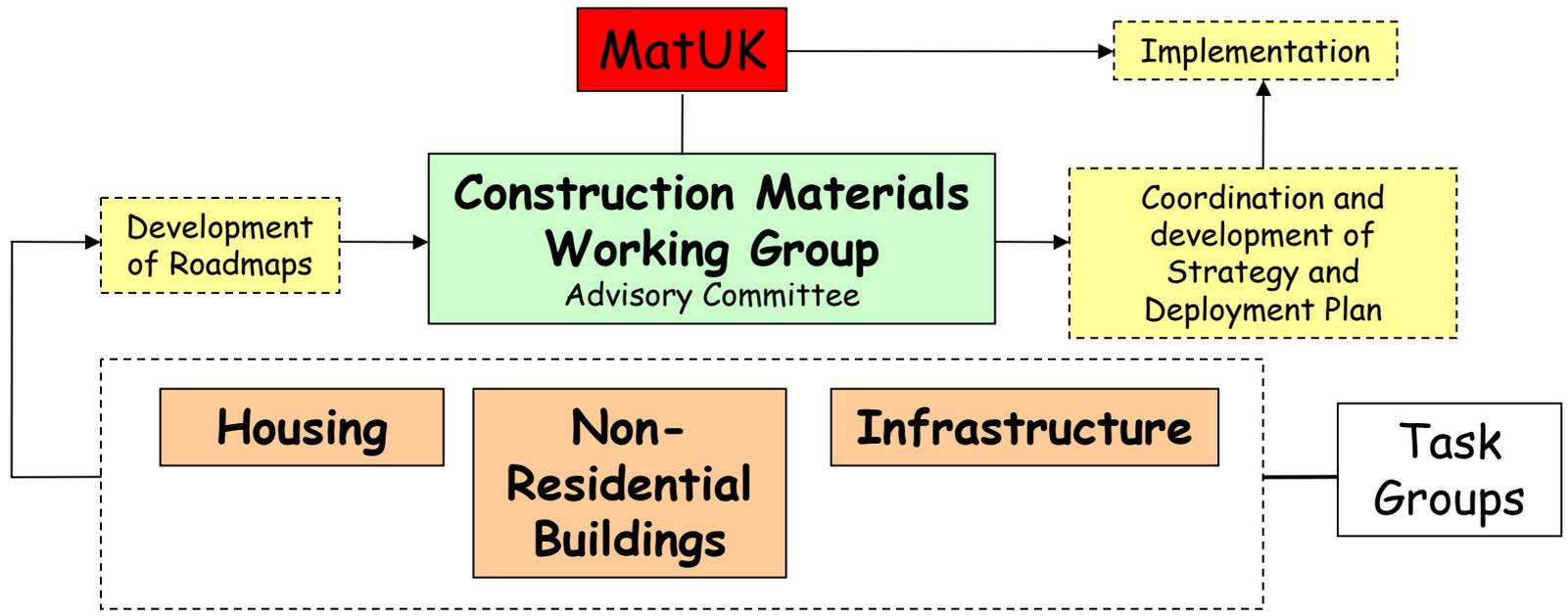


Construction Working Group

Dec 2007

Construction Working Group - Structure



Common Themes - Feedback and Further Discussion

- Life Cycle Analysis (LCAs) and Full lifetime costing of construction mats
- Models of building performance - ease of use, validation
- Coatings and surface engineering
- Novel potentially step-change materials and systems
- Thermal mass - heavyweight vs. lightweight, phase change materials
- Interfaces - joining technologies, interfaces, tolerances, airtightness
- Embodied Energy
 - Alternative fuels
 - Heat recovery and re-use
 - Increased use of recycled materials
 - Lower temperature manufacturing processes
 - Modified input raw materials
 - (Improved properties leading to less material being used)
- Construction methods - off-site, skills, H&S, waste, etc

1) Life Cycle Analysis and Full Lifetime Costs

- Reason: Need comprehensive and consistent LCAs of major construction materials for realistic calculations of environmental impact
- TWI - i) intrinsic materials - input into manufacture and recycling issues
ii) structures - in-service use and disassembly issues
Co-ordinated effort needed to capture whole life issues
Need to review pockets of existing work (incl non-UK), identify gaps
MatUK should consider funding a review from independent sources
- Andy Tyler, Omya -
LCAs need to consider embodied energy, energy in use and recyclability.
All downstream materials (except timber & crops) are made from minerals.
- J Tebbit comment - BRE are snowed under with requests for LCAs
- R Wakeman, R Lambert proposal - Gov develops independent LCAs for construction materials based on BREEAM methodology and BRE's Green Guide. Concerned about BRE's monopoly. Independence is important when comparing materials. Broaden to Whole Life Costing.

2) Models of building performance

- Reason: Current models are not easy to use, cannot easily changes materials and designs to investigate sensitivities. Will need to validate.
- TWI - A modular, integrated approach is needed to consider sustainability and impact of recycled materials and virgin. Need to take note of existing models (eg Finnish Con. Ind.)
- Andy Tyler, Omya - Need to consider sustainability of raw mats. Apply TNS Sustainability Model (www.naturalstep.org)
Some moves within EU to adopt this model

3) Coatings and Surface Engineering

- Reason: The performance of most construction materials can be improved using coatings and other surface treatments
- TWI - i) intrinsic materials - will need multi-functional coatings
ii) structures - need to note the potential impact of coatings on disassembly and recycling.
Merit in stimulating cross fertilisation between material manufacturers and surface eng / coating experts
This approach could solve some material shortcomings which would be difficult or expensive to solve by modifying the material itself
- Andy Tyler, Omya - Recycling coatings containing mineral fillers
Multi-functional coatings that can perform positive environmental functions (eg capture PCBs, absorb smoke, absorb CO₂)
Spray coatings made from recycled or waste fillers

4) Novel, step-change materials

- Reason: Some traditional construction materials are reaching maturity, step change materials would be useful, if reasonable cost, etc.
- TWI - Examples may be materials with substantially less embodied energy or high performance materials based on recycled input streams. Another example would be high strength / high toughness steel. Candidates may be few and far between, need to communicate needs to existing (blue sky) R&D delivery routes
- Andy Tyler, Omya - Would it be possible to make a building purely out of natural minerals excluding oil and petrochemicals?
How would this compare to other 'sustainable' buildings?
Compression moulding of mineral fines with vegetable binders.
- Michelle Field - all materials will be novel to some extent. In the long term it's an issue of which materials will be conserved at the same time that they are used ('cradle to cradle').

5) Thermal Mass

- Reason: Promising materials already being developed.
- TWI - Improved insulations materials is 1 priority, not least for retro-fit
An understanding of thermal management of whole room enviro
Robust, affordable 'vacuum' insulation would be one approach
Suggest "thermal management" as a title familiar in other indus
Greater attention to keeping buildings cool will be needed
- G Couchman - Need to expand the category to include related design issues such as solar gain and night time cooling; mass on its own can be misleading

6) Interfaces

- Reason: Increasingly important roles of multi-material and multi-functional systems. Need for better capability and understanding of joining technologies, interfaces, tolerances, airtightness, etc
- TWI - joining a material to itself with good performance and easy disassembly and flexible reconfiguration.

This area is becoming more important as designers mix materials to gain optimum performance

Novel joining methods for disassembly at end of life

Reliable solutions appropriate to an increasing amount of off-site manu'
modelling and prediction of joint performance needs greater attention

7) Embodied Energy

- Reason: Although Gov targets emphasise energy / carbon use, embodied energy must also be considered.
- TWI - Need to liaise with MatUK Energy WG for their approach to alternative fuels and heat recovery

The fragmented nature of mat supply indus means that tech transfer from Energy will not necessarily happen of its own accord

- Andy Tyler, Omya - Reduction of cement in construction
 - Innovative mineral based concrete products
 - Many waste mats (eg slate) have lower embodied energy than cement or bricks (what's wrong with naturally dried clay bricks (adobe))
 - Huge amounts of clay and silt lagoons in UK. Blending with clay?
 - Need to consider specifications, what is a brick required to do?
 - New types of glass, brick, cement from minerals with lower energy
 - Different fuels: why use gas, why not coal and capture and use SO_x?
- Avoidance of thermal processing and chemical combinations in the production of materials. What about room temperature or solar driven reactions, catalysts, etc.
- Transport is a key factor

8) Construction Methods

- Reason: Clearly a relevant subject - eg off-site, skills, H&S, waste, etc
- TWI - Ensure site issues are considered at the early stage of new mat dev
Build in approaches to mistake-proof on-site assembly
Promote solutions / supply chains which minimise waste on-site
For off-site there is scope to learn from existing manufacturing industry, such as lean techniques
Skills are such an important issue that we propose a separate item (9)
Slow penetration of new solutions due to lack of knowledge in the industry
Skills issues more important as hybrid material solutions are adopted which span traditional construction skills
Gov schemes to stimulate new materials need to take note of skills issues
Indiv material supply chains limited, solutions will be cross mat boundaries
Need accreditation schemes to give confidence in new approaches
- Andy Tyler, Omya - What constitutes good and bad buildability?
Criteria for buildability has to be determined by its end use and design
Should not apply the same tolerance requirements to all materials
Need to think outside the 'Western World box' (wigwam, igloo, etc)
- GCouchman - Potential conflict between composite materials for efficiency and easy of deconstruction.

Other Points

- G Couchman - Need to consider standards and accreditation on new materials, a robust and user-friendly system so new materials can be introduced with confidence.
- G Couchman - worth doing some cost benefit analysis for the various levels in the Code for Sustainable Homes
- G Couchman - for buildings I don't see much benefit in a Centre of Excellence, need to get existing bodies working together.
- P Whittington - there has been a lot of roadmapping going on recently, benefit in knitting them together. TSB Innovation Platform on Low Impact Buildings (Richard Miller).
- Materials specifications need to be reconsidered in light of zero carbon
- M Field - Density of living is important.
- Need to reconsider what we *need* from a house, as opposed to what we want

Key Drivers

New products / systems to benefit all 3 aspects, rather than trade-offs

