



A sustainability performance metric for roadway design and construction

Sasobit Warm Mix Asphalt  
I-90 near George, WA  
23 June 2008



**more sustainable roads for a better transportation future**

### **What is it?**

Greenroads is sustainability performance metric for roadway design and construction. It applies to new or reconstructed/rehabilitated roads. It awards points for approved sustainable choices/practices and can a means for project-level sustainability assessment.

### **How does it help?**

More sustainable roadways. This means less ecological impact, lower life cycle costs/impacts and better quality of life as a result.

# Greenroads effort right now...

## (July 24, 09)

- Who is developing Greenroads?
  - University of Washington and CH2M HILL
- Who is funding Greenroads so far?
  - TransNow (DOT Region 10 University Transportation Center)
  - State Pavement Technology Consortium (WA, CA, MN, TX)
  - Federal Lands Highway Division (FLHD)
- What is the status right now?
  - Version 0.95 now
  - Version 1.0 by end of 2009
  - Online: [www.greenroads.us](http://www.greenroads.us)
- When can it be used?
  - Pilot projects: NOW (limited basis)
  - General use: 2010



What we mean by “sustainability”



It is important to have a precise and actionable definition of “sustainability” in order to develop a performance metric. This is ours.

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Natural laws = Ecology

Rule: Don’t break the earth

How we do this:

1. Do not take stuff out of the earth faster than it will go back in.
2. Do not produce stuff (e.g., pollution) faster than it can be broken down and integrated back into nature.
3. Do not diminish nature’s productivity or diversity or we will affect nature’s ability to process stuff that we create or use.

These 3 rules are based on Karl-Henrik Robert’s [The Natural Step Framework](#)

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Natural laws = Ecology

Rule: Don’t break the earth

Human values = equity and economy

Equity rule: Seek quality of life for all

Economy rule: Manage resources wisely

Resources = human, natural, manufactured and financial capital

The economy idea is based on Hawken, Lovins and Lovins *Natural Capitalism* (1999)

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Sustainability can be:

- Measured
- Judged
- Managed
- Improved

Let’s be very clear: “sustainability” is a human-centric concept.



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“Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs.”

-UN World Commission on Environment and Development (WECD) Report (1987) chaired by Gro Harlem Brundtland (Norway’s prime minister then) on page 24

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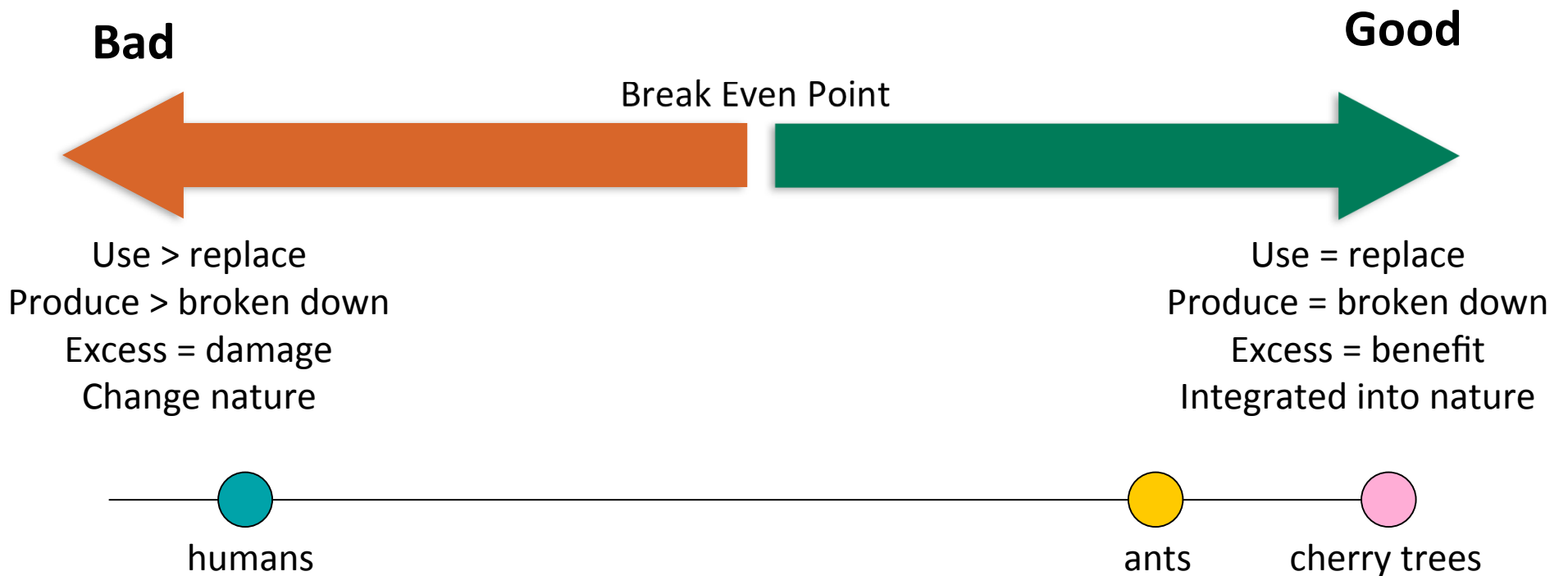
- Defining “sustainable” for your project
  - Extent: how long do you want it to last?
  - Expectations: What are the performance expectations?
- Making “sustainability” work
  - Experience: Need technical expertise to develop solutions
  - Exposure: Education and public awareness

7 total components:

ecology, equity, economic

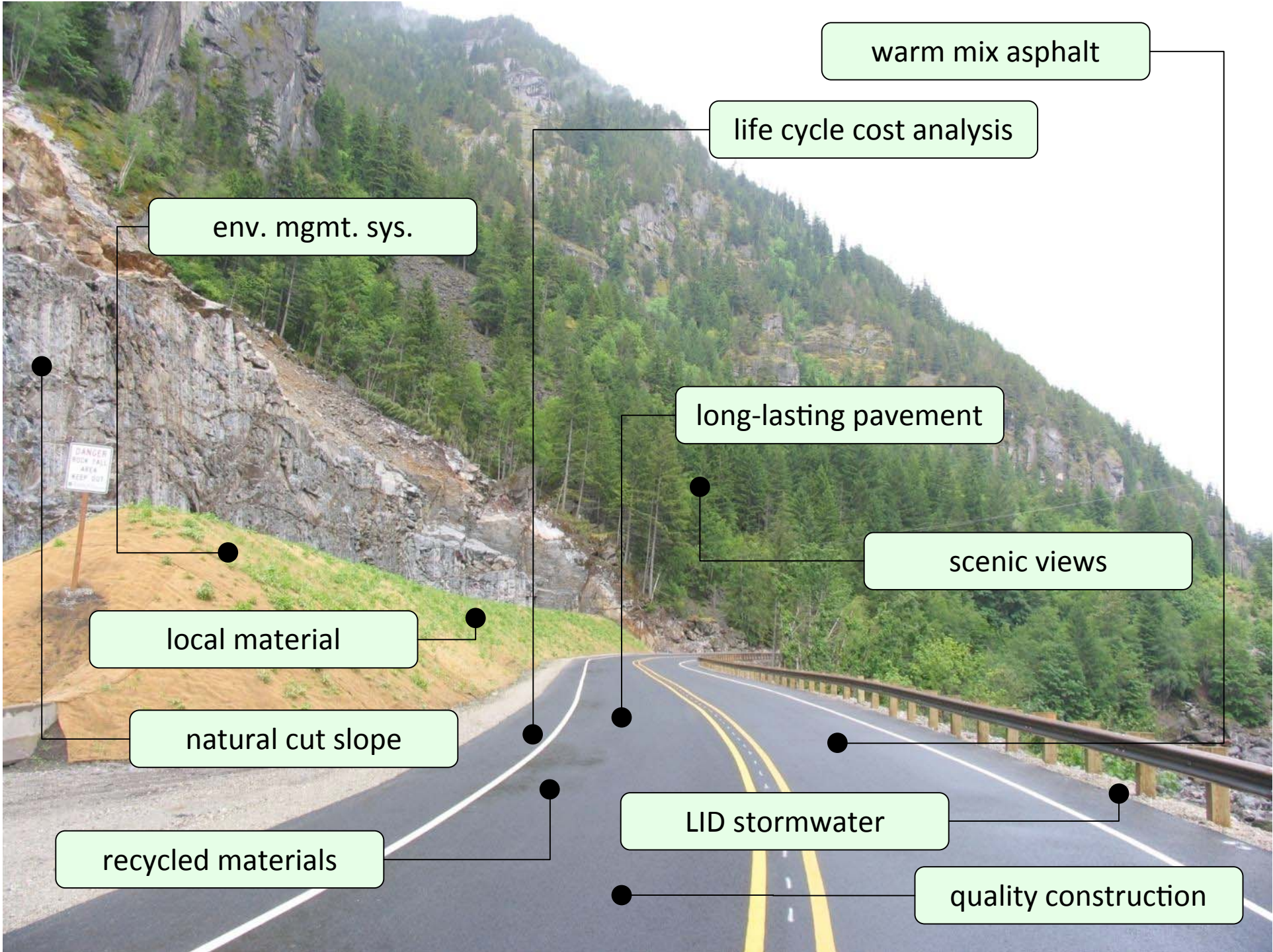
extent, expectations, experience, exposure

We are really just talking about being “more sustainable” than we were. We are going for “do less bad”. The goal is “do good”.



So what does a more sustainable roadway look like?





warm mix asphalt

life cycle cost analysis

env. mgmt. sys.

long-lasting pavement

scenic views

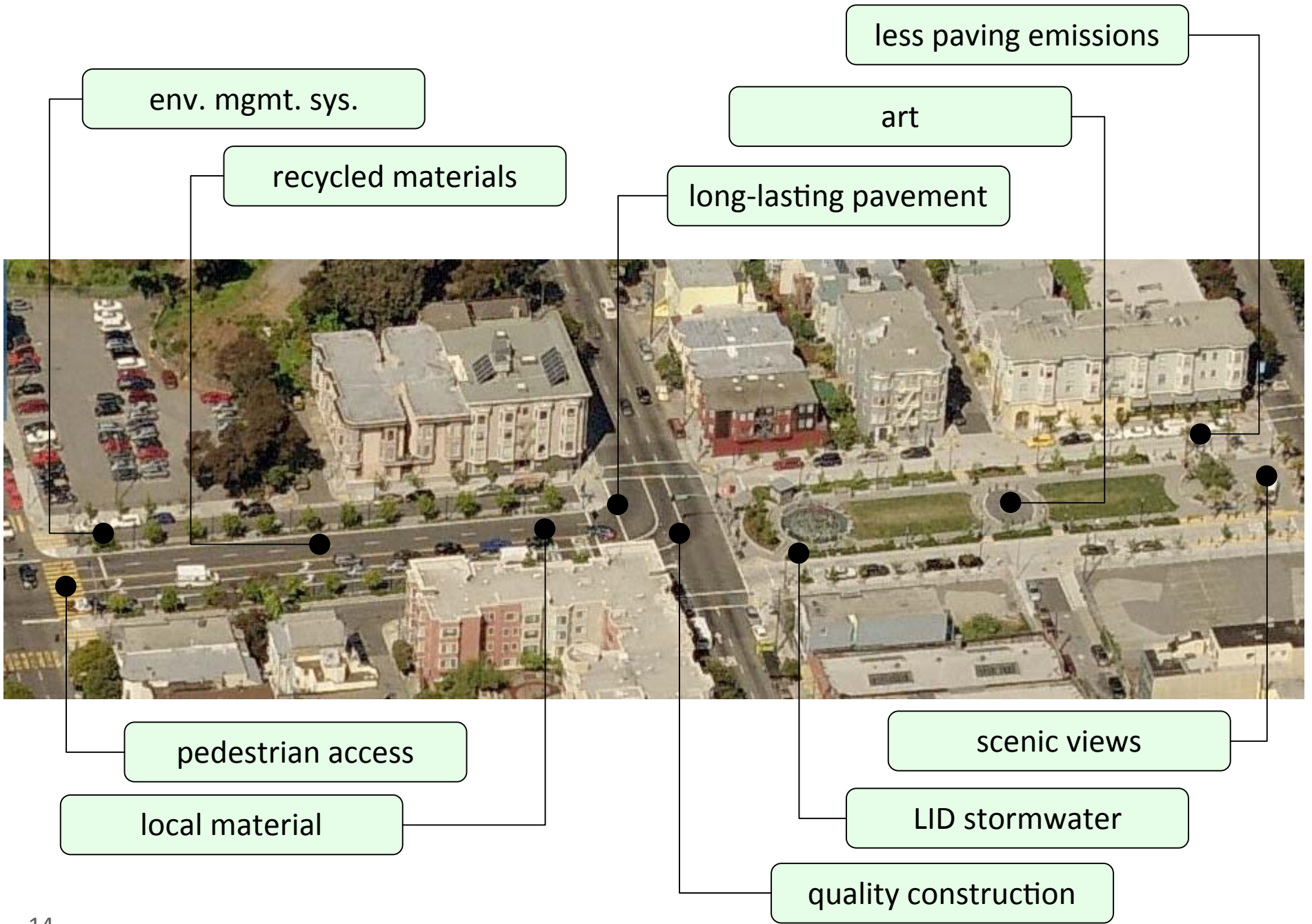
local material

natural cut slope

recycled materials

LID stormwater

quality construction



The Greenroads performance metric.



Quiet Pavement  
SR 520 Near Bellevue, WA  
14 July 2007



**more sustainable roads for a better transportation future**

**Greenroads is a project-oriented metric.**

It does not deal with planning and it does not deal with operations.





## Greenroads Categories (Version 1.0 preview)

Category	Description	Points
<b>Project Requirements</b>	Minimum requirements for a Greenroad	Req
<b>Environment &amp; Water</b>	Stormwater, habitat, vegetation	21
<b>Access &amp; Equity</b>	Modal access, culture, aesthetics, safety	30
<b>Construction Activities</b>	Construction equipment, quality, use	14
<b>Materials &amp; Resources</b>	Material extraction, processing, transport	23
<b>Pavement Technology</b>	Pavement design, material use, function	20
<b>Total Voluntary Credit Points</b>		<b>108</b>
<b>Custom Credits</b>	Write your own credit for approval	10
<b>Grand Total</b>		<b>118</b>

# Achievement Levels

Version 1.0 (preview): 108 Voluntary Credit Points



32-42 points

PR + 30% VC



**SILVER**

43-54 points

PR + 40% VC



**GOLD**

55-63 points

PR + 50% VC



**EVERGREEN**

64+ points

PR + 60% VC

Each Project Requirement and Voluntary Credit can be mapped to one or more components of sustainability.

## Elements of Sustainability

- Ecology
  - Equity
  - Economy
  - Extent
  - Expectations
  - Expertise
  - Exposure
- 
- Air
  - Water
  - Earth
  - Virgin space
  - Developed space
  - Non-human life
  - Human life
  - Renewable energy
  - Non-renewable energy

Why bother?



## Why bother with a performance metric?

- More sustainable roads
- Specific benefits:
  - Defines basic roadway sustainability attributes
  - Greater participation in roadway sustainability
  - Better evaluation of tradeoffs and decisions
  - Provide means for sustainability assessment
  - Allows innovation because it is end-result oriented
  - Confer marketable recognition on projects

# One example: If improving sustainability is an agency goal, how do you assess your performance?

Some examples from LEED:



## **City of Seattle: Sustainable Building Policy**

All City construction projects over 5,000 ft<sup>2</sup> must meet LEED Silver rating level. LEED Pilot program provides small grants to help.



**King County**

## **King County**

Highest LEED level achievable based on life-cycle cost analysis and funding. Applies to all new construction and renovation over \$250,000.



## **Washington State**

All State funded projects (even prisons) over 5,000 ft<sup>2</sup> are required to achieve LEED silver.

Note: In FY 2008 WSDOT awarded 149 highway construction and ferry terminal contracts. They are generally not covered by the WSDOT LEED criteria.

## A broad overview of the reception and use of Greenroads shows several types of use.

- **Owner agencies (DOTs, Cities, Counties, etc.)**
  - Those with a good grasp of their sustainability strategic direction see Greenroads as a tool to help them accomplish organizational goals (e.g., an accounting of project sustainability, publicity)
- **Design consultants**
  - Many consultants have their own internal systems (published or not)
  - Use as a list of sustainability ideas in response to owner's goals
  - A means of legitimizing what they do as “sustainable”
- **Contractors**
  - A means of differentiating themselves in competitive environment
  - A means of getting ahead in the green business space

What have we done so far?





## Recent Work

- Manual
  - 95% done
  - Finish up in 2009
- Website
  - [www.greenroads.us](http://www.greenroads.us)
  - Online registration
- Case studies
  - WSDOT (6)
  - City of Seattle (2)
- Pilot projects
  - WSDOT
  - Caltrans
  - City of Bothell, WA
  - City of Denver, CO
  - Oregon DOT (3)



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**Greenroads Manual**  
(under construction)

- ▶ Project Requirements
- ▶ Materials & Resources
- ▶ Environment & Water
- ▶ Access & Equity
- ▶ Construction Activities
- ▶ Exemplary Performance
- ▶ Pavement Technologies

## The Greenroads Sustainability Performance Metric

Greenroads is a sustainability performance metric for roadway design and construction. It is applicable to new and reconstructed/rehabilitated roadways. It awards credits for approved sustainable choices/practices and can be used to assess roadway project sustainability. This assessment can, if desired, include four different certification levels depending upon total points earned.

[See the v0.95 Manual](#)

[Buy Greenroads Merchandise on Cafe Press](#)

### Check These Out

- [Version 0.95 now available](#)
- [What can Greenroads do for you?](#)
- [Greenroads at the 2009 TRB Annual Meeting](#)

This website is now up and running...sort of. We are still working hard to get the full Greenroads manual up online. Forgive the dust; we are still working.

**Learn about Greenroads**

▶ What is Greenroads? What does it do? How does it work? What can it do for me?

**See the Greenroads Manual**

▶ View the online manual including example implementation ideas and research notes.

**Get Greenroads Resources**

▶ View and download white papers, articles, presentations and more.

**Work on My Project**

▶ Log in to Greenroads and begin or resume working on a project for certification.

**Project Login**  
(under construction)

User Name

Password

[Forgot your password?](#)

**Projects Created**

- 15th avenue

**Projects Linked**

- Test Project
- Happy Fun Time
- For Testing
- 2009-02-27 Test Project
- 2009-03-17 St Patricks Project
- NE 51st St and 148th Ave

**I-90 West of George Paving - Warm Mix Asphalt**  
The Washington State Department of Transportation

Sustainability is the next great game in transportation.  
The game becomes serious when you keep score.

Greenroads keeps score.

