Green Roads

Minnesota Pavement Conference
<table>
<thead>
<tr>
<th>Country or Group</th>
<th>Tonnes oil equivalent/capita/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>0.6</td>
</tr>
<tr>
<td>China</td>
<td>1.3</td>
</tr>
<tr>
<td>EU (25)</td>
<td>3.6</td>
</tr>
<tr>
<td>US</td>
<td>7.8</td>
</tr>
</tbody>
</table>
Roads use a lot of materials every year.

<table>
<thead>
<tr>
<th>Individual materials</th>
<th>Amount Used per Year</th>
<th>Cost per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virgin aggregate</td>
<td>1,300 million tons</td>
<td>$10 billion</td>
</tr>
<tr>
<td>Asphalt</td>
<td>40 million tons</td>
<td>$13 billion</td>
</tr>
<tr>
<td>Cement</td>
<td>10 million tons</td>
<td>$1 billion</td>
</tr>
<tr>
<td>Total</td>
<td>1,350 million tons</td>
<td>$24 billion</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conglomerate materials</th>
<th>Amount Used per Year</th>
<th>Cost in Place</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot mix asphalt (HMA)</td>
<td>600 million tons</td>
<td>$36 billion</td>
</tr>
<tr>
<td>Portland cement concrete (PCC)</td>
<td>60 million tons</td>
<td>$6 billion</td>
</tr>
<tr>
<td>Total</td>
<td>660 million tons</td>
<td>$42 billion</td>
</tr>
</tbody>
</table>
Energy costs serious money.

There is a strong case for sustainable practices in transportation making a big difference.

2000 CO₂ Emissions by Source
Industrialized Countries

- Electricity & Heat: 36%
- Manufacturing & Construction: 12%
- Agriculture: 8%
- Other Fuel Combustion: 13%
- Transportation: 20%
- Other: 11%

2006 U.S. Energy Use

- Residential: 21%
- Commercial: 18%
- Industrial: 32%
- Transportation: 29%
- Other: 11%

2007 Little Green Data Book (World Bank)
Transportation Energy Data Book (U.S. DOE)
More specifically, sustainable choices in transportation construction can make a big difference.

2006 Non-Residential Construction Spending from the U.S. Census Bureau
Sustainability

Goal
Sustain economic prosperity and a high quality of life for all while protecting the natural systems of the planet.

Key Components
• Economic
• Environmental
• Social
Support for sustainability everywhere.
Making Sense of Sustainability:
Green Roads Rating Standard

What is it?
A rating system designed to distinguish high-performance sustainable new or redesigned/rehabilitated roads.

What does it do?
It awards credits for approved sustainable choices and can be used to certify projects based on total point value.

How does it help?
Provides a straightforward means of understanding and quantifying sustainability in roadway design and construction.
LEED
(Leadership in Energy and Environmental Design)

A “…nationally accepted benchmark for the design, construction, and operation of high performance green buildings. LEED gives building owners and operators the tools they need to have an immediate and measurable impact on their buildings’ performance.”

-U.S. Green Building Council

LEED certification standards
– New Commercial Construction and Major Renovation Projects
– Multiple Buildings and On-Campus Building Projects
– Existing Building Operations and Maintenance
– Commercial Interiors Projects
– Core and Shell Development Projects
– Homes
– Neighborhood Development
– Schools
LEED for new construction buildings as of 07/06

Distribution by geography

AK=10
HI=16
PR=1

200+
100-199
50-99
20-49
1-19
Green Roads is a rating system designed to distinguish high-performance sustainable new or redesigned/rehabilitated roads.

It awards credits for approved sustainable choices/practices and can be used to certify projects based on point value.
<table>
<thead>
<tr>
<th>Category</th>
<th>Goal</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainable Design</td>
<td>Reduce impacts due to design choices including the road alignment.</td>
<td>10</td>
</tr>
<tr>
<td>Material &amp; Resources</td>
<td>Reduce impacts from material extraction, processing and transport.</td>
<td>11</td>
</tr>
<tr>
<td>Stormwater Management</td>
<td>Reduce impacts of polluted stormwater and treatment devices.</td>
<td>8</td>
</tr>
<tr>
<td>Energy &amp; Environmental Control</td>
<td>Improve human and wildlife health.</td>
<td>12</td>
</tr>
<tr>
<td>Construction Activities</td>
<td>Reduce impacts from construction activities.</td>
<td>9</td>
</tr>
<tr>
<td>Innovation</td>
<td>Encourage innovation in design.</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>54</strong></td>
</tr>
</tbody>
</table>
## Materials & Resources (MR)

<table>
<thead>
<tr>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Waste Management</td>
<td>1</td>
</tr>
<tr>
<td>Reuse of Pavement</td>
<td>2</td>
</tr>
<tr>
<td>Recycled Content</td>
<td>4</td>
</tr>
<tr>
<td>Pavement Life Cycle Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Regionally Provided Material</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total Credits Available</strong></td>
<td><strong>11</strong></td>
</tr>
</tbody>
</table>
Construction Waste Management
We have done well recycling HMA and PCC as part of road construction.

Asphalt and Concrete Recycled 1999 to 2004

HMA/PCC recycling = 51% of diverted waste

Graph from the Washington State Department of Ecology
But we can do better.

Origins of the 3.2 billion tons/yr of aggregate used in the U.S.

- 94% from virgin aggregate
- 6% from recycled
We can reduce the amount to landfills, and increase the amount to high-value surfacings.
Example MR Credit

Recycled Content Credits

One credit: Use recycled content to a minimum of 20% in the HMA/PCC and 40% of the total material in the structure if base course is included in the project.

Two credits: Use recycled content to a minimum of 30% in the HMA/PCC and 50% of the total material in the structure if base course is included in the project.

Three credits: Use recycled content to a minimum of 40% in the HMA/PCC and 60% of the total material in the structure if base course is included in the project.

Four credits: Use recycled content to a minimum of 50% in the HMA/PCC and 70% of the total material in the structure if base course is included in the project.
Construction Activities (CA)

<table>
<thead>
<tr>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced Diesel Emissions</td>
<td>1</td>
</tr>
<tr>
<td>Reduced Fossil Fuel Dependency</td>
<td>1</td>
</tr>
<tr>
<td>Temporary Stormwater Control</td>
<td>1</td>
</tr>
<tr>
<td>Noise Mitigation Planning</td>
<td>1</td>
</tr>
<tr>
<td>Paving Emissions</td>
<td>1</td>
</tr>
<tr>
<td>Construction Quality</td>
<td>2</td>
</tr>
<tr>
<td>Quality Process</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total Credits Available</strong></td>
<td><strong>9</strong></td>
</tr>
</tbody>
</table>
Certification Levels

- Green Road certified
  - Green Road Certified
    - Silver: 19-25 credits
    - Gold: 26-31 credits
    - Evergreen: 32-37 credits
    - 38+ credits
Benefits

• More sustainable roads

• Specific benefits:
  – Provide a system which defines basic roadway sustainability attributes
  – Allow a greater audience to participate in roadway sustainability in a meaningful way
  – Allow sustainability tradeoffs and decisions to be made in a systematic manner
  – Provide means for sustainability assessment
  – Confer marketable recognition on sustainable roadway project
  – Allow for sustainability innovation because it is end-result oriented
Where do we go from here?

- Fully develop each item
- Calibrate rating system
- Get industry/agency participation

See on Pavement Interactive