortunately it is quite a complex thing to procure in the first instance.

Elaine Toogood: I agree with everything that has been said. Every material has its place. There is no single silver bullet that is going to solve this. Every material needs to be used for its appropriate place. Every material has different sustainability benefits from a credentials point of view. One of the benefits of concrete—and you mentioned the volatility—is that concrete predominantly is a local material. It is the only construction material for structures that is; 95% of everything that we need for concrete is made here in the UK. That is why it is so important that these UK credentials are key for concrete because what we use here is made here from locally responsibly sourced material. The supply chain of responsible sourcing is hugely important. It is much more challenging to maintain that and keep control of it because of fluctuation in the price for the imports of all other materials as well.

Concrete sometimes uses steel as well, of course, if it is a reinforced structure. I was just checking the very latest performance report data, the annual report. In the 2020 data, 97% of all the steel that was used for reinforcement within concrete was made with the electric arc furnace

process. It is all recycled steel and almost all of that is UK made, which is great.

Professor Ramage: Steel has been incredibly heavily studied for efficiency and there is not a huge amount of efficiency to be gained further. Its tremendous benefit, if we can unlock it, is that its reuse potential is very high. Reuse of steel is a direction in which our built environment should go. Of course it can be recycled, it is quite straightforward, it is quite energy intensive because it has to be melted and reformed, but if we can reuse the steel members of a building there is very little energy embodied in reusing that and keeping—

Q129 **Jerome Mayhew:** Is that kind of the Meccano-isation of steel structures? Is that what you have in mind where you have x lengths that you can—I am making it sound too easy—bolt together with a standard specification?

Professor Ramage: Yes, and it is not that farfetched to imagine that we can do it. It is part of incentivising deconstruction in a particular way or demolition turning towards deconstruction so that those elements do not go into a waste stream or recycling stream. They go into a reuse stream.

Dr Williams: To quickly follow on from that, one of the key issues of reusing steel is not so much the demolition part, it is the reuse supply chain. Lining up buildings that need those steel beams at the same time is very rarely going to happen, so you need places to store them, which is cost intensive. Also there is warranty in building, so understanding that that steel member is still a valid steel member for the structural application that it will be used for.

Q130 **Jerome Mayhew:** How do you do that? Do you have to scan a beam or can you inspect visually? What is involved in assessing its retained strength?

Dr Williams: There is a number of ways. I am not a particular expert on the reuse of steel, but there are companies that will test the steel beams for you. There are always issues and there have been. Twenty years ago you would find people would not want to test them on their machines in case they damaged their machines. This is now getting past it. There is a performance verification and then the insurance market needs to catch up as well. There are a number of things there.

Professor Ramage: I will come in again because the Government have invested very heavily in digital twins and BIM and understanding how material has been used in a building over its lifespan can, at demolition time, help understand how you can reuse it. The reuse of style and other building components fits in with other government strategies currently underway towards the digitisation of the built environment.

Q131 **Jerome Mayhew:** Elaine, can you say the same for concrete? I know that you can crush it up and use it as aggregate, as you have said before, but is there a similar future where you can deconstruct and reuse

concrete?

Elaine Toogood: Yes, absolutely. It is totally doable. The top tiers of the Olympic Stadium were all designed in concrete to be disassembled, but of course they are still there. What most commonly happens is that they stay there for all the reasons I explained before. It is possible and there are some fantastic new things coming through. Lang Walker is producing a school, I think it is, that can be completely disassembled.

Q132 **Jerome Mayhew:** The problem with that is, yes, it can be disassembled but then it is a piece of concrete thereafter, unless you want to build another school to replace the first one.

Elaine Toogood: Yes, you are absolutely right. All the challenges for anything to do with disassembly and reuse is the amount of energy in transportation and processing needed to enable them to be used. Where do you store them, how do you align the future markets with regards to that? There is an enormous amount of work going on within all the circular economy thinking to do that, which is why proven, tested, we do it all the time right now, reuse in situ, retain and reuse that concrete. We design it for long-life loose fit so that you can use it for 100 years. The key benefit with concrete is its durability. It doesn't rust or rot, it stays durable with pretty low maintenance. As I said, the design period is 100 years. We should all be doing that and demolition is a word that we should not be using going forward.

It is about retaining for as long as we possibly can and then if you can disassemble to reuse it for buildings that were designed for a shorter length of life, but surely we want our homes or the rest of the other investment that goes into it to last for 100 years or more. It is proven to do that with concrete. That is where its benefit comes from. The end of life scenarios for other newer materials are slightly less proven because they have not been around for so long.

Jerome Mayhew: I live in a wooden house and it is currently 500 years old, so it is doing okay.

Elaine Toogood: You are absolutely right and I am not denying that at all, but the timber that is made for construction today is a very different timber. It is fast grown, so it is not the beautiful hardwoods or long living—

Professor Ramage: It will last just as long.

Q133 **Jerome Mayhew:** I am sure we will come back on that. I think Duncan will talk about timber. Finally, Louisa, with your experience as a practising architect, how can the Government facilitate greater reuse and recycling of steel?

Louisa Bowles: I start with the point that Joe Jack introduced on a wider more national network of the circular economy and how to implement it. Potentially at local authority level or borough level networks, storage

made available and cataloguing processes, so that things that are taken from buildings can be stored properly, catalogued, checked, almost warrantied at a warehouse-type scenario. As a designer, when you are looking at what is available in the local area it is a network, it is a resource you can access, and you can design your proposal around what is available or even contractors—

Q134 **Jerome Mayhew:** But a role for Government or is that a commercial opportunity? Where do you see that sitting? This is open to anyone.

Louisa Bowles: It is an interesting question. My feeling is for it to happen at scale there needs to be a national mandate for it and then potentially there is a role for private finance and—

Q135 **Jerome Mayhew:** We have had architectural salvage for as long as I have been alive, haven't we? Isn't this just commercial architectural salvage that we are talking about?

Dr Williams: I think the role of the Government is about the insurance and the warranty aspects and wherever there is a case of underwriting or something equivalent with key safeguards there, that is the key barrier. We are in an incredibly risk averse position with insurance post-Grenfell. They don't want to take any additional risk. For me, that is the real key bit where they could help.

Professor Ramage: We are going to agree on something. I think demolition should not be a word and the role of Government could be very strong here in renovation, reducing the VAT to zero on renovation and considering reuse of the materials as renovation. That would be a very strong signal that this is something the Government are underwriting.

Q136 **Jerome Mayhew:** A clear market signal, 20% market signal, and that is the role of Government not to get in the way and start directing—

Professor Ramage: That will unlock commercial opportunities that we want the private sector to take on.

Chair: Now on to timber with Duncan Baker.

Q137 **Duncan Baker:** We are going to get off the fence now. I have heard it all from the panel that the use of material must be used in balance. Come on, let's stop sitting on the fence, because I think that timber holds the real key to a sustainable future and we need to start to drive towards that. I have a very open question first of all. We will start going that way because I will probably like the answer you are going to give me, Professor Ramage, just leading the question. To what extent is timber going to be a good solution in reducing our carbon emissions in the built environment?

Professor Ramage: Nobody is going to be surprised to hear that I think timber is the best solution to reducing carbon in the built environment. By any measure on any building a timber building is the lowest embodied

energy structural system and this is before you take into account that building with timber sequesters carbon. If we store that carbon for a long time we can count it as a carbon sink, so our cities can become carbon sinks. Building with timber is quieter, so cities like it. It is also possible for 90% of the buildings under construction in the UK at the moment. Anything under 12 storeys can be built with timber now. Foundations will be concrete, connections will be steel. This is not a monomaniacal solution. This a hybrid approach, but there is no reason we should not be doing that now.

The industry issue is that we know how to do this one building at a time, but we are not going to get to net zero one building at time, so we need systems that will unlock the potential of timber. It is Government regulation and it is also Government procurement.

Dr Williams: I try to avoid sitting on the fence too much, but I am incredibly pro-timber. I think it is a fantastic material. We have a long history within our practice of using it. Carbon is just one measure of material sustainability and timber has fantastic wider determinants of sustainability. It is a truly renewable resource and as you are doing it, it is capturing carbon out of the atmosphere. I remember hearing a lovely story of someone showing a handful of seeds for how many trees they had grown—it starts in the hand and becomes a whole building. Timber is fantastic for that. There is a real role for having hybrid solutions. There are some places where timber is not quite the right solution. I tend to disagree with Michael that it is perfect for every solution but it is widely applicable. That is what I say.

Duncan Baker: Elaine, you are going to come up with a slightly different and more balanced rationale, I presume.

Elaine Toogood: Only that it is not the silver bullet. There are many considerations that we have to address as architects to understand what the best solution is for the job. As you said, it is not always going to be timber. You are certainly not going to be wanting to use that anywhere, especially not in modern methods of construction, where there is any risk of water damage. It is not the recommended way to build. We know that there is a problem there, not to mention flood. You always have think about the co-benefits as well: is it supporting good indoor air quality; there is acoustics as well as security and resilience issues. We have to think about where materials are coming from. Do we have enough resources? Are they going to be able to—

Q138 **Duncan Baker:** We will come to that in a minute, but picking up on water damage, we have been putting HMS Victory and things like that in the water for years and it has not been a problem. Surely there are modern methods and ways that we can mitigate against water. That is not a reason to say we can't use that.

Elaine Toogood: I suggest you talk to the surveyors and the people associated with needing to assess these and look at the repairs where

there has been damage. It is a very different type of construction. You are talking about very solid, slow-grown timber and CLT is much more inferior. It is held together by glues; it is smaller elements. It is a very different product. I talk a lot about shades of green in concrete. I don't talk about shades of grey, there are shades of green. There are different ways in which you could do it, many solutions. It is the same with timber. You can't group it all into one place. There are timber stick solutions and timber CLT and they have some realms of different use within them and they are certainly not appropriate for everything.

The other thing is where it is coming from: are we happy with the resources, is there enough studies done to make sure that we can sustain the resources within climate change as well?

Duncan Baker: We will flesh that out, but we will finish on this question with Louisa, a general overview that this is the right way to go.

Louisa Bowles: I will try to contribute something that has not been said already. I definitely support that in all the embodied carbon analyses we have done, timber comes out generally as the lowest embodied carbon. There are barriers. We have certainly suffered as a practice. At the early stages it has been ruled out because of various issues and I think LETI also put a piece in the evidence about insurance issues, which I presume will be covered in the second panel at length. We have it effectively ruled out as an option at the very early stages on the majority of our projects at the moment.

Q139 **Duncan Baker:** I feel like I am getting the theory between the practicality from the two ends here. Elaine, we will go back to the points that you were making. 60% of the timber that we get into this country is imported, so the suitability of timber would not be able to keep up with the demand if we moved in that direction.

Elaine Toogood: We are relying on imports, aren't we? It is not home grown and I guess it is where it is coming from. As I understand it, there are still some challenges with that.

Q140 **Duncan Baker:** Could we meet it from UK sources, perhaps not now but over future time? You have to grow timber and you have different grades, as you have said. What is the overall ability for the UK to meet its own demands?

Elaine Toogood: I don't believe that we have enough land to be able to meet all of those demands if we do a complete wholesale switchover, as is being suggested, but also we don't need to. We are just about to publish an independent study that we commissioned that showed that without even optimising the solution of the concrete, there was just a 6% difference in the overall embodied carbon of the project between CLT and timber. There are other analyses that show that. It depends which microcosm of the project you are looking at. I am very happy to share that once it is published so that you can see and drill into it. I think a

very important point to make is that—and this is where we were saying it is that people understand the data—concrete is hugely variable.

For concrete in the past, carbon has not been part of the language of procurement. Enormous savings can be made if it is talked about. We talk about the efficiencies of the structure, swapping out, going for local carbon mixes and using the concrete to save on other elements of the building. NHBC published a study that said there is a 4% difference between the two and in the variance of data it is therefore negligible. I think we have to have the data to prove it. We also have to make sure that we are clear. If you are going to count sequestration, where it is coming from—

Q141 **Duncan Baker:** I will keep us moving otherwise the Chair will move me on. Michael, we are going to be able to meet the UK's demand for regulating timber use in the built environment, aren't we?

Professor Ramage: I would put it the other way round. The UK timber industry can make a tremendous contribution to our building materials but it does not yet. It does in stick frame, but it can also in engineered timber and cross-laminated timber. This is an industry across Great Britain that we can enhance through greater construction of timber buildings. We will always be importing timber, just as we import steel. We import steel for steel buildings and I am sure we import steel for reinforcing bars in concrete. I am more interested in what the industry can do and what we can do with timber buildings for UK forestry.

Q142 **Duncan Baker:** You have answered the next question, which is for Joe Jack. What do we do then? This is all a trade-off, isn't it? We end up with issues on importing timber from other countries and the carbon footprint that that takes or we have concrete that has its own set of problems that that is manufactured here, but that has its own set of issues because—we can't say this, can we—it is dirty and horrible to produce. Where do you end up sitting with those two issues? One has to end up taking precedence over the other. I know you will say we have to have a balance on this, but at some point in time we have to keep pushing towards those targets. How would you weigh up those two issues with each other?

Dr Williams: I think this comes back a bit to having a robust target. Currently we deliver a project, it will have a fixed fee and the contractor, depending on the procurement route, is able to swap and change to meet that. Whatever the budget restraints or market volatility, they are able to swap and change that. As long as they are functionally equivalent they could pick an alternative thing. Having a high target for say 500 kilograms of CO_2 per litre squared, for argument's sake, if that goes into the specification and the employer's requirements, it is down to the market to deliver those. I think that is a very important bit. We will not necessarily on the design side be able to predict all of those things in three of four years and how things will change.

It needs a bit of work, but once we have that initial target it will become a bit easier. Whether it is using timber or steel or concrete, there are incredibly low carbon ways of procuring concrete, but they require things like cement additives and issues, particularly spatial issues. Louisa mentioned earlier about reducing grid sizes. There are ways of procuring low carbon solutions in many different materials. Wood tends to be the easiest way to procure low carbon solutions. It is very difficult to get the kind of timbers that we need for structural design within the UK. There are two CLT factories in production currently. I think there is one up in Scotland and another one in Wales. I don't know what their output is yet and how far along they are but they are certainly getting there. We are making the right steps.

Louisa Bowles: I will follow up on what Joe Jack said. We have to acknowledge that we are going to be importing our timber for a while, but I don't think that should prevent us from investing as a country in our own timber supplies. There was a report from the CCC. We need to follow through. There was a tree-planting strategy recommended by the CCC, which was then adopted by Government. Potentially we could look at the land use percentages again and have a real strategy about, for example, the type of buildings that we might advocate timber in as opposed to other ones. Elaine is right that at the moment we don't have the land area to accommodate doing every building in the UK in timber, but if we had a long-term strategy, for example, for low and medium-rise housing in timber, what land use do we need over the next 10, 15, 20 years to make that happen and lower the carbon emissions of the other material pallets that we know we will have to use over the next 10 to 15 years.

Professor Ramage: I want to make it very clear that around the world, if we increase the use of timber in construction, we have the trees available. Deforestation is a global problem. It is mostly driven by agriculture and it is mostly rainforest as opposed to the trees we use for buildings. We can house the entire population of Europe in wooden buildings with the sustainable harvest of timber—that is the trees we can cut while the forests still maintain their ecology—but we don't. That is the problem. The wood currently goes to pulp and biomass, which is an abomination. We should never cut trees down and burn them. We should cut trees down and turn them into long-life products, buildings.

Government can unlock this in three ways: procuring timber buildings, so looking at them for large-scale government buildings, school building programmes, housing schemes; they can unlock it through regulation, which I think is the next session, but there are definitely routes to removing barriers for timber construction; and they can unlock it by giving carbon credits to storing timber in buildings. That will encourage our buildings to last longer and if we do that those buildings will last not 10 years and not 50 years but 500 and beyond, just like Westminster Hall.

As long as we look after our buildings, whatever they are made out of, steel or concrete or timber, they will last for ever. If they get wet, they will dry out as long as we are looking after them. Any material that we forget to look after will fail and it will fail long before we expect it to. The most recent example is the A4 flyover built in concrete that was ready to collapse just before the London 2012 Olympics and had to be rebuilt. It is not a question of the material. We can be material agnostics on longevity. It is a question of maintenance. As long as we maintain whatever it is, it will last.

Q143 **Duncan Baker:** On that note we have to finish because the Chair will be moving me on. I can feel his eyes burning into the back of my head. The third and the fourth thing that you perhaps did not say was surely this comes down to supply chains as well. Elaine, you wanted to have a final word.

Elaine Toogood: It is supply chains but it is also skills of use. We have had centuries of skills of understanding how to build in material that is mineral-based, non-combustible and does not rot. What we need is to upskill the use of this as well because it is not appropriate in every situation. The final thing is that even Michael has acknowledged that concrete still has its role and its place. If the Government are after a way of being able to significantly decarbonise, invest and assist in the UK industry to decarbonise concrete cement will make a significant difference to the UK's decarbonisation process. We must not overlook that opportunity because the industry is there and ready and has laid out how to do it.

Duncan Baker: We were saying before we started this session how all the panellists always agree with each other, so I think we can now say we have managed to liven that up a little.

Chair: Thank you very much, Duncan. We will have two quick sets of questions to this panel, first from Cherilyn Mackrory.

Q144 **Cherilyn Mackrory:** I will be as quick as I can. I want to talk a bit about green infrastructure and possibly blue infrastructure, the towns and cities of the future, so the parks, canals, sewage outlets and all the rest of it that have to go with development. Michael, are certain building materials better suited for green infrastructure initiatives than others?

Professor Ramage: I think we can use a range. It is the appropriate building material in the appropriate place. One thing with any kind of infrastructure—as we have probably all agreed—if you design it well you will use as little material as possible and that is a basis on efficiency. One of the issues we have is the labour to design efficiently is far more expensive than the cost of the material when you design inefficiently.

This is where Government regulation has a penalty for inefficient design that is larger embodied carbon will allow any infrastructure to be better designed. We can do parks in concrete, in timber, elements of them in steel. All of them have their place, but it is the efficiency of design and

Government not just advocating for but demanding that we do it well and do it in as low carbon way as possible.

Cherilyn Mackrory: Elaine, do you agree with that?

Elaine Toogood: It might seem completely analogous to think that concrete has a role in green infrastructure. You might think it is the complete opposite, but it is an essential and key role for supporting green infrastructure. Green roofs we all recognise as a very useful way of being able to delay the flow of water into the sewer system and the UK guidance for an intensive green roof, the roof terrace you can walk out on to, is that it needs to be supported by a concrete deck, just as a simple example.

There are concrete solutions. We still have to have some hard paving somewhere. There are sustainable drainage systems, permeable concrete, pervious concrete, lots of below ground attenuation tanks. One of concrete's benefits is it can be used everywhere and do lots of different things, so you put in the ground because it will stay there and survive. The ability to be able to bury some of our infrastructure to release the ground for soil and planting and to properly sustain the green infrastructure, green walls and things like that, which need the water. We need plants, the greenery, to be able to grow and self-sustain itself so there is less requirement on other infrastructure like water. The way to do that is to release the ground and a lot of that is relying on concrete and to put it down there.

It is great innovation that gets me very excited. There is something called nature-inclusive concrete. You may have seen the development of coastal flood barriers where the concrete has been specifically cast and designed. You can make concrete look amazing. It does not have to look great and we do not need beautiful stones and shapes, but it is designed to encourage marine biodiversity, to encourage things to grow on it because it mimics the shape of natural rocks and it is using low carbon concrete to do it.

Q145 **Cherilyn Mackrory:** You can create an artificial reef out of anything, can't you?

Elaine Toogood: Yes, artificial reefs are very well developed. There is a 3D printed artificial concrete reef that has been submerged off the coast of France. There are lots of great solutions there.

Q146 **Cherilyn Mackrory:** Louisa, can I talk about the appraisal process that considers whole life carbon and the value of green infrastructure across entire projects and housing schemes? How could that appraisal process give the potential of the entire housing scheme? How could it be implemented and what would Government have to do to help with that?

Louisa Bowles: There are two scales you can look at. On a whole estate you are not looking at individual buildings but the network and the holistic design of everything coming together. If I was to start that in our

office, I would look at it from a master plan. You would probably look at the individual buildings. We know roughly what a good building should look like in terms of embodied carbon, so we have that. What we lack at the moment in the industry is a huge amount of benchmarking on infrastructure elements and within that I would include soft landscaping.

We have tried to do some carbon measurements for the City of London at the moment. We have found it very hard to get environmental data on the UK source products. There is a lot of environmental data on products we can get from Europe, brilliant, but the City of London, for example, want to use York stone but we do not have an EPD for that, so how do we assess the embodied carbon? If we want to source local and from the UK, we need the data to back up our decisions.

Q147 **Cherilyn Mackrory:** We were saying at the beginning of the session that industry has gone a long way already so can we not use something they are already using to get that data, even if it is not a Government standard?

Louisa Bowles: That is what we have been doing in our office. There are risks with using a data source and making assumptions about it so we would prefer to have it direct from the supplier because it has gone through a third-party verification process and we can rely on that more. In our office we take the nearest equivalent and then convert it.

The other piece I wanted to draw in a little bit that has not been mentioned yet, slightly related to infrastructure, is the drive for MMC and offsite fabrication, for example. A lot of those solutions tend to rely on steel, for example, so from our point of view it would be brilliant if the MMC manufacturers created hybrid EPDs for their products rather than the individual materials they are using, so we could drive down the low carbon supply into those systems. Equally, with precast concrete options or even timber options. Timber is easier because it is a single material. We have material databases but we do not have a lot of product databases. From our experience, specifying offsite construction, they have lagged behind in terms of introducing low carbon materials, no matter which material you talk about, timber excepted perhaps. But yes, integrating low carbon materials into the offsite prefabricated mechanisms.

Q148 **Cherilyn Mackrory:** Joe Jack, if I could draw it back to the green infrastructure and blue infrastructure and that appraisal process, do you have any comments to add on that?

Dr Williams: Counting embodied carbon is incredibly simple, as I mentioned earlier. Effectively all we do is take the best source of data we can find, whether that is a material or a product, and multiply it by the quantity we have. There is no more mystery to it than that. Compared to operational energy, operational energy is not a complex thing, but it is slightly more complex than building physics and climatic design.

There is no particular concern. Louise is completely correct. Every now and then we get foxed by a material that we cannot quite find in our databases and then we are always trying to find the best fit. It is definitely doable. It is a case of drawing that red line and where you stop the calculation. It is always the problem when you start to look at infrastructure rather than buildings.

Q149 **Helen Hayes:** There has been quite a lot of mention so far about the role of public procurement. I wanted to briefly drill down a bit more into that and ask what a public procurement process that was designed to drive the use of more sustainable materials would look like.

Dr Williams: The procurement process itself, once we have a target and we all know it is very similar to working with a budget. It is effectively an additional line item within our spreadsheet. It is not a particularly complex thing to calculate, but somebody has to take ownership of it and there would have to be a recognition of additional scope services and then there would need to be some sort of additional processes to go through, kind of checking.

Interestingly, when we look at the RICS professional statement for whole life carbon, launched by RICS, who are chartered surveyors, it aligns very closely with their processes and that is being updated currently. It is due to start early next year. That will throw out a lot of these procurement issues. From us as an architectural practice, it is part of our processes. There is not a particular additionality to it, and I suspect this is what is happening across lots of the design industry.

Professor Ramage: There are three things I would put forward. This low carbon standard as a requirement for government buildings would be incredibly helpful. I think materials that government buildings are built with should come with independently certified responsible sourcing. This already exists for timber. Forest Stewardship Council is one of them and British Government buildings require them for their construction. It is an area where the UK is leading. It is not the same in other parts of the world.

The last thing I would say—and you will not be surprised—is there should be a natural building materials mandate of some sort. France has gone with 50% of their public buildings need to be in timber. Other countries have said that you can build in any material as long as you consider the timber option first. There are lots of ways to think about it. It would unlock the market and also unlock the skills and education system so as a country we would invest in looking forward to building and materials with lower embodied carbon.

Elaine Toogood: I agree with the Government procuring to create the market for low carbon materials, but it needs to be material agnostic and to leave to the designers to understand and collate on the basis of the latest data what the right solutions for the job are, which should be a level playing field. Given also that things will change through time, if you

lock in a solution now, it may not be the same appropriate solution later on.

In procurement, it is about early engagement, recognising that and monitoring that right the way through the process. It needs to be transparent and comparable. Often one of the challenges is in design you choose the lowest solution or you choose the lowest EPD to get you there. What is important is you choose the EPD for the material that is appropriate to make sure you can achieve what you are designing. At the moment there is a performance gap and that is where the skills need to come through as well. It is not just having the data, it is how people use it and that could be provided through leadership from Government, but for a level playing field there so everybody can be investing in finding the right solution.

Louisa Bowles: I can add a couple of points. I agree with the target setting. I agree with the implication that is an additional scope to the design team and we need to encourage that not to be a one-off measurement at the point you submit the tender, for example. It needs to be an ongoing process throughout the design stages of the project.

The other piece I would add is that there is an education and development piece. Michael hinted at it early on, that as professionals we are getting up to speed with this. I know universities are integrating it into their curriculum, but we also need to bring the suppliers, the supply chain, the subcontractors, the main contractors along as well in the training so they understand why we are specifying what we are specifying, because if they do not understand it, the presumption always is, "I will do it how I used to do it". There is definitely a training and education piece and there is a verification piece at the end when the building is built. Go back and check and do a third-party verification to minimise the performance gap because there is likely to be one at the beginning, once the industry is getting up to speed with this and we need to minimise that as quickly as we possibly can.

Q150 **Helen Hayes:** That is very helpful, thank you. My final question, if we can whizz quickly along the line from Louisa to Michael, where should the Government invest to achieve the most with regard to reducing carbon emissions from the built environment?

Louisa Bowles: Personally, I think the easiest thing to start with is to roll out the whole life carbon reporting template methodology the GLA has adopted and to roll that out nationally to start measuring and then start setting the targets. I think that would be the easiest starting point and that will encourage everything else to follow on.

Elaine Toogood: I agree with that, investing in the provision and availability of data and skills and upskilling. Also it is investing in what is set out by industry across the bodies for what is needed to be able to decarbonise fast and quickly and help the deployment of the big ticket items that will help you, which will be fuel switching. Energy materials as

well is going to make a big difference if we are talking about one of the big ticket items.

Dr Williams: I will boringly agree with Louisa and Elaine. The key thing is to set up a methodology that is robust, transparent and allows us to understand where we can invest in the next steps so that every project is directly comparable and we have good benchmarks.

Professor Ramage: I will say something completely different. I think Government should invest in renovation and refurbishment. We all know the most sustainable building is the one we have already. The Government should invest in renovation by removing VAT on renovation and refurbishment.

Q151 **Chair:** I think you have read our previous reports. Can I just conclude this panel with a question about going back to timber? Michael, you indicated there is enough timber being grown around the world if all timber was put into building and not used for other things. If we plant trees today—and the governments in many countries have ambitions to plant a great many trees—we will not be able to use softwoods for probably 40 years. It will not have any impact in the next 10 to 20 years, which the panellists were talking about earlier, and hardwood is more like 150 years. How realistic is it to think we will be able to consume the amount of timber in building products we need over the next 40 years until any of that becomes available?

Professor Ramage: Timber construction is part of a nature-based solution towards reducing our impact on the natural environment. We need to plant the right trees in the right place, so we will be planting hardwoods; we will plant a mix. Some of them we will never want to cut down. We will want to plant forests for forests' sake and we will want to plant forests as crops. Until we get to those crops, we will import timber and it is a global commodity with a global supply chain. Just the way we import many things into the UK, we should be part of a global solution. Although we have partly our own solution, we should look at it as a global problem we can lead on.

Chair: I will finish it there. Thank you very much to our first group of panellists. We will invite Michael Ramage to stay on for the first set of questions on the next panel.

Examination of witnesses

Witnesses: Will Arnold, Sam Liptrott and Rhian Williams.

Q152 **Chair:** Will Arnold is the head of Climate Action, Institution of Structural Engineers. Can you say a few words about what that involves?

Will Arnold: The Institution of Structural Engineers is the world's largest membership organisation dedicated to the science and art of structural engineering. We have 30,000 members, about 20,000 in the UK and 10,000 overseas. I was previously a practising structural engineer for just

over 10 years at Arup, where I worked with all materials, so I am a material agnostic, you might be relieved to hear. My job at the institution is to put sustainability as a focus on everything we do. Two years ago, the ISE passed a motion at board level that we would put sustainability on a par with safety, which is where our focus has been historically. The two will be treated as equal and my job is to bring that into everything we do. That is through standard setting and guidance for members.

Chair: We will get into what you do shortly, but that is a very helpful summary, thank you. Next to Will is Rhian Williams, the principal strategic planner at the Greater London Authority. Welcome, Rhian.

Rhian Williams: I am in the London Plan team at the GLA and have been involved in developing policy and the supporting guidance on issues relating to carbon and energy and green infrastructure. That includes the whole lifecycle guidance that has been mentioned earlier in the session.

Chair: Thank you. We are also joined by Sam Liptrott. Thank you for joining us. You are the director of OFR Consultants, a fire and risk consultancy.

Sam Liptrott: I am one of the founding directors of OFR, the UK's largest specialist fire engineering consultancy, and we are at any given time involved in the design of between 30 and 40 mass timber buildings. We are doing a lot of research in mass timber to help standardise how things are done.

Q153 **Chair:** I will kick off the first set of questions with Sam while Michael is with us to do with the fire and risk elements in particular of timber construction. Following the Grenfell tragedy, the Government imposed a ban on combustible materials and certain local authorities imposed their own restrictions on combustible materials. In relation to timber, is this ban having a disproportionate impact on the way fire risk is managed in new building construction?

Sam Liptrott: The ban is limited to residential construction, not commercial construction, so if it is offices and things it is not affected. It is only buildings that people sleep in. The ban has effectively killed timber construction in residential building, not just in London but across the country. In London that was doubled down in the GLA statement, the Mayor's statement that no affordable housing could have any combustible construction. The ban has effectively completely torpedoed any chance of using timber in high rise or medium-rise residential across the country. We have seen multiple schemes—10 or 15 timber residential schemes—that have died as a result of the ban, including the most recent one a few weeks ago. That was an 18-storey, 450-unit apartment scheme in London. There would have been 120 affordable units. That scheme is dead and it is not unusual.

Q154 **Chair:** What materials were being used in place of timber in those projects?

Sam Liptrott: It will go to steel and concrete. The problem with steel and concrete—and I do not want to talk about concrete for much longer—is it is extremely heavy. That means if we are looking at existing buildings and building extensions to existing buildings, if we use timber we can get 15 or 20 storeys. If we use steel or concrete, we can get 10 or 12. Suddenly you are halving the size of a potential scheme because of the weight impact of moving away from timber.

Q155 **Chair:** Michael, you have been telling us we should be building all houses out of timber and at the moment we cannot build any. What is your assessment of how proportionate that is?

Professor Ramage: We can build large-scale residential buildings out of timber safely. There are lots of examples of them in the UK and because of the UK's building regulations, the UK led the world in engineering timber. Our engineers and architects are exporting those skills around the world to design engineered timber buildings. Sam mentioned that offices are not affected by the ban and it is true they are not affected by the legislation, but talking to colleagues, developers, engineers and architects, the ban is affecting the design of offices because people are worried the ban might be extended and nobody wants to build a building that will be affected by legislation that makes it uninsurable.

The combustible materials ban has had a disproportionate effect on timber construction and one government policy is making another government policy untenable. There needs to be a middle ground where we can acknowledge that combustible materials as cladding are a bad idea, but timber as a structural material can be built fire-safe and that should be independent of a combustible material ban on cladding.

Q156 **Chair:** Perhaps we will come on to that shortly, but that is intriguing. In France there is a mandate that 50% of building materials are timber or natural materials of some kind. Rhian, as the GLA has adopted such a strict posture in relation to this, is there any work being done by the GLA, by your department or that you are aware of across Government, to look at how we will resolve this evident conundrum?

Rhian Williams: In simple terms, the Mayor just is not prepared to face any risks with safety while the building safety regulator is not in place. The fundamental first point is there have been some huge failings exposed by the Grenfell Tower fire and fires since, and safety is the number one priority. My colleagues have had some constructive conversations, I believe, with the Structural Timber Association and I know that is on the developing of evidence that can start to look at how fire risks can be mitigated.

In the interim we have guidance that supports policy D12 in the London Plan that states that major developments should meet the highest fire safety standards and we would look for that to be supported by experts outside of planning. Planners are not experts in fire safety so we are

looking for that fire risk to be mitigated and demonstrated in all applications.

In terms of materials, we are not specifying any particular materials through our policies. We are quite material agnostic. We have approached the whole life carbon issue from setting our standards, looking at measuring what is in developments coming forward and looking at how we can use that information to develop our benchmarks.

Q157 **Chair:** Will, is your organisation looking at this issue and how we can make timber products fire-safe?

Will Arnold: One of the initiatives we are involved with is the CROSS scheme, which stands for Collaborative Reporting on Safer Structures. Off the back of the Dame Hackitt review, we were given the mandate to strengthen, and this is something we do in conjunction with the Institute of Civil Engineers and the Institute of Fire Engineers. It is a reporting scheme for unsafe practice, whether that is fire or other risks, and we still get reports coming in regularly about fire products being installed incorrectly. For example, the last one I saw was in August this year, so not that long ago.

It is not limited to timber and fire and the point it draws out is construction is a complex system and Grenfell showed us how wrong it can go. To answer your question directly, we are not focusing at the moment on how you make timber safer in fire because there are people out there looking at this. We know that more testing needs to happen. The wealth of knowledge of how timber behaves in a fire is not on the same level as it is with other materials. For a large open-plan office space we do not really understand how fire spreads from one end to the other, so tests need to happen. We would fully support any action that could be taken to push that testing forward, to get that knowledge base up to where it needs to be so that a blanket ban can be turned into something a bit more specific and nuanced.

Q158 **Chair:** Sam, the issue of insurance was raised a bit earlier. Is the insurance sector influencing the use of building materials appropriately and are they doing it differently in this country to other countries that you are aware of?

Sam Liptrott: It is significantly impacting the viability of timber schemes. The issue we have with timber is there is a relative paucity of competence when it comes to the ability to design and build in timber. It is not a common building type. There are not very many timber buildings in the UK. We do not have a long history of building in timber in the same way, for example, as in Scandinavia or mainland Europe. That means when it comes to having some form of reliability and trust that the designer and constructors will do the right thing and understand what the right thing is, insurers are—somewhat understandably—a little bit reticent.

We find at the moment we are getting quite a lot of traction with approvers, and by that I mean building control bodies and fire brigades. They understand the knowledge does exist, albeit in small pockets, but this does exist on how to do this properly. We find with approvers that we can build the buildings but they are generally fairly small buildings, three to four storeys, five to six storeys, offices predominantly.

When it comes to engaging with insurers to try to get property insurance for those buildings, it is not forthcoming. In the last 12 months alone I have worked on six mass timber office buildings that have flipped from timber to steel and concrete because insurance could not be procured for those buildings. Those are relatively straightforward buildings and the insurers are at times fairly intransigent about their willingness to do this. We had a conversation with one of the major insurers, in the top three, and they started the discussion by saying, "We do not care what you say, we will not insure it". They have no interest and it is not a technical reservation, it is a commercial reservation. Insurers are commanding phenomenally high premiums from steel and concrete buildings right now. Grenfell cast a long shadow on the construction industry, as we all know. As a result, I don't think it is a risk they want to take.

Q159 **Chair:** Are they doing the same in other countries, do you think?

Sam Liptrott: Zurich Insurance asked me what they did in Switzerland, so who would know?

Professor Ramage: A new very large mass timber insurance scheme has just begun in the United States to encourage the construction of large-scale timber buildings. We agree completely that the barrier is not technical. It is whatever you want to call it—a regulatory or business barrier.

I was talking to one of the largest science medical trust CEOs recently. It wanted to build all its new campuses in engineered timber, so you can imagine this is a very large investment. It was stopped because it could not get the buildings insured, so exactly what Sam is saying: not technical, not financial, purely risk.

Q160 **Chair:** A final question from me before I hand over to Barry, who has some questions on this subject. Sam, are the Government working to try to resolve this issue post-Grenfell?

Sam Liptrott: Not currently. The biggest thing that we can do is fill the knowledge gap. I am not pro-timber; I am pro-science. I think we need the science to be able to be more confident in what we are doing. That science does not exist at the moment. It exists in the small elements of knowledge and it is fairly condensed in small numbers of people.

In order for us to look at timber on a more wide scale, we need more knowledge and that knowledge can only be arrived at by testing. Look at the steel industry. I know you alluded to the steel industry previously. From the 1950s to the early 2000s the steel industry invested, in modern

terms, tens of millions of pounds in research as to how steel could be used more widely and what we see now are hundreds of steel buildings. The timber industry doesn't need to go to that extent, but it needs to do some form of research.

At the moment the private sector is providing funds and impetus to do that research. It is not being matched by any Government funding at all. The Ministry for Levelling Up, Housing and Communities—what used to be called the MHCLG—has recently invested a lot of money in research to underpin the next iteration of the building regulations, some £6 million in research programmes. Not a single penny of that is focused on timber, not one, so there is no intention of Government to change this.

Q161 **Chair:** Hang on, Michael has just told us that there isn't a technical barrier and you are saying that there is a lack of scientific data to support the safety case for timber, so that suggests that there is a technical barrier to me.

Professor Ramage: I think where you can join those two thoughts is there is no technical barrier on any single project, so if you have something you want to build you can find the technical expertise to get that done. There is a system problem because if you are part of a system of investment and you are doing very large-scale projects you will run up against this insurance barrier, you will run up for this need for data. The need for data can be satiated by data elsewhere.

The Americans are doing a huge amount of testing; the French are doing a huge amount of testing. There has already been testing in the UK. Collating that data, accepting data from around the world towards the safety of any building material would go a long way to getting over those technical hurdles. If we insist that it must be UK-tested it will take us a very long time to get there. We have the capability to do it, but the time—

Q162 **Barry Gardiner:** I want to ask a little bit further about the problems here. Michael, you spoke about structural wood and how you could build fire-safe and I think everybody said, yes, that was possible. You exempted cladding. Of course we are also talking safety about fire stopping and the deficiencies in the building process that can create additional risk, so what I want to ask you is about the impact that the privatisation of building regulations has had on the industry. To refine the question more closely, it would be on what basis do private building regulations compete against the old local authority building regulations, if it is not on turning a blind eye?

Sam Liptrott: I am not sure what that has to do with zero carbon.

Q163 **Barry Gardiner:** It has to do with the fundamental risks attached to the whole building process. We are coming on in your panel, not in Michael's, to talk about the whole planning process and therefore building regulations are a part of that.

Sam Liptrott: If we keep the discussion to timber and to carbon for now, what tends to happen with timber building is most building controls acknowledge that they don't have the competence—whether that is local authority or approved inspector—because it is not a common building type. Building control bodies are jacks of all trades. By their very nature, they have to know as much about fire as they do about drainage and about wind resistance and so on.

What you tend to do is you bring in an expert independent third party on behalf of the building control, who gives their view as to whether the building is adequately safe. Then they are effectively the proxy for the local authority building control. When it comes to timber, I think the privatisation of building control is irrelevant because there is a mechanism that we use to effectively come around the building regulations because the competence does not exist in the building regulatory enforcement sector and they will acknowledge that.

Barry Gardiner: Let's go round the panel and see if they are—

Rhian Williams: I think that it has exposed failures throughout the construction process. I wouldn't like to pick a difference between local authority building control and approved inspectors necessarily, but I think it has thrown up huge problems at every stage of it and the real need to get a proper building safety regulator embedded in the process to improve standards throughout.

Will Arnold: The point I would make is that within the building regulations and within the codes, the codes that deal with fire in buildings do not account for how timber behaves in fire in buildings. The codes also do not tell you what timber detailing will pass muster from a fire point of view and what will not.

The last timber building I designed was three or four years ago now. We had fire consultants working with us from the outset of the project, from the scheme design. They worked very closely with us. They had to develop a whole floor build-up with us so that fire wouldn't spread from the lecture theatre downstairs into bedrooms upstairs. They had to work with us very closely when it came to working out how we were going to cut holes in the timber, because there were no fireproofing products available on the market that met a certain standard already.

There is a bit of a gap here. It is filling that gap, either by the development of some kind of framework or standard or something that linked the existing fire codes back to how timber behaves in a fire, and/or standards for details, which is where a lot of the problems come from. It is how you fix things together rather than fire going straight through the middle of a floor plate. First, it would enable design teams to go it alone and design with timber much quicker and far more competently from a fire-safe point of view. It would also allow building control officers, whether it was private or local authority, to sign things off a lot more easily.

A quick analogy is that part A of the building regulations, which is structural safety, tells you if you are building a house how thick your brick walls need to be or how far apart your joists need to be. That means you can design a house very quickly without having to do all the fancy complicated finance elements that you would do on a high rise. You need the equivalent of that from a fire and timber point of view if you want to start making progress on this.

Q164 **Barry Gardiner:** I am totally with you, but what the whole fallout from Grenfell has revealed across the country in high rise is that it isn't just cladding. It is a whole range of fire-stopping defects. What is so significant is that building control has not at any stage managed to pick up on those, even though it is supposed to be involved at every stage during the development's construction and ultimately there is a circularity of who is believed and who is responsible for what has happened. It ultimately comes back to the developer. Therefore I agree, let's get that framework in place. It will make life easier for the building control officer, but I am not yet convinced that we have a system that is guaranteeing the safety of the building without the proper checks and balances a construction takes.

Will Arnold: I think what you are saying is that regardless of whether it is timber or another material, it is to do with competency, isn't it? It is to do with is what is built meeting the details—

Q165 **Barry Gardiner:** Or integrity, competence or integrity. That is why I raised the issue about on what basis is somebody else competing here. This was a statutory function, building control. It was applied by local authorities without fear or favour, but once you put that on to a marketised basis the question is: how do we as a company compete against the local authority? Certainly my contacts with builders have always said, "We will get the private building control officer because they will allow us to get on with the project a lot faster".

Sam Liptrott: It is worth saying, by the way, the building control that signed Grenfell was a local authority.

Barry Gardiner: No, absolutely. I am just posing these as questions. I accept, yes, that in that case that was right.

Sam Liptrott: I think this is a point I made at a roundtable not long ago that, from my experience, the same level of complacency does not exist in timber buildings as it does in steel and concrete buildings. From my limited experience, what I have seen is the level of care and attention that gets applied to timber buildings, because it is recognised as a novel building type, is far more and in far more detail than in a steel and concrete environment because people say, "Well, we have been doing it for 50 years". Grenfell showed us that we haven't been doing it right for 50 years, but we have been doing it for 50 years. I think the move to novel building materials gives us more control over the quality of the

construction and results in higher quality buildings because people care more.

Barry Gardiner: Greater risk, greater attention.

Sam Liptrott: Yes.

Professor Ramage: You might not be surprised, since I am a professor, that I think that education is the key. I think that is the key to both greater understanding, whether through private or local, but I also think it is the key to greater integrity. I think those will come together if we invest well in teaching, whether it is conventional building materials or novel building materials, teaching what needs to be done and what is expected, and I think the Government's role here is to be very clear about what is expected, whether or not the Government is doing the inspection.

Chair: Thank you, Barry. We will see if we can get through the next set of questions in 20 minutes, which means you have 10 minutes each. Jerome Mayhew.

Q166 **Jerome Mayhew:** Rhian, I am interested in what lessons we can learn from local authority action to increase sustainability. The London Plan introduces a whole life carbon assessment, circular economy statements and urban greening into the planning system. How and why were the London Plan's sustainability measures initiated? Give us the background.

Rhian Williams: The Mayor has a duty to tackle climate change. He has quite a strong climate change agenda and that includes zero carbon targets in London by 2030. We have quite a long-established approach to operational emissions, built on previous approaches to set a zero carbon development standard in the new London Plan. That applies to major residential and non-residential development.

We are also looking at where there were gaps in that and we recognise that the embodied carbon issue was something that was growing in prominence, so when we developed our policy initially we were looking for developers to address embodied emissions and reduce them in their applications. Then through our consultation and from feedback from some of the people in this room, we realised that that wasn't quite comprehensive enough.

Therefore what we have developed is this approach that we have now, which is the requirement for referable scale applications. That tends to be the larger-scale schemes that are referred to the Mayor to produce a whole lifecycle carbon assessment and to reduce the emissions associated with that. That was to bolster our approach on the carbon side.

We are also looking at the things we are doing on the green infrastructure side. London is 50% green. We have had a lot of success in implementing London's green infrastructure, but we also recognise, as we

feel the effects of climate change more, that the existing green spaces we have are going to be under more pressure, so that is something that we also need to see from development, a real contribution to quality greening. I think that covers, as briefly as I can, those two angles.

Q167 **Jerome Mayhew:** What were the biggest challenges that you faced? If you have overcome them, how have you managed to do so?

Rhian Williams: I would say that there weren't a lot of real fundamental objections to us introducing policy on whole life carbon. I think it was something that was recognised in the industry and by a lot of the community that responded and other respondents that this was something that was lacking and it wasn't something that the Government were sharing leadership on. It was a real opportunity for us to try to move things forward.

What we did do was set up stakeholders' groups. We made sure that developers, other professionals in the industry and planning consultants were involved in how we developed the guidance. I think the policy that we have in the London Plan is quite simple. It recognised that we would have to do the work on the guidance to make sure that we were going to implement that policy properly.

Jerome Mayhew: Will, have you been involved in this at all? Do you have any comments on that?

Will Arnold: I do have some comments. I wasn't involved in the development of the plan. I was involved briefly in trying to reconcile the notional targets that existed. I recommended limits. We usually try to align those with the work that LETI and the RIBA and others have done, which we have now reconciled so we have one set of numbers for the industry.

The comment I was going to make is that speaking to people in the industry about what the London Plan has done on whole life carbon, it is one of the most important things that has happened in this country on this topic. It is a complete exemplar of what we need to be doing around the country. By requiring teams to assess whole life carbon at concept stage, an early stage in the project, it means that when the design team is small, when strategic decisions are yet to be made, it elevates the importance of carbon and it puts it on a par with having to deliver this on time and on budget, which means people are talking about it early enough to make the right decisions.

Without having that at planning stage, it is a can that gets kicked down the road. If it is a requirement, a regulation, you don't do that, so it is an important thing. We have had lots of feedback about it.

Q168 **Jerome Mayhew:** How do you measure compliance, Rhian?

Rhian Williams: We have a team of officers who assess the applications, so we are looking for information ideally at the pre-application stage. Not

that every application will go through that, but pre-app stage, at planning stage and at post-construction stage. We have a methodology in the guidance and that builds on the BS EN standard and the RICS guidance. It makes it relevant for planners and it accommodates our operational emissions. It also expands it out to all modules, so you are looking at the full lifecycle and making sure that you have as much information as you can on all those stages. Yes, we have officers in-house that are looking through those submissions. We have a template for developers to fill in at the different stages. The information is reviewed and it is compared with the benchmarks.

Q169 **Jerome Mayhew:** Are there plans to go further?

Rhian Williams: The London Plan was adopted in March 2021, so the plan itself is quite new, although obviously it has been quite a long period of development. We are working on the final version of the guidance at the moment, which will be published early in the New Year. That is taking into account comments and feedback we have had, such as on the benchmarks, which have moved on since we consulted last year.

At the moment we are looking at implementing what we have. There is an awful lot we are going to learn, I think, from gathering that data and that will of course inform any future targets that we set. At the moment there is pretty wide consensus, not just from developers, but from everyone that was involved in the conversations in our examination. It was too early to set targets in our policy, but of course the information that we are getting through from the assessments will inform possible future targets, if there is a revision to the London Plan or a new London Plan, but not at the moment.

Q170 **Jerome Mayhew:** Will, do you think this is an exemplar that we could use to roll out in national policy rather than just being in London?

Will Arnold: I do, yes. I think there are probably some nuances that need to be ironed out. There are a few details. The fact that you are asking for a whole life carbon assessment down through every module and every material at planning stage is probably too fine a level of detail to go through. Most design teams don't have that information to hand, so they have to spend time making assumptions, but in essence, with a couple of revisions—which I am sure you are probably already looking at and have in hand—yes, I think it could and should be rolled out nationally.

Chair: Thank you very much, Jerome. Just before I hand over to Duncan Baker, I am going to hand the Chair over to Barry Gardiner, who has some further questions to ask after Duncan and will conclude the session for us. Thank you all very much. I will be slipping out, please forgive me, as I have to go to the Liaison Committee.

[Barry Gardiner took the Chair]

Q171 **Duncan Baker:** I shall try to move through quite rapidly. I think the key

is, while this area is still essentially voluntary, we will have issues with being able to decarbonise as fast as we perhaps want to. Rhian, first of all, what role can building regulations play in achieving net zero whole life carbon?

Rhian Williams: We would agree with many other people that I think you have heard from already that it is something that the Government should regulate. We think it should be part of building regulations and that is something we would like to see brought forward as a proposal as part of the consultation on future homes and future building standards.

I would say that one of the issues we have—and something that you just mentioned there—is the role of building regulations and the role of planning and the value of having things considered early in the process through planning. Building regulations is something that we need as a baseline and it is something that we need to be included nationally and bring everyone up, but I think there is potentially a starring role for planning and going further and faster.

That is something that we have historically done with our operational emissions policy. Schemes that are referred to the Mayor are achieving on average a 40% improvement over current building regulations in terms of operational emissions, something that is set as a lowest common denominator that is appropriate across the country. There is every likelihood that London and other places might be able to go beyond that. I think there is potentially a twin-track approach that might be needed there.

Q172 **Duncan Baker:** Will, you are one of the authors of Part Z as one of the ways to do this. Clearly we know where your positioning is on this, but I will ask you two questions that relate. First, how would any new regulation that was implemented sit with existing building regulations, particularly on energy efficiency and ventilation? That is the first part of what you are proposing. How does that sit with what we already have existing and then where are the actual barriers? We know what some of them are obviously going to be, but where are all of the barriers to introduce these new regulations, which of course is what many of us passionately want to get to?

Will Arnold: I should say I agree with the point on the fact that you need planning and regulation to make this work efficiently. Planning acts as a filter. It should be a first round interview, if you like, where regulation then sets the limit for your emissions. That is how I kind of see that.

In terms of links between new regulations to existing, you are right I am one of the co-authors of Part Z. I have brought some printed copies with me this time, which we can leave with you afterwards, which also include statements from industry, which we are now up to 121 major firms who are backing the need to regulate embodied carbon. I believe at the last witness hearing you had it was only 100. It is growing all the time. The

most recent was from Aberdeen Investments, which has something like £0.5 trillion worth of assets under management and about 1 million stakeholders, so this has real backing from industry.

In terms of how any new regulation—call it what you want—would link with existing, they clearly have to work together. The way we wrote this was to do exactly that. Part L, which is to do with energy use, will continue to be, in our minds at least, the way in which you estimate energy use in a building and therefore operational carbon in buildings. If you introduce regulation for whole life carbon you will always need to feed that number into it and so the two work hand in hand.

I think the important thing from this is to do with timing. With Part L you are required to report on operational carbon twice, once prior to starting construction and again following completion of construction to make sure you delivered what you said you were going to. Any whole life carbon or embodied carbon regulation should do the same thing.

Prior to starting construction, you may not have your supply chain locked in so you may not have all the EPDs that you need, which you have heard about in other sessions, but you will be able to use national averages for all of the materials that you have and then you finalise it afterwards, so they need to work one and the same. The way we have written this, they do work one and the same.

Your second question on barriers, I don't think there are many left, to be honest. I think when other countries have started to implement this—and you have heard previously how in Europe there are four or five countries now that are bringing in embodied carbon regulations—the Netherlands were the first, but more recently France and Sweden and I think Norway as well. When they did this, they did not have the tools already in the country that we have in the UK.

We already have the RICS professional statement, which gives us the methodology. We have a group of institutions working together at the moment, of which the ISE is one, alongside the Institution of Civil Engineers, RIBA, RICS, the Chartered Institute of Building and many others. working to set up an online reporting portal. It is called the Built Environment Carbon Database. That will be free to use. That is due to go live early next summer, building on something that used to exist on the RICS Environment Carbon Database.

Therefore we have methodology; we have a way of reporting; we have the skillset throughout the industry. Not all of industry has upskilled yet. Those that have have typically done it in the last two years. It was the Government of this country saying, "We will be net zero by 2050", that really got people throwing their papers up in the air saying, "God, we had better do something about this".

In the last two years, everything you see today has happened in that period of time. In another two years, even without regulation you will

probably see the same movement again, but with firm deadlines. You will see more of that. To me that sort of time period is the only real barrier that needs to still be overcome. To overcome it you need to set dates in stone and say, "By this date you will be required to report on anything".

Q173 **Duncan Baker:** Rhian, the Future Homes Standard misses a trick, though, because it doesn't talk about anything. It doesn't mention anything about embodied carbon in that document at all. That is someone dropping the ball. How do we rectify that? How do we actually end up designing that so we do account for embodied carbon?

Rhian Williams: I would totally agree that it is a failing of those proposals. What we would like to see is those principles woven in and, as other people have said, we would be glad to offer up our guidance and our approach as a way of doing that. That could be a method to follow and something that should be consulted on as part of that technical consultation on the future homes and buildings standards. That is what we would recommend.

Q174 **Duncan Baker:** We said that we should do it either through the planning system or through regulation. Will, you have mentioned regulation. Rhian, do you agree it is better to do it through regulation or is it hand in hand? Is there a precedent of one area, whether it is planning or regulation, that should take the lead on this?

Rhian Williams: As I said before, I think building regulation is important in having that power of regulation and setting a baseline, but I think there is an obvious role for planning as well in going further and faster, so I think we need both.

Duncan Baker: Will, I will just bring you in on that.

Will Arnold: As I say, in terms of future homes and future building standards, they are effectively aligned with the 2025 update to Part L. Part F, that would be happening anyway, and by that point in time we will also have the home heating regulation, which would be updated as part of it. While the ambition on those is good, I think we agree that that is still missing, the Part Z piece of the puzzle, call it what you will.

Future homes in a way is just an opportunity—and it is a missed opportunity in this case—to say which part of the building regulations need to be updated in order to give us buildings that are fit for the future and fit for the sort of world we want to live in.

Q175 **Duncan Baker:** Is Part Z the magic bullet or is should a carbon tax be implemented to perhaps drive this as well, or will regulation be the sole way to sort this issue out?

Will Arnold: Whether it is regulation or carbon tax, the first step will remain the same, which is that you will still need people to report whole life carbon on their projects, whether that is because you are going to tax them when they finish construction or because you are going to say, "Is

this over a certain limit? In which case we are going to fine you" assuming that you don't go down a different sort of punishment, such as, "Demolish the building and start again", which I would probably advise against. Either way you need the first things to be in place. You need methodology; you need a way of reporting.

It doesn't change it, but what I would say about carbon tax is that we have not gone around asking the industry whether or not they are ready for carbon tax. We have gone around asking them whether or not they are ready for carbon regulation. They have all said yes to regulation.

Q176 **Barry Gardiner:** Rhian, what is your assessment of the planning White Paper and the outline of the Planning Bill?

Rhian Williams: That is another area where we see real failings to reflect the role planning has in delivering net zero. We have talked about buildings here, but there is a much broader role for planning—setting patterns of sustainable development, making sure transport is sustainable, greening and connecting to local energy networks.

Barry Gardiner: Air pollution, biodiversity.

Rhian Williams: There are token mentions of things here and there is what it feels like to some extent and there is not a sense of how planners should take that net zero agenda forward. That is something that has been a bit lacking in the proposals. If there is a revision and a new NPPF or revision to the NPPF, what it needs to do is make net zero a fundamental common thread throughout it and to recognise the wider role planning has alongside changes to building standards.

Q177 **Barry Gardiner:** In terms of national policies that you would like to see in the Bill when it comes, not just to encourage net zero but for all those other aspects of sustainability, what would you say you would like in there?

Rhian Williams: We have the London Plan and we have a whole host of guidance. We have talked mainly today about the whole lifecycle guidance. We also have related guidance on energy monitoring, which is touching on closing the performance gap that we have mentioned. We also have guidance on the urban greening factor. Lots of these things could be taken forward. We have submitted a response to the planning White Paper proposals and we think we have lots of good ideas that the Government could take forward. We would be happy to share our learning and the guidance that we have as a way to take that forward.

Q178 **Barry Gardiner:** Will or Sam, anything to add? You defer to Rhian. Many local authorities have come out and said, "Yes, we are declaring a climate emergency, we are going to achieve net zero" but a lot of the action has varied between different local authorities. Do you think there is a role for Government to co-ordinate that local authority engagement to deliver a sustainable built environment and how would they best bring that about?

Rhian Williams: Yes, there are obvious benefits to some kind of consistency and ways for places to share their experiences. The one thing that we have been concerned about in the past—and this happened with the ability for local authorities to set higher standards on energy efficiency—is that there has been a threat of that being taken away through ministerial statements and through the proposals as part of the Future Homes Standard. While there might be some issues where it is difficult for developers working in different areas where they might have different standards in different places, I do not think that is necessarily a huge issue. It is important to let boroughs and different local authorities have that ambition, innovate, show leadership and develop their approaches.

Barry Gardiner: Let a thousand flowers bloom.

Rhian Williams: With the scale of the challenge that is ahead of us, what we do not want to see is anyone, through some sort of standardisation of approaches, slip back. That is a real risk. If people want to press ahead, we need absolutely everything that we can get. I do not think that is a huge concern.

Will Arnold: It is very heartening to see so many local authorities setting ambitious targets such as net zero 2035. What is often not recognised in the built environment is how many quick wins exist that could help get us there. You have already heard a lot today about lower carbon versions of materials but, to be frank, they are all based on things that are in very short supply. Low carbon concrete involves replacing cement with something else. We are already using as much of the something else as we make every year, so it is short supply. We cannot magic more of it up.

Low carbon steel: Jerome talked about EAF versus BOF steel. What drives low carbon EAF steel is the high amount of scrap that gets used in that. But globally we used three times as much steel as exists in scrap form, so again you are not going to be able to drive more of that to come out of nowhere. There are still efficiencies to be gained just by switching from the BOF to EAF, but it is mostly scrap. With timber we have heard already about the amount of time it can take to upscale in that area.

With all materials, the key point is that we must to use them far more efficiently than we do currently. Whether it is local authority, national, whatever, there are very quick wins to be made that would result in people changing the way buildings are built to use materials far more efficiently. There are few hurdles that spring to mind when you have client briefs that demand a higher floor capacity than the codes require in the first place, because they perceive that it might make for a stronger and better building, whereas it does not. The code is written there for safety reasons; you do not need more than that. The client briefs asking you to move columns further apart, engineers who will happily overdesign with a bit of spare capacity in their back pockets, that sleep-

at-night factor, it is not needed. There are all of these areas that purely by getting carbon on to the table through planning and through regulation and getting people talking about it and setting their sights on where they can go, people will start to grab at these.

The role that central Government should play is to help. Maybe it is not a co-ordinated approach with all local authorities, but it is to help them understand what the quick wins should be on their projects, on the things that are being built in their cities so that they can go to their design teams and say, "What are you doing about the following things?"

Q179 **Barry Gardiner:** One final question on permitted development rights. We all understand that those rights are intended to advance and expedite the supply of housing, which we all appreciate the need for. But there is also the sense that it has allowed development to go ahead that has been unsustainable, where the spaces are not fit for purpose and it has encouraged demolition rather than retrofitting. Can you give us your take on PDR?

Rhian Williams: There are different flavours of PDR but the ones that we are talking about here are the commercial to residential and the demolish and rebuild. Yes, that is not something that the Mayor supports. The commercial to residential one, as you say, often results in poor quality accommodation, affecting the health of high streets and London's economic success. It is a way of missing out on lots of our important policies. It reduces contributions for affordable housing and other important infrastructure. Like you say, it means that we cannot apply those environmental and sustainability qualities as well, so it is an issue.

There is a very limited set of things that are part of the prior approval process for those. You could add things but there would come a point when the point of going down at that expedited route starts to not make sense and maybe those things would be better—

Q180 **Barry Gardiner:** That is an interesting suggestion. Although it is a permitted development right, there might be certain flaws there that—I am mixing metaphors here, but you know what I mean. There are certainly basic principles that you cannot just push through. Would you have any recommendations as to what this Committee might say in its report in regard to that?

Rhian Williams: You could recommend that there are certain standards of energy efficiency or that embodied emissions are considered as part of that prior approval process. But as I said, there is probably a whole host of things that we think should be applied, especially to the larger more complicated schemes. Perhaps PDR is not appropriate for that type of development, but I do not know how far you would get with that.

Will Arnold: Any policy that allows people to demolish and build a new building as something that is passing straight through does not quite sit with everything else we have talked about today and on your other

hearings. Maybe one or two years ago it was not so widely known that retrofitting buildings is your quickest way to saving carbon. I just talked about quick wins and I did not even mention retrofit, because it is a whole other level again.

If you were to tweak the permitted development rights and you were to bring in extra barriers to get through, one of them would be if there is a building on the site already, you should not be removing it. You need to be able to prove a need to demolish that and start again. Even if you only save the structure of a building and you take everything else out, you still reduce the carbon footprint by 60% compared to building new. We have 600,000 empty buildings in this country, I understand, so policy needs to encourage people to make best use of those.

Barry Gardiner: Thank you very much. Sam, is there anything you want to add to that?

Sam Liptrott: No, not without going down the timber route again.

Barry Gardiner: One of the things that the Chair has pointed out to me that he failed to do when introducing you was to thank you in particular, Sam, and to congratulate you on the birth of your child and in particular to congratulate you for managing to get your written submission to this Committee while on paternity leave.

Will Arnold: Thank you very much. My wife was delighted.

Barry Gardiner: Very good. I thank not only you, but Rhian and Will also for joining us today, and both panels for an excellent session.