



Aims

This month, we are 'looking into the future' of a specific resource - wood - and we'll use it to make links between innovation and design, and the future supply and demand for natural materials.

The panel of witnesses will explore how shifts in the way we use wood may change and by focusing on timber in buildings, we are hoping to generate questions related to both forestry production and the kinds of materials that architects, designers and engineers will looking for in the future.

Apologies

Martin Rees: At a Pontifical Academy of Sciences meeting in the Vatican

Bhaskar and Hildegard: co-ordinating the evacuation of colleagues injured in the recent earthquake in Nepal

Agenda

All the witnesses will give a 10 minute introduction and their perspective on the two core questions followed a general discussion:

- 5:00pm Welcome by the Chair and an introduction to the topic
Each witness gives a short introduction and thoughts about the questions (10 mins)
Responses from **Simon Smith**, Co-Founder of Smith and Wallwork
Adrian Campbell, Associate Director of Buildings at Arup
- 6:15pm Questions and beginning the open discussion
Coffee break
Come back together as a single group
Responses from: **Dr David Coomes**, Head of the Forestry and Ecology Group
Professor Paul Dupree, Department of Biochemistry
- 7:15pm Reception and dinner, which will include a working session

Witnesses

This month, the three witnesses are:

Professor Peter Freer-Smith	Chief Scientist, Forest Research and Forestry Commission
Jon Kirkpatrick	Head of Sustainability, Europe, Lend Lease
Michael Ramage	Senior University Lecturer, Department of Architecture, University of Cambridge

Questions

- The witnesses have all been asked two core questions:
- 1) What do you perceive as being the main gaps in our knowledge?
 - 2) What would you include in the 'next generation' of research questions?

Witness profiles

Professor Peter Freer-Smith

Chief Scientist, Forest Research and Forestry Commission

As Chief Scientist for Forest Research and Forestry Commission, Peter ensures that Forest Research provides the scientific knowledge and expertise required to achieve sustainable forest management. He ensures that advice to policy makers and practitioners is based on good scientific understanding and sound research and contributes to the formulation and implementation of the Forestry Commission's policies and objectives. Additional responsibilities include Head of Station at Alice Holt Forest near Farnham in Surrey (where he is based) and representing Forest Research on the Forestry Commission Research Management Board.



Peter studied for his first degree at Stirling University gaining a first class degree in Biological Sciences. His PhD was on the Impacts of Air Pollutants on Trees. Both his PhD and DSc are awarded by the University of Lancaster. Peter did two periods of post-doctoral research at Lancaster before moving to a lecturer's post at the University of Ulster. He joined the Forestry Commission in 1987. In June 2005 Peter was appointed Honorary Visiting Professor in the School of Biological Sciences, University of Southampton. He was appointed Forestry Commission Chief Scientist in 2009.

Jon Kirkpatrick

Head of Sustainability, Europe, Lend Lease

Jon Kirkpatrick heads up sustainability for Lend Lease across the EMEA region, and acts as the central liaison for all sustainability issues across all of its business units. His role covers two essential areas, environmental operations plus associated performance and development innovation and strategy (both environmental and community investment).



In addition to embedding sustainability across the business, he is also ultimately responsible for sustainability on major projects at Lend Lease, and works primarily on significant urban regeneration projects across Europe (such as Elephant and Castle & The International Quarter). Jon works closely with the development teams to focus on comprehensive urban and infrastructure problems, including finding solutions for renewable energy, water, waste, transport, biodiversity, green infrastructure and public realm issues through integration of sustainability into design. Before joining Lend Lease, Jon has experience across a wide number of major projects globally including the London 2012 Olympic Park and Education City in Qatar as an associate director of EDAW/AECOM.

Michael Ramage

Senior University Lecturer, Department of Architecture, University of Cambridge

Michael Ramage is an architectural engineer and Senior Lecturer in the Cambridge University Department of Architecture, a fellow of Sidney Sussex College, and a founding partner of Light Earth Designs. He studied architecture at the Massachusetts Institute of Technology, and worked for Conzett Bronzini Gartmann in Switzerland prior to teaching at Cambridge.



His current research is focused on developing low-energy structural materials and systems in masonry, better housing in the developing world and improved engineered timber and bamboo through natural material innovation. He teaches, researches and designs buildings, and receives research funding from the Leverhulme Trust, the Engineering and Physical Sciences Research Council, the Royal Society, the British Academy, Cambridge University and industry.



Top three ideas

After the meeting, everyone was asked to outline the three things that they took away from the discussion and what aspects of they found most interesting. These included ideas or questions that they would like to explore more or those we didn't talk enough about.

Henry Burridge (Post-doc at the Centre for Natural Materials Innovation, based in DAMTP)

Is it really correct to assert that since methane is a far more harmful greenhouse gas (~20 times the impact) than CO₂ that we should really just burn wood rather than let it rot? This suggestion seems nonsensical to me, if we consider that at periods during its history the Earth had huge forest cover, all of which was left to rot and release methane, then this would imply that green house levels would have been far higher previously.

Is there a significant role for mono-culture 'crop' forests to play in the future supply of timber? It wasn't said explicitly last night but I got the feeling that the consensus was that there is, I just wonder how significant they should be.

I was interested to learn that shipping timber all over the globe contributed less to the carbon budget than the last 50-100 miles (or so) of timber movement by road.

Miles Parker (Associate Fellow at the CSaP)

Much of the focus was on the structural and architectural properties of wood as an alternative to concrete. I was surprised that the only refs to aesthetic properties were essentially negative; there are significant advantages here, which contribute to well being. Wood enables much more organic forms - cf. the use of wood in art nouveau decoration, window frames etc. Wood panelling has traditionally been associated with warmth and cosiness - watch any period movie!

Britain is still a deforested country, even if forest growth has been spectacular recently - its from a very low base. But much of the space in which trees used to grow now forms treasured romantic landscapes, bare and denuded - moors, fells, hill tops etc. Contrast e.g. the Black forest, the lower Alps.

We didn't discuss the use of glues in laminated woods. These are obviously important contributors to structural strength but what is their environmental impact, esp at deconstruction.

We didn't discuss the social/ritual significance of woodland, something which emerged viscerally from the national psyche at the great forest Sell Off debacle, when people became aware of a routine operation that had been running for years.

Doug Crawford-Brown (Director of 4CMR and the Department of Land Economy)

Through well managed forests, we can withdraw a lot more wood - sustainably - than is currently the case globally. But this requires a view to forests as to some extent being a resource base rather than only a conservation zone. Research is needed to quantify this potential increase in sustainable withdrawal and how this compares with potential demand for wood products in construction.

The low carbon credentials of the use of wood in construction are still not well quantified with respect to lifecycle carbon. This is in large part because the counterfactuals on the use of the land - if not for timber production - are not well quantified or even specified. Research is needed to allow development of better models for competing land uses, with both economic and non-economic drivers included.

There is a lot of research still to be done on the properties of natural materials and how well these properties match the performance required in construction. Especially pressing is the need to better understand WHY we have such performance requirements, and whether a shift to natural materials would cause these performance requirements to change because the entire design of buildings would change.

Adrian Campbell (Associate Director, Buildings at Arup)

I was really interested in how you are working at so many scales on timber: cellular to city.

As to topics:

The future impacts of climate change on forestry seems a major risk, but also an opportunity. Is there a strategic case for scaling up forestry cover in the UK back to the sort of averages in other European countries Peter was talking about?

It was clear from Jon that Lend Lease don't focus on embodied impacts as the primary driver, but it is an important part of the story and better end of life information is needed I think; will we be putting large engineering timber in landfill (I think not) or do we, as Peter Guthrie was suggesting, need to think more clearly about future scenarios for timber recycling now including avoiding treatments?

There are many unknowns still about the performance of timber in fire and genuine concerns over some aspects due to the lack of familiarity with the material in the UK (real contribution to the fire load, glue delamination, self-extinguishment etc) and this is an important area for study. It reinforces and supports your (and Arup's) multidisciplinary approach to timber and development of holistic solutions. I came away genuinely buoyed by it.

He is also happy to provide case studies and examples for the report

Bea Shlarb-Ridley (Director of Innovation and Impact at the British Antarctic Survey)

We need to re-think the design of timber buildings from scratch, rather than applying concrete-based design expertise

The importance of perception, and hence of engaging social sciences

The value of hybrid technologies - it doesn't have to be all timber

Will Simonson (Coordinator of the Global Food Security Initiative, based in Plant Sciences)

Something that interested me from the discussion was the competing uses/functions of forests (timber, paper, biofuel, biodiversity, recreation) paralleling similar pressures on agricultural land. Has the land sparing/land sharing debate been extended to forests?

Also, regarding the 'embodied carbon' sustainability arguments of timber constructions - how they can be overstated, and the need for whole-life cycle assessment and deconstruction issues. I still find it surprising that shipping large volumes of timber round the world has a negligible carbon footprint.

Paul Dupree (Professor of Biochemistry in the Department of Biochemistry)

I was surprised to hear about the resistance to use of wood in construction. I had thought building regs and conservatism in construction would mean changes are slow, but I also thought pressure for change would be high. We need to work at multiple levels to improve this- architect research and education, construction industry education, and material innovation.

The prospects for supply increases seem good - better use of current forest, and improved productivity of trees. Decrease in use of wood for paper.

The most productive trees are fast growing eg eucalyptus, but how many and which aspects of construction are they suitable for? Does reduced use of timber for paper really increase the supply of suitable grade wood for construction? Can we increase the use of such timber by material innovations?

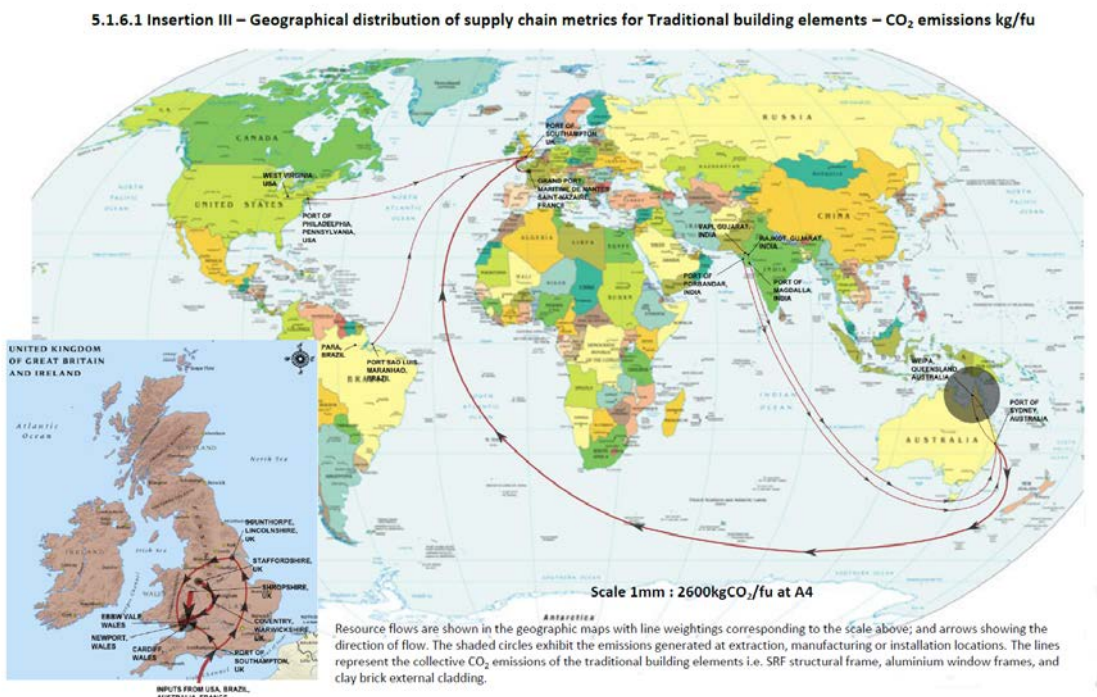
Peter Guthrie (Director of the Centre for Sustainable Development in the Dept. Engineering)

Following on from people's questions:

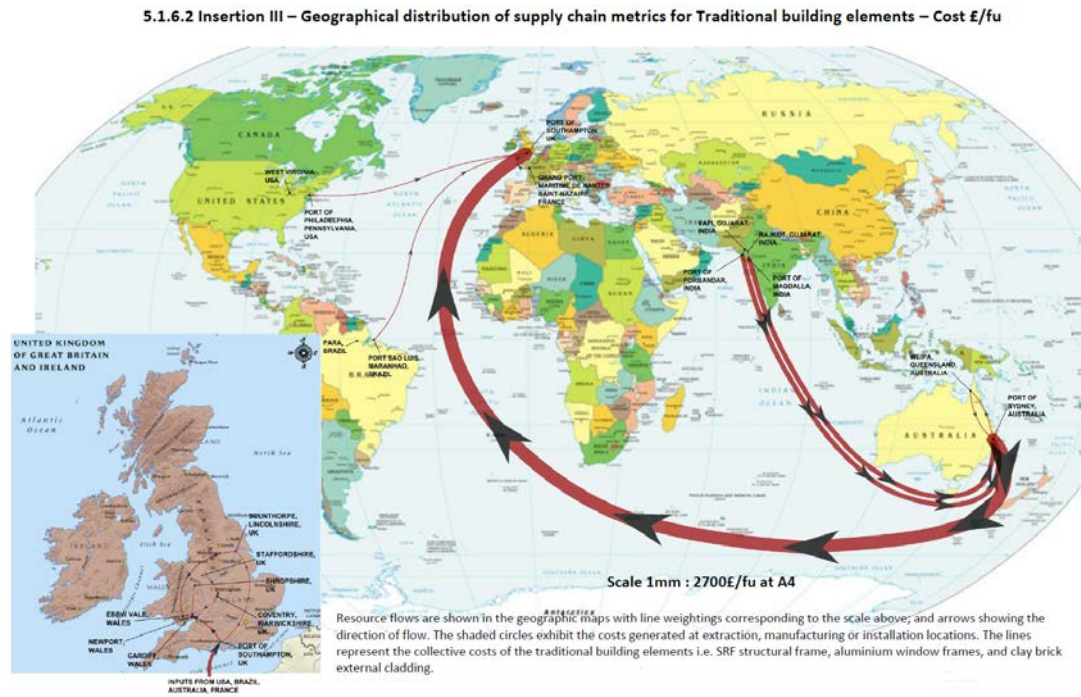
The CO2 emissions from shipping by sea compared to over land

I was surprised there was not more widespread understanding that the carbon associated with shipping is small comparatively with transport on land and in particular the "last 20 miles". I attach a report done by Sita Shah, a fourth year student studying civil, structural and environmental engineering (not peer reviewed or published) which makes the point well – see figures below:

Co2 emissions – the thicker the line, the higher the emissions



The cost of shipping the timber in GBP – again, the thicker the line, the higher the cost



As for methane versus carbon dioxide, the rule of thumb is 25x greater in its greenhouse effect (global warming potential =25, GWP of CO₂ is 1), despite being shorter lived in the atmosphere (12 years), see <http://epa.gov/climatechange/ghgemissions/gases/ch4.html> , so it would always be better to intercept CH₄ and burn it to produce CO₂. All rotting vegetation produces methane (eg landfill)

His points:

It was an excellent evening! I have since been contacted again by Jon Kirkpatrick and we will meet in London next month. I am sorry you and I did not get a chance to talk over dinner.

Timber faces many barriers as a mainline construction material, from codes to prejudice in designers to lack of skills on site to fear of fire (made worse by the recent destructive fire at Nottingham University).

CLT is routinely being overdesigned for structural elements; not enough attention paid to timber floor cassettes which can be installed efficiently.

The supply of timber needs more exposure - there is an OVER supply of softwood timber in Europe, Canada does not replant its softwood harvesting, and there is more potential in European hardwoods such as Beech and Ash.

David Coomes (Head of the Forest Ecology and Conservation group in Plant Sciences)

I thought the FAO figures presented by Prof Freer-Smith were revealing: such a large proportion of industrial roundwood still coming from natural forests at present, but production from plantations on the ascendancy. I came away with a changed perspective on tropical plantations - perhaps they could be good for biodiversity conservation if they help relieve pressure on primary tropical forests. If.

Interesting to hear that wood could be a cost-effective alternative to steel and concrete. Not so if the raw material costs were the only consideration, but the speed of construction at the building site makes it attractive.

As a great fan of wooden building I was fascinated to hear that influential people in the construction industry don't want to see exposed wood in their buildings!

Dimitra Dantsiou (PhD student in the Department of Architecture)

The potential of plantation forestry to take the pressure off global deforestation. In particular, the ethical and practical implications of increasing wood production in certain countries through the intensive cultivation of genetically modified species such as the Eucalyptus in Brazil.

The existing public scepticism on timber-framed and clad buildings and how awareness could be raised on the issue. There is a need for exemplar housing and public building projects.

The potential for research regarding hybrid technologies for modified wood and the economic/social/health benefits of wood if entering the UK construction market. The role of vested interests and building codes in shaping the existing construction industry (concrete, steel, cement).