Backup Slides on Cool Colored Roofs, Pavements and Cars
Solar Reflective Surfaces Also Cool the Globe

Source: IPCC
Methodology: Energy and Air-Quality Analysis

Strategies

- Cooler Roofs
- Shade Trees
- Cooler Pavements
- All Vegetation

Processes

- Reduces A/C Use
- Reduces Demand at Power Plants
- Slows Reaction Rates
- Area Sources Emit Less

Results

- Less Energy Consumed
- Lower CO₂, NOₓ, and VOC Levels
- Lower Ozone Levels

Direct and Indirect Strategies Processes Results
Cool and **Standard Brown**
Metal Roofing Panels

- Solar reflectance ~ 0.2 higher
- Afternoon surface temperature ~ 10°C lower

Courtesy
BASF
Coatings

![Cool and Standard Brown Metal Roofing Panels](image)

- **cool**
  - Solar reflectance = 0.27
  - Thermal emittance = 0.85
  - Roof temp – air temp = 36°C (65°F)

- **standard**
  - Solar reflectance = 0.08
  - Thermal emittance = 0.85
  - Roof temp – air temp = 45°C (81°F)
Designing Cool Colored Roofing

<table>
<thead>
<tr>
<th>Material</th>
<th>Solar Reflectance Gain (Δ)</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cool Concrete Tile (R ≥ 0.40)</td>
<td>+0.37</td>
<td>Courtesy American Rooftile Coatings</td>
</tr>
<tr>
<td>Standard Concrete Tile</td>
<td>+0.26</td>
<td></td>
</tr>
<tr>
<td>Solar Reflectance Gain =</td>
<td>+0.23</td>
<td></td>
</tr>
<tr>
<td>Cool Clay Tile (R ≥ 0.40)</td>
<td>+0.15</td>
<td>Courtesy MCA Clay Tile</td>
</tr>
<tr>
<td>Cool Metal (R ≥ 0.30)</td>
<td>+0.29</td>
<td>Courtesy BASF Industrial Coatings</td>
</tr>
<tr>
<td>Cool Fiberglass Asphalt Shingle (R ≥ 0.25)</td>
<td>+0.29</td>
<td>Courtesy Elk Corporation</td>
</tr>
</tbody>
</table>
Cool is Cool: From Cool Color Roofs to Cool Color Cars and Cool Jackets

Toyota experiment (surface temperature 10K cooler)
Ford is also working on the technology

Courtesy: BMW (http://www.ips-innovations.com/solar_reflective_clothing.htm)
Cool Paving Materials:
Reflective Pavements are Cooler

- Fresh asphalt
  Albedo: 0.05
  Temperature: 123°F

- Aged asphalt
  Albedo: 0.15
  Temperature: 115°F

- Prototype asphalt coating
  Albedo: 0.51
  Temperature: 88°F
Temperature Effect on Rutting

Source: Dr. John Harvey, UC B Civil Engineering, Inst. Transpo. Studies
Simulated Meteorology and Air-quality Impacts in LA

Temperature Change

Ozone Concentration Change
Potential Savings in LA

- **Savings for Los Angeles**
  - Direct, $100M/year
  - Indirect, $70M/year
  - Smog, $360M/year

- **Estimate of national savings:** $5B/year