The following tables summarise the pros, cons and sustainability attributes of various sub-floor construction systems (Table 1) and floor materials/coverings (Table 2) as discussed in the article ‘Strength, stability and performance—The right floor for your build’ in ReNew magazine issue 143.

Table 1. Sub-floor systems—summary and pros/cons.

<table>
<thead>
<tr>
<th>Sub-floor system</th>
<th>Materials used</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple slab on ground and stiffened raft slabs</td>
<td>Concrete, steel</td>
<td>High thermal mass (note: needs to be suitable for climate; needs strategies for heating/cooling slab; may become an issue as climate changes/warms) Can act as sub-floor, structural floor and floor surface Termite resistant Bushfire resistant Long lived</td>
<td>High embodied energy unless using eco-concrete, which (often) also uses a waste product (fly ash from furnaces and power stations) Difficult to fully insulate underneath, particularly edge insulation while maintaining termite resistance Not recyclable Not easily reused at end of life, but can be used for road fill etc Need to add piers/bores for reactive soil types</td>
</tr>
<tr>
<td>Wafflepod (standard)</td>
<td>Concrete, polystyrene, steel</td>
<td>Good insulation High thermal mass Uses less concrete than other slabs Cheaper to install than other slabs</td>
<td>High embodied energy (though less than other slabs) Need to add piers/bores for reactive soil types, which reduces cost difference from other slab types</td>
</tr>
<tr>
<td>Wafflepod (Cupolex)</td>
<td>Concrete, recycled plastic, steel</td>
<td>Moderate insulation Moderate thermal mass Can run utilities through voids after the slab is poured Can ventilate voids to eliminate moisture problems, but this reduces thermal performance</td>
<td>High embodied energy (though less than other slabs) Plastic not easily recycled with current recycling stream in many parts of Australia</td>
</tr>
<tr>
<td>Suspended slabs</td>
<td>Concrete, steel</td>
<td>As for on-ground slabs, plus: High strength compared to wood joist floors</td>
<td>As for on-ground slabs, plus: Requires strong supporting structure such as concrete or brick walls</td>
</tr>
<tr>
<td>Bearers and joists—timber</td>
<td>Concrete, timber or galvanised steel stumps Timber bearers and joists</td>
<td>Low embodied energy (concrete stumps small part of system) Long lived when designed right (particularly concrete stumps) Can be designed to be termite resistant Can be designed and prefabricated off-site for faster assembly on site Insulation can be added relatively easily at build time</td>
<td>Thermal mass depends on structural floor materials used, but likely to be low Timber may not be termite resistant Timber needs to be of the correct strength for the use and mould/rot resistant Check sourcing of timber</td>
</tr>
<tr>
<td>Bearers and joists—cold rolled steel</td>
<td>Concrete, timber or galvanised steel stumps Cold rolled steel bearers and joists</td>
<td>Light and strong Recyclable Long lived Insulation can be added relatively easily at build time Can be designed and prefabricated off-site for faster assembly on site</td>
<td>Higher embodied energy than timber Thermal mass depends on structural floor materials used, but likely to be low High thermal conductivity unless thermally broken</td>
</tr>
<tr>
<td>Bearers and joists—hot rolled steel</td>
<td>Concrete, timber or galvanised steel stumps Hot rolled steel bearers and joists</td>
<td>Heavy, requires cranes to install Recyclable Long lived Insulation can be added relatively easily at build time Can be designed and prefabricated off-site for faster assembly on site</td>
<td>High embodied energy Thermal mass depends on structural floor materials used, but likely to be low High thermal conductivity unless thermally broken</td>
</tr>
<tr>
<td>Bearers and joists—timber/steel combo</td>
<td>Concrete, timber or galvanised steel stumps timber/steel combo bearers and joists</td>
<td>Light and strong Long lived Insulation can be added relatively easily at build time Can be designed and prefabricated off-site for faster assembly on site</td>
<td>Composite not easily recycled unless deconstructed Thermal mass depends on structural floor materials used, but likely to be low</td>
</tr>
</tbody>
</table>
Table 2. Flooring materials—pros/cons and material sustainability considerations.

<table>
<thead>
<tr>
<th>Flooring material</th>
<th>Pros</th>
<th>Cons</th>
<th>Material sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>No extra materials needed</td>
<td>Consider insulation</td>
<td>Consider VOCs and eco-credentials of finishes</td>
</tr>
<tr>
<td></td>
<td>High thermal mass</td>
<td>Polishing result may not be as expected</td>
<td>High embodied energy; use eco-concrete</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surface hard/can be cold</td>
<td></td>
</tr>
<tr>
<td>Concrete screed</td>
<td>Allows for in-screed heating to be added</td>
<td>Additional materials needed</td>
<td>As above</td>
</tr>
<tr>
<td></td>
<td>after slab is laid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timber floorboards</td>
<td>Low embodied energy</td>
<td>Low thermal mass</td>
<td>Consider VOCs and eco-credentials of finishes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>May be draughty; seal and/or insulate underneath</td>
<td>Can use recycled timber</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bamboo floorboards</td>
<td>Low embodied energy</td>
<td>Low thermal mass</td>
<td>Cheaper bamboo may use toxic glues</td>
</tr>
<tr>
<td></td>
<td></td>
<td>May be draughty; seal and/or insulate underneath</td>
<td>Consider VOCs and eco-credentials of finishes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lower quality may be soft and warp from moisture</td>
<td>Consider bamboo</td>
</tr>
<tr>
<td>Particleboard flooring</td>
<td>Eliminates draughts under another floor finish</td>
<td>Check water resistance</td>
<td>Check VOCs in resin binder</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Consider VOCs and eco-credentials of finishes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Consider wood chip source</td>
</tr>
<tr>
<td>Ceramic tiles</td>
<td>Good for wet areas</td>
<td>Needs occasional grouting</td>
<td>High embodied energy</td>
</tr>
<tr>
<td></td>
<td>Hard wearing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Provides some limited thermal mass</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slate tiles</td>
<td>Good for wet areas</td>
<td>Needs occasional regrouting</td>
<td>Check source of slate</td>
</tr>
<tr>
<td></td>
<td>Hard wearing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Provides some limited thermal mass</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stone/marble tiles</td>
<td>Good for wet areas</td>
<td>Needs occasional regrouting</td>
<td>Check source of stone</td>
</tr>
<tr>
<td></td>
<td>Hard wearing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Provides some limited thermal mass</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laminates</td>
<td>Relatively easy to DIY install</td>
<td>Can scratch/dent, not usually repairable</td>
<td>May off-gas from vinyl or other coatings; check sustainability of components</td>
</tr>
<tr>
<td>Rubber sheets and tiles</td>
<td>Very durable</td>
<td>Check natural, not synthetic</td>
<td>Natural material</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Can be made from recycled rubber</td>
</tr>
<tr>
<td>Carpet—synthetic</td>
<td>Hard-wearing</td>
<td>Not as fire resistant as other materials</td>
<td>Not easily recycled at end of life</td>
</tr>
<tr>
<td></td>
<td>Stain-resistant</td>
<td></td>
<td>May off-gas depending on plastics used</td>
</tr>
<tr>
<td>Carpet—wool</td>
<td>Fire resistant</td>
<td>Can stain easily</td>
<td>Natural material</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Consider ethical credentials</td>
</tr>
<tr>
<td>Coir, sisal, jute, seagrass</td>
<td>Stains easily</td>
<td></td>
<td>Natural material, usually compostable</td>
</tr>
<tr>
<td></td>
<td>Short lifespan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cork</td>
<td></td>
<td>Needs sealant to protect from stains and scuffs</td>
<td>Natural material</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Need to protect from furniture legs</td>
<td>Can be made from recycled cork</td>
</tr>
<tr>
<td>Vinyl</td>
<td>Hard wearing</td>
<td>Can go brittle over time</td>
<td>May want to avoid due to off-gassing of plasticisers</td>
</tr>
<tr>
<td></td>
<td>Stain resistant</td>
<td></td>
<td>Not generally recyclable</td>
</tr>
<tr>
<td></td>
<td>Waterproof</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linoleum</td>
<td>Hard wearing</td>
<td>May discolor or stain over time</td>
<td>Natural material</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Almost completely biodegradable</td>
</tr>
</tbody>
</table>