Sustainable Construction

Tim Smart

Head of Engineering and Operations, HS2 Ltd
Combating climate change
- Mode shift
- Reduced greenhouse gas emissions
- Resilience to climate change
- Flood risk
- Green space / amenity

Sustainable consumption & production
- Resource efficiency
- Waste generation
- Whole life - Whole System management
- Agriculture & soils

In looking at sustainability, we have tried to reach a balance combining environmental protection and enhancement, social wellbeing and opportunity, and economic wealth and prosperity.

- Environment
- On budget

Sustainable economy
- Economic welfare
- Economic prosperity
- Value to taxpayer
- Best value

Sustainable communities
- Increased rail capacity
- Business opportunities
- Job creation
- Skills enhancement
- Regeneration
- Innovation

Sustainable communities
- Health, safety & security
- Designed for passengers
- Benchmark excellence
- Vibrant city regions
- Environment

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# Sustainability Policy Themes

<table>
<thead>
<tr>
<th>Theme</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td><strong>Growth and regeneration</strong></td>
<td>• Support Sustainable economic development and the localism agenda.</td>
</tr>
<tr>
<td><strong>Environmental change</strong></td>
<td>• Seek to avoid significant adverse effects on communities, business, and the natural, historic, and built environment. Minimise impacts where they occur and deliver enhancements as far as practicable to ensure there is no net loss to the natural environment.</td>
</tr>
<tr>
<td><strong>Skills and employment</strong></td>
<td>• Improve skills, jobs, education and the economy through out investment along the length of the route. Act as a driver for improvements in the sustainability of the engineering and construction sector. Promote diversity, openness and fairness.</td>
</tr>
<tr>
<td><strong>Climate change</strong></td>
<td>• Minimise the carbon footprint of HS2 as far as practicable and deliver low carbon long distance journeys that are supported by low carbon energy.</td>
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<td><strong>Resilience</strong></td>
<td>• Build a network which is resilient for the long term and seek to minimise the combined effect of the project and climate change on the environment.</td>
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<tr>
<td><strong>Resources and waste</strong></td>
<td>• Source and make efficient use of sustainable materials, maximise the proportion of material diverted from landfill and reduce waste.</td>
</tr>
<tr>
<td><strong>Integrated transport</strong></td>
<td>• Engage with stakeholders to create seamless transport links with other modes and ensure accessibility for all.</td>
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</tbody>
</table>
A typical breakdown of embedded carbon for the construction of a high speed rail network

- Concrete: 28%
- Cement: 4%
- Steel: 3%
- Aluminium: 11%
- Glass: 3%
- Composite (Steel/Copper/Aluminium): 3%
- Other: 49%
Opportunities of reducing embedded carbon

• Develop materials with lower embedded carbon.
• Maximise opportunities to reuse excavated material on site and minimise transportation.
• Use 4-D modelling to plan efficient logistics using low carbon modes (such as rail).
• Build off site.
Example 1: ‘Sustainable’ concrete

- Reducing CO2 by the reduction of cement through the increased use of cement replacement, such as PFA and GGBS.
- Increased use of recycled aggregate.
- Better prediction of strength gain using ‘START’.
Example 2: Re-use of excavated material

- Secondary treatment of unsuitable material to allow re-use in engineering works.
- Use in non-engineering mitigation earthworks.
- Construction integration and joined-up logistics.
Example 3: Build off site

• Reduction in concrete compared to in-situ solutions.

• Produced in quality factory conditions results in reduced wastage and recycling of ‘off-cuts’.

• Reduced transportation. Finished product only rather than larger workforce, plants and materials.
Sustainable case study: Greening the M25

James Richardson
Operations director, Skanska UK
5 November 2013
M25 DBFO

Hatfield Tunnel

Junction 16-23

Work underway Junctions 23 – 27

Junction 27-30

Work underway Junctions 5 – 7
The M25 team

- HIGHWAYS AGENCY
  - Balfour Beatty
    - Atkins
  - Connect Plus
    - CJV Team
      - SKANSKA
      - Balfour Beatty
    - O&M Team
      - Balfour Beatty Infrastructure Services
      - Atkins
      - egis projects
      - egis road operation
Sustainability and Green

1. We care about our people
2. We help build communities
3. We play fair
4. We use natural resources with care
5. We respect the local environment
6. We choose projects with care
7. We choose like-minded partners
8. We create shared value

Social Agenda:
1. Human Resources
   Health & Safety
2. Community
   Involvement
3. Business Ethics

Environmental Agenda:
4. Energy
Carbon
Materials
Water

Local Impacts

Economic Agenda:
6. Project Selection
7. Supply Chain
8. Value Added
to society

Together the marked boxes = Green Business

Skanska Sustainability Agenda

Skanska Color Palette™
## Our Green Targets

<table>
<thead>
<tr>
<th>Compliance Vanilla</th>
<th>Beyond Compliance Green</th>
<th>Future Proof Deep Green</th>
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<tbody>
<tr>
<td><strong>Energy</strong>¹</td>
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<tr>
<td>Preliminary project carbon footprint⁵ established and used to perform value engineering</td>
<td>&gt; 25% reduction of the footprint by savings in materials and the construction process</td>
<td>Net Positive Energy</td>
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<tr>
<td>Use design and planning reviews to: maximize the (re)use of sustainable materials⁶ with &lt; than 10% waste to landfill⁷</td>
<td>Use design and planning reviews to: maximize the (re)use of sustainable materials⁶ with &lt; than 5% waste to landfill⁷</td>
<td>Near Zero Carbon Construction</td>
</tr>
<tr>
<td>Preliminary baseline for use of potable water at site established. Sustainable⁶ drainage system in place.</td>
<td>Measures to reduce consumption of potable water by &gt; 25%.</td>
<td>Zero Unsustainable Materials</td>
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<tr>
<td><strong>Carbon</strong>²</td>
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<tr>
<td><strong>Materials</strong></td>
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<tr>
<td><strong>Waste</strong>⁷</td>
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¹ Local codes, standards and regulations in place

² Use of green energy sourced from renewable resources

⁵ Includes carbon footprint of construction materials and carbon dioxide emissions from energy consumption.

⁶ Includes wood, steel, recycled glass, and recycled plastic.

⁷ Includes water, energy, waste, and environment.
Our approach to green on the M25

- Take a lifecycle approach and reuse existing assets
- Move to carbon management
- Target high recycled content
- Target zero inert waste to landfill
- Implement lean construction
Materials and waste

- **Design** out waste
- **Retain** inert waste on site; through work with EA and planning.
- **Challenge** specification to use non-primary sources; C&D waste, glass sand, PFA, IBA, road plannings
Materials and waste

- Retention of 100% inert material on site
- 92% recycled/secondary content for aggregates
  - 2.4 million tonnes total
  - Surety of supply and quality
- Waste disposal 2.36 t/£100k vs UKCG target 8.11 t/£100k

~35,000 t ~£18m
Energy: 9%
Transport: 14%
Materials: 76%
Waste: 1%
Carbon

- Carbon management
- Sustainable procurement process
  - Work with the supply chain to reduce carbon
- Lean studies of transport movements
- Energy efficient technology
- Quarterly carbon targeting
Recycled Aggregates
35,000 t CO$_2$

Retaining walls
45,000 t CO$_2$

Environmental Barrier
166 t CO$_2$

Concrete Barrier
336 t CO$_2$
Carbon

Cumulative t CO₂

- Cumulative carbon
- Illustrative design
- Carbon saving
Question to the floor

What are the key obstacles for delivering sustainable construction?

• *ISO/TSI standards, specifications etc;*
• *Client acceptance;*
• *Quality;*
• *Cost.*
Question to the floor

Who do you consider has the greatest influence in delivering change?

- Government/Industry bodies;
- Client;
- Supply chain.