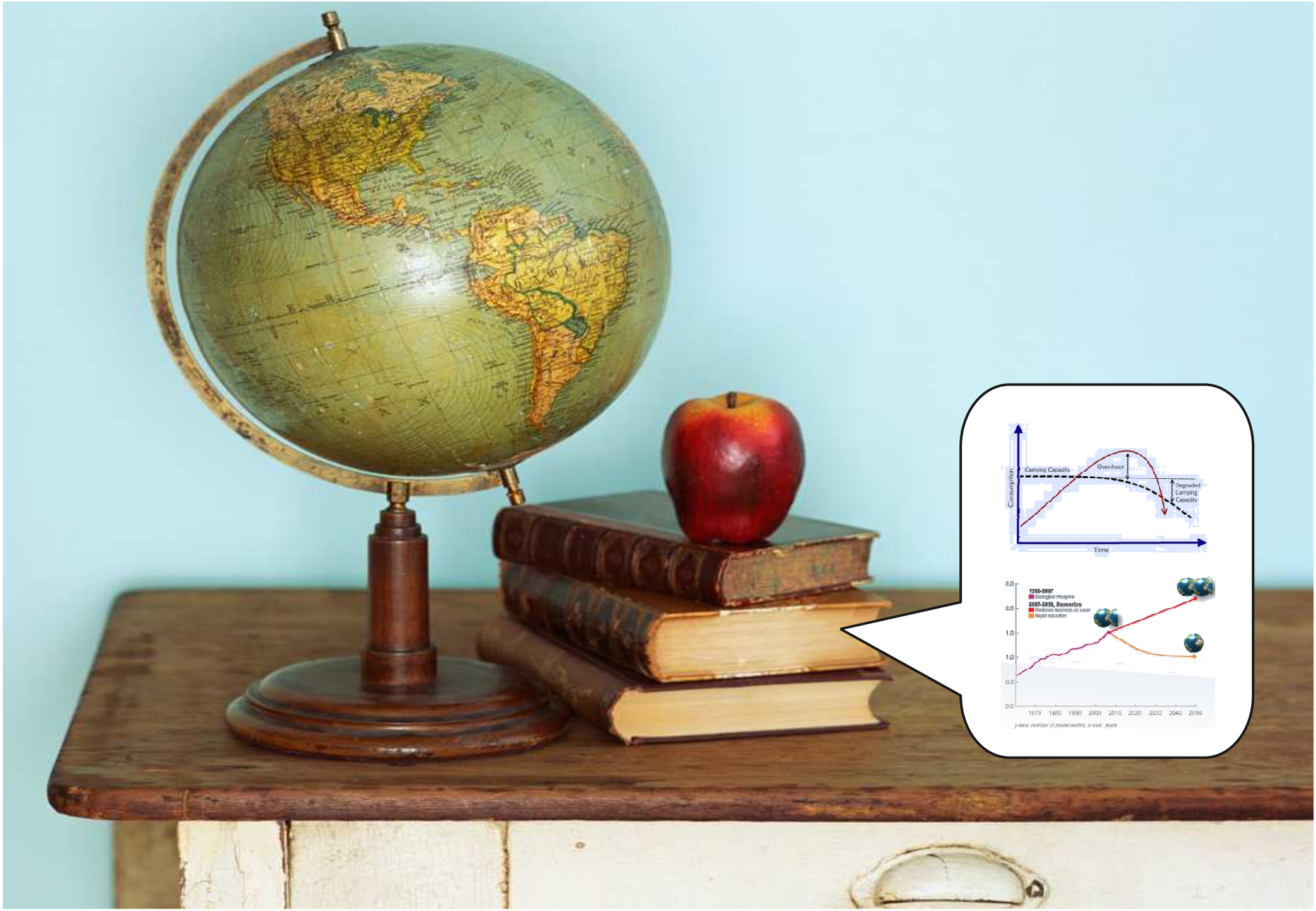
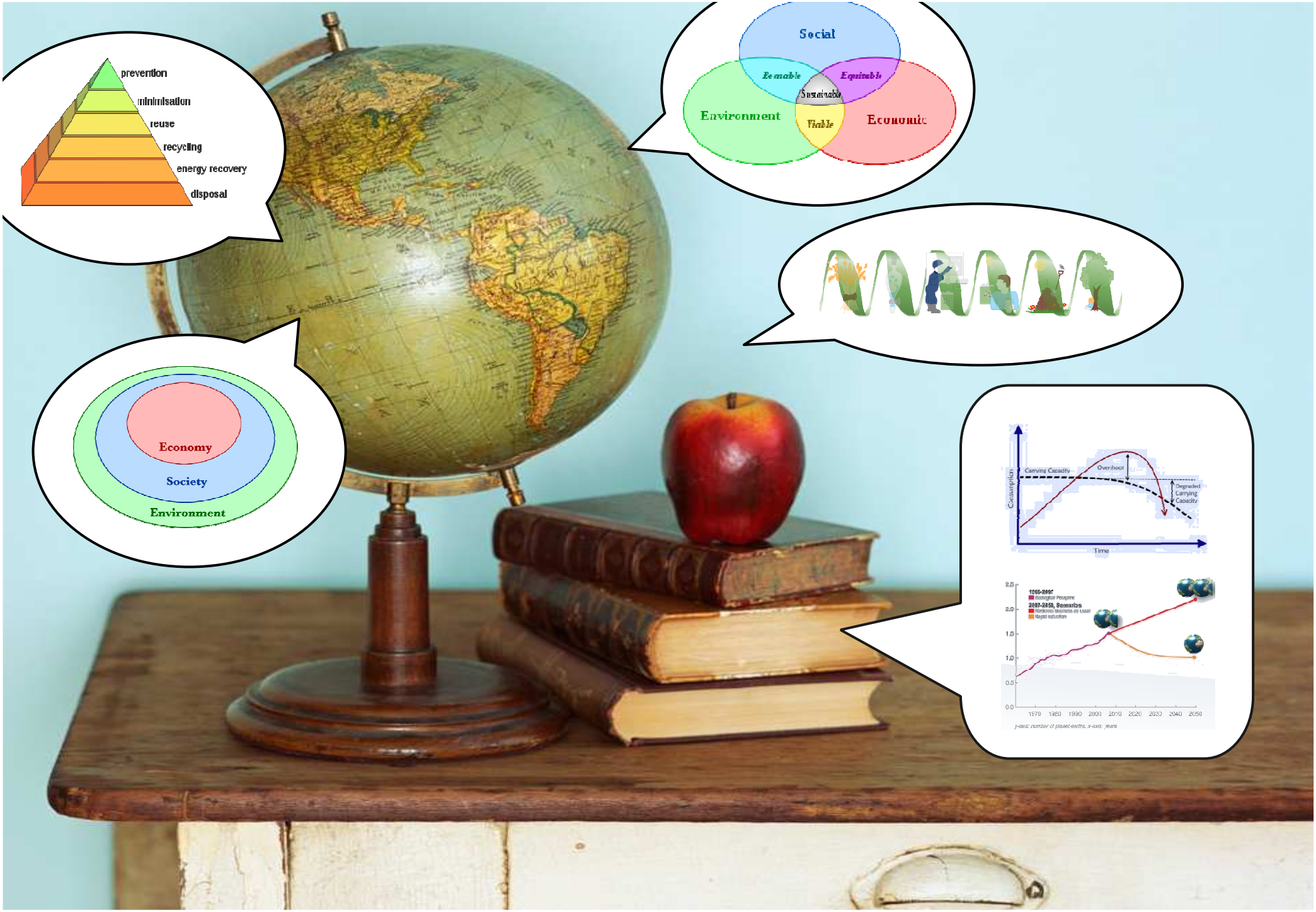
Sustainable Roads for a Better Transportation Future: Greenroads

Road Pavement Forum 22nd Meeting

- BACKGROUND
  - CHALLENGES
- OPPORTUNITIES
- PROPOSED SOLUTIONS

Philip JOUBERT
Jonah PTAK
SSI Engineers


Carrying Capacity
Overshoot
Degraded Carrying Capacity
Consumption
Time
1961-2007
Ecological Footprint
2007-2050, Scenarios
Moderate declines as usual
Rapid reduction
2.5
2.0
1.5
1.0
0.5
0.0
1970
1980
1990
2000
2010
2020
2030
2040
2050
y-axis: number of planet earths, x-axis: years


prevention
minimisation
reuse
recycling
energy recovery
disposal
Social
Bearable
Equitable
Sustainable
Environment
Viable
Economic
Economy
Society
Environment
Carrying Capacity
Overshoot
Degraded Carrying Capacity
Consumption
Time

DBA PRODUCTS FORTHCOMING ABOUT DBA CUSTOMER SERVICE CHECKOUT

98

98% BIO ABLE
PEN E L INK
BL 5 %
STING
USING WIND POWER

THREE-PACK
w/ black ink

1 Three-Pack

$8.98 ADD TO ORDER

Pen & Paper Set
2 Notebooks, 3 Pens

1

$15.00 ADD TO ORDER

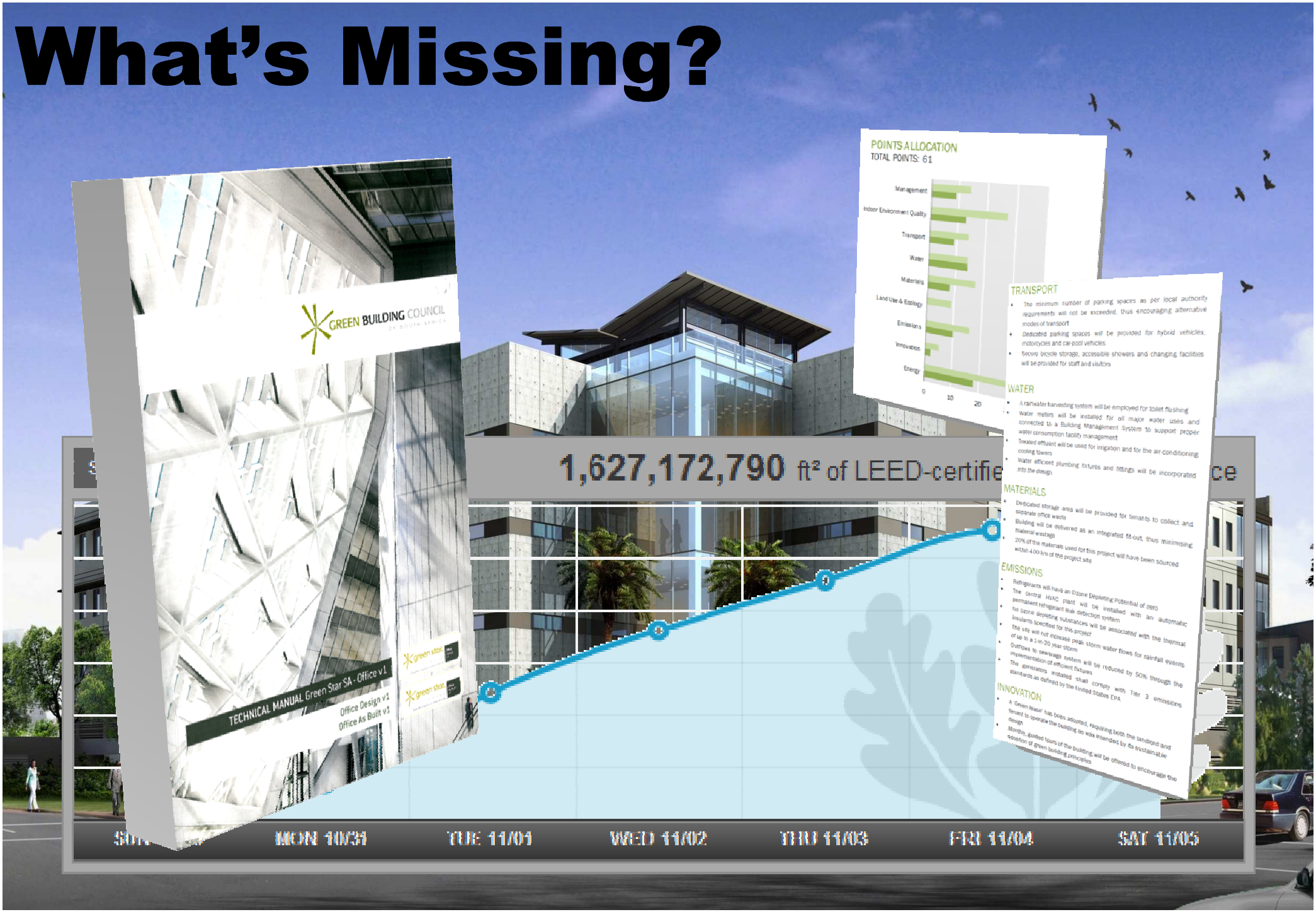
Think before you write.

The DBA 98 Pen is the only 98% biodegradable pen in the world. It's also the only pen to use ink composed of simple, environmentally responsible ingredients. Produced at a wind-powered facility in the United States, it was designed as a responsible alternative to the wasteful and often toxic pens we use almost every day. And with its straightforward design and rollerball tip, the DBA Pen looks good and writes well, too.

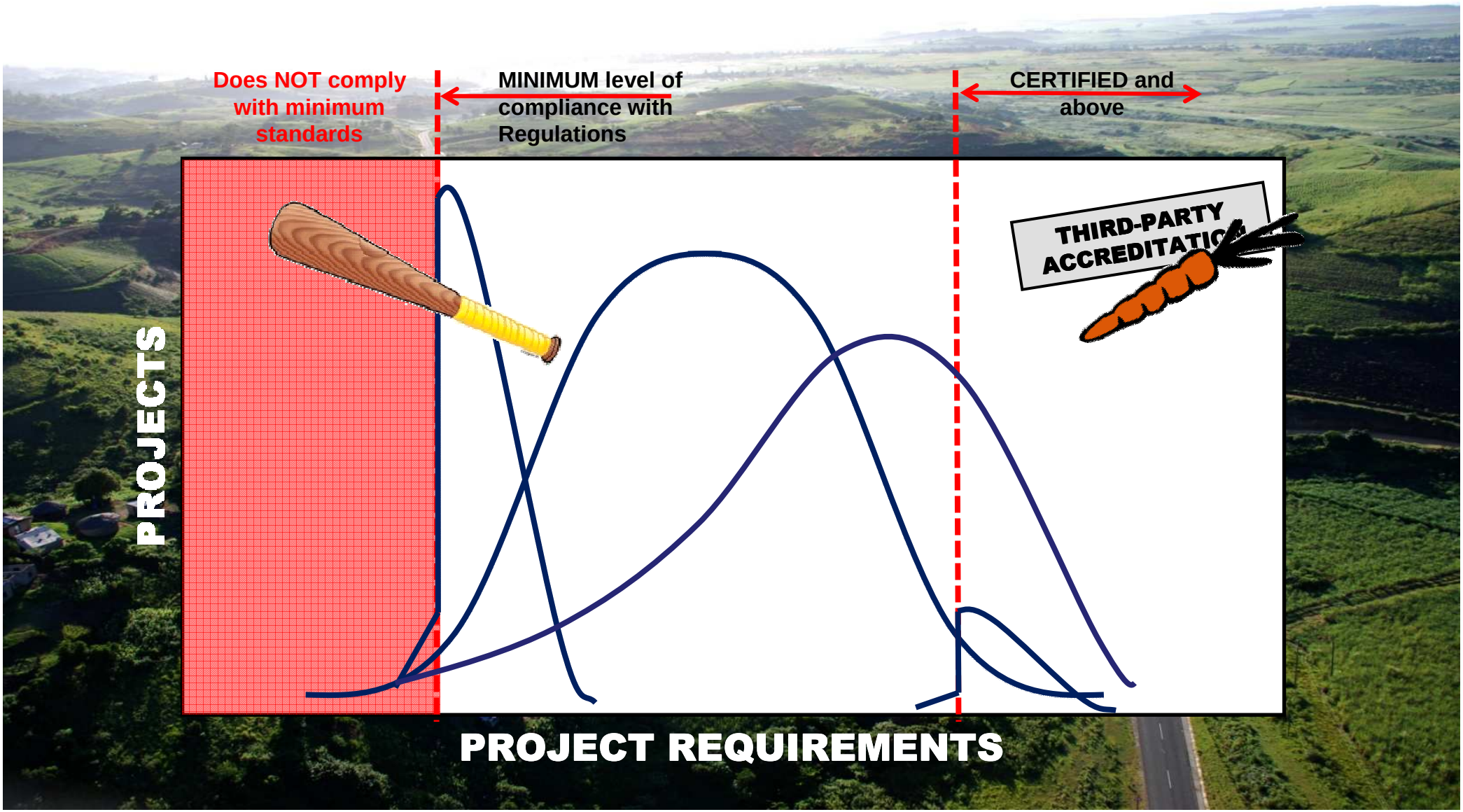
"GREENWASHING"

IMAGE GALLERY

What's Missing?



Roles&Challenges



Greenroads Rating System | What is Greenroads? - Windows Internet Explorer provided by SSI

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Mercer Corridor East - Phase I: Groundbreaking >>

Explore Our Site

You can work on a project, make comments on the manual, view members-only information, or learn something new.

- Project Workzone
- Read the Manual
- Members Area
- Learn More

What is Greenroads?

Greenroads is a sustainability rating system for roadway design and construction. It is applicable to all roadway projects including new, reconstruction and rehabilitation (even overlays), bridges, you name it. If it is a project where a road is involved, you can use it.

Greenroads is a collection of sustainability best practices, called "credits," that relate to roadway design and construction. Achieving these credits can earn points toward a total score for the project, and in general, this Greenroads™ score can be used as an indicator of sustainability for the roadway. Four different certification levels (rating) are available depending upon total score on a voluntary basis.

Contact Us

Internet 100%


Greenroads™ Summary
Review Stage: Construction
Fernan Lake Road
Federal Lands Highway
Total Score* 21
Project Requirements 6/11
Environment & Water 6/21
Access & Equity 7/30
Construction Activities 1/14
Materials & Resources 7/23
Pavement Technologies 0/20
Custom Credits 0/10
*Score does not include Project Requirements
Greenroads™ Summary
Review Stage: Construction
Mulligan Road
Federal Lands Highway
Total Score* 18
Project Requirements 4/11
Environment & Water 3/21
Access & Equity 9/30
Construction Activities 1/14
Materials & Resources 0/23
Pavement Technologies 5/20
Custom Credits 0/10
*Score does not include Project Requirements
Greenroads™ Summary
Review Stage: Design
Mercer Corridor East - Phase I
Seattle Department of Transportation
Total Score* 48
Project Requirements 7/11
Environment & Water 5/21
Access & Equity 26/30
Construction Activities 1/14
Materials & Resources 9/23
Pavement Technologies 5/20
Custom Credits 2/10
*Score does not include Project Requirements
Greenroads™ Summary
Review Stage: Construction
Conzelman Road and Various Routes
Federal Lands Highway
Total Score* 25
Project Requirements 5/11
Environment & Water 3/21
Access & Equity 10/30
Construction Activities 1/14
Materials & Resources 11/23
Pavement Technologies 0/20
Custom Credits 0/10
*Score does not include Project Requirements
Greenroads
MANUAL
v1.0
UNIVERSITY of WASHINGTON
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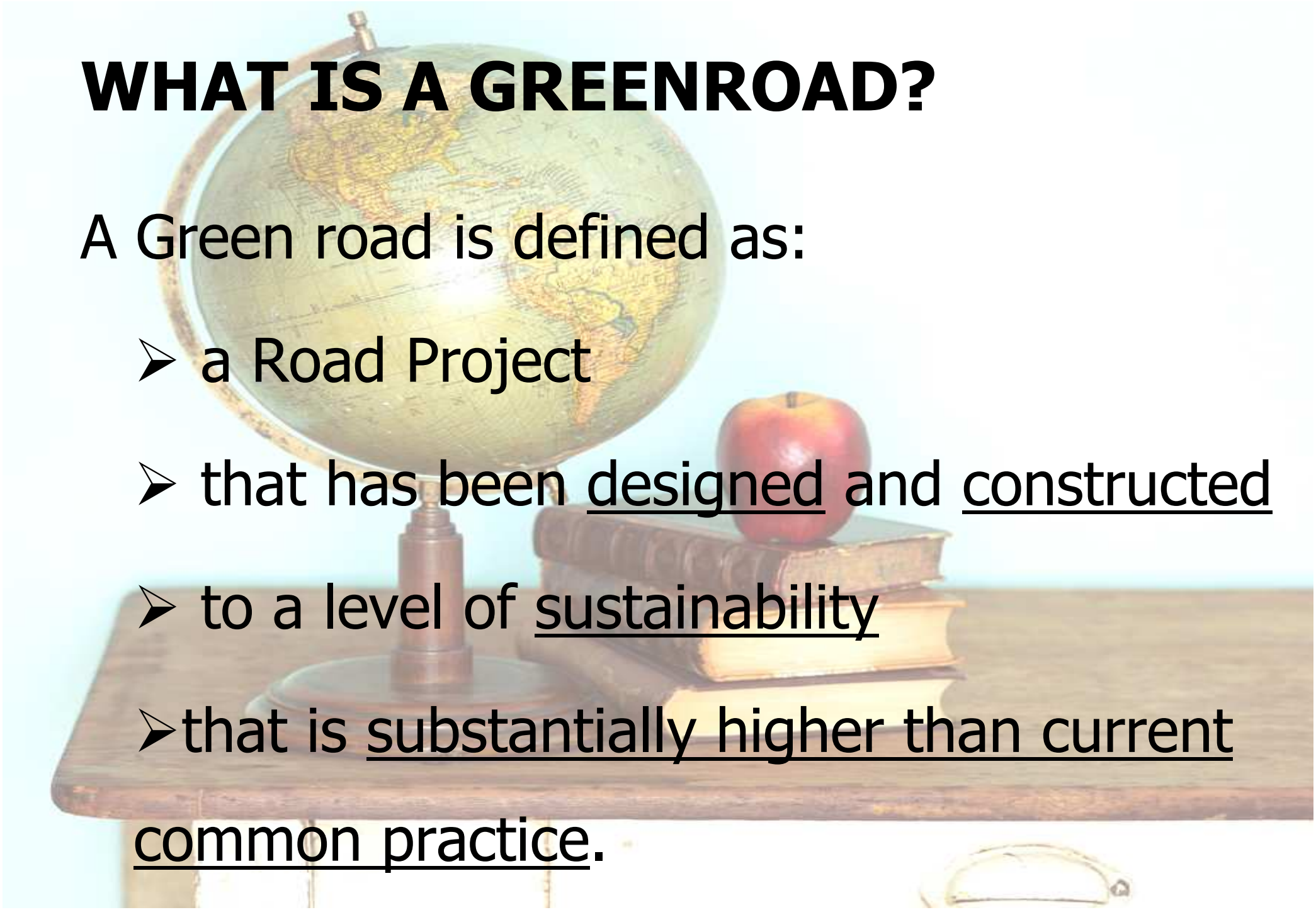
GREENROADS RATING SYSTEM

LIST OF CREDITS (v1.5)

No.	Title	Pts.	Description
Project Requirements (PR) – Mandatory for all projects			
PR-1	Environmental Review Process	Req	Complete a comprehensive environmental review
PR-2	Lifecycle Cost Analysis (LCCA)	Req	Perform LCCA for pavement section
PR-3	Lifecycle Inventory (LCI)	Req	Perform LCI of pavement section
PR-4	Quality Control Plan	Req	Have a formal contractor quality control plan
PR-5	Noise Mitigation Plan	Req	Have a construction noise mitigation plan
PR-6	Waste Management Plan	Req	Have a plan to divert C&D waste from landfill
PR-7	Pollution Prevention Plan	Req	Have a TESC/SWPPP
PR-8	Low Impact Development (LID)	Req	Complete a LID feasibility study
PR-9	Pavement Management System	Req	Have a pavement management system
PR-10	Site Maintenance Plan	Req	Have a roadside maintenance plan
PR-11	Educational Outreach	Req	Publicize sustainability information for project
Environment & Water (EW) – Up to 21 Points			
EW-1	Environmental Management System	2	ISO 14001 certification for general contractor
EW-2	Runff Flow Control	1-3	Reduce runoff quantity
EW-3	Runoff Quality	1-3	Treat stormwater to a higher level of quality
EW-4	Stormwater Cost Analysis	1	Conduct an LCCA for stormwater elements
EW-5	Site Vegetation	1-3	Use native low/no water vegetation
EW-6	Habitat Restoration	3	Restore habitat beyond what is required
EW-7	Ecological Connectivity	1 or 3	Connect habitat across roadways
EW-8	Light Pollution	3	Discourage light pollution
Access & Equity (AE) – Up to 30 Points			
AE-1	Safety Audit	1-2	Perform roadway safety audit
AE-2	Intelligent Transportation Systems (ITS)	2-5	Implement ITS solutions
AE-3	Context Sensitive Solutions	5	Plan for context sensitive solutions
AE-4	Traffic Emissions Reduction	5	Reduce emissions with quantifiable methods
AE-5	Pedestrian Access	2	Provide/improve pedestrian accessibility
AE-6	Bicycle Access	2	Provide/improve bicycle accessibility
AE-7	Transit Access	1-5	Provide/improve transit accessibility
AE-8	Scenic Views	2	Provide views of scenery or vistas
AE-9	Cultural Outreach	1-2	Promote art/culture/community values
Construction Activities (CA) – Up to 14 Points			
CA-1	Quality Management System	2	ISO 9001 certification for general contractor
CA-2	Environmental Training	1	Provide environmental training
CA-3	Site Recycling Plan	1	Have a plan to divert waste from landfill
CA-4	Fossil Fuel Reduction	1-2	Use alternative fuels in construction equipment
CA-5	Equipment Emissions Reduction	1-2	Meet EPA Tier 4 standards for non-road equip.
CA-6	Paving Emissions Reduction	1	Use pavers that meet NIOSH requirements
CA-7	Water Tracking	2	Develop data on water use in construction
CA-8	Contractor Warranty	3	Warranty on the constructed pavement
Materials & Resources (MR) – Up to 23 Points			
MR-1	Life Cycle Assessment (LCA)	2	Conduct a detailed LCA of the entire project
MR-2	Pavement Reuse	4-5	Reuse existing pavement sections
MR-3	Earthwork Balance	1	Use native soil rather than import fill
MR-4	Recycled Materials	5	Use recycled materials for new pavement
MR-5	Regional Materials	5	Use regional materials to reduce transportation
MR-6	Energy Efficiency	5	Improve energy efficiency of operational systems
Pavement Technologies (PT) – Up to 20 Points			
PT-1	Long-Life Pavement	5	Design pavements for long-life
PT-2	Permeable Pavement	3	Use permeable pavement as a LID technique
PT-3	Warm Mix Asphalt (WMA)	3	Use WMA in place of HMA
PT-4	Cool Pavement	5	Contribute less to urban heat island effect (UHI)
PT-5	Quiet Pavement	3	Use a quiet pavement to reduce noise
PT-6	Pavement Performance Tracking	1	Relate construction to performance data
Custom Credits (CC) – Available for all projects based on context and innovation, subject to approval			
CC-1	Custom Credit 1	1-5	Design a new voluntary credit
CC-2	Custom Credit 2	1-5	Design a new voluntary credit
	Greenroads Total Points:	**118**	

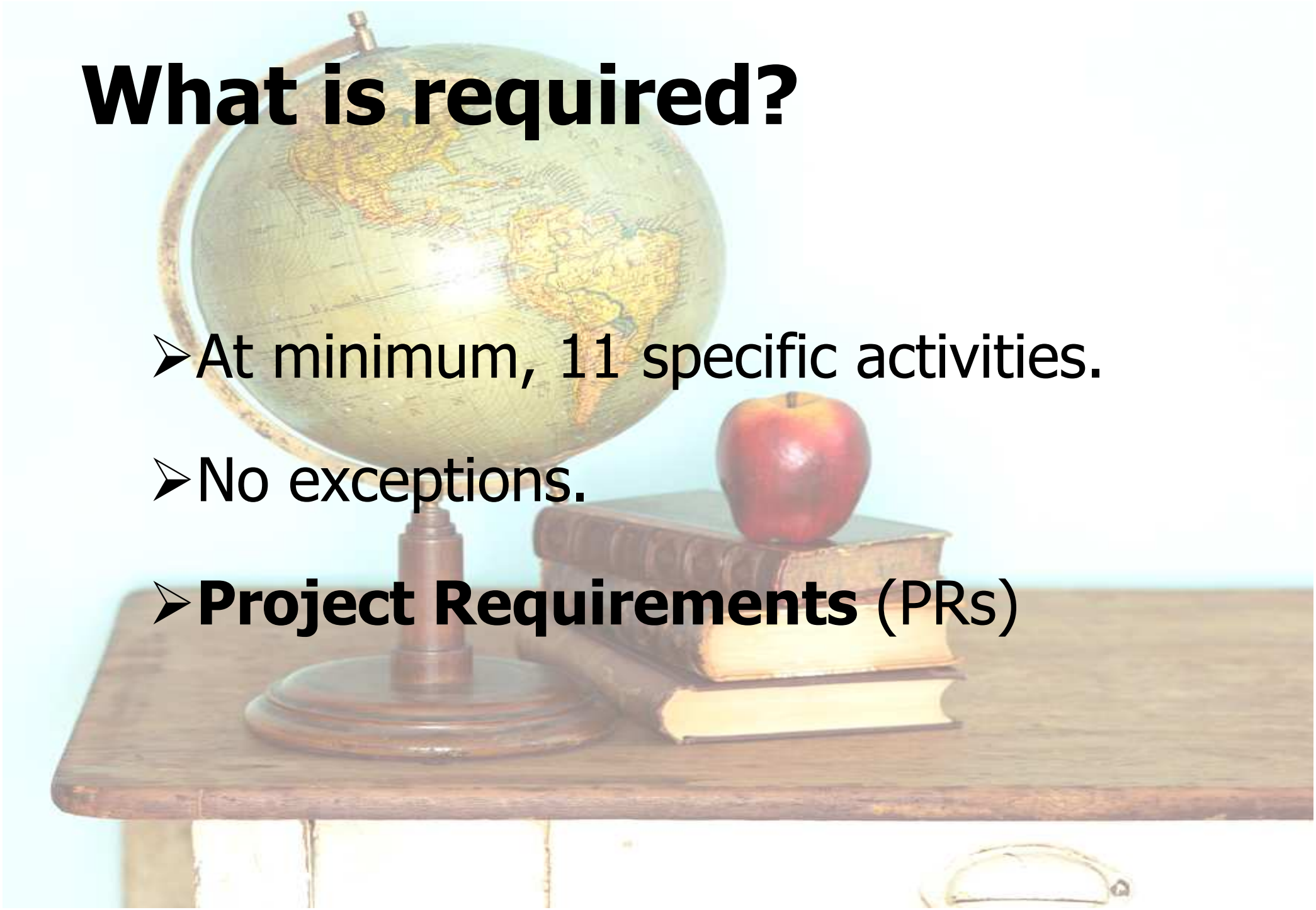


WHAT IS A GREENROAD?

A Green road is defined as:

- a Road Project
- that has been designed and constructed
- to a level of sustainability
- that is substantially higher than current common practice.

What is required?



- At minimum, 11 specific activities.
- No exceptions.
- **Project Requirements** (PRs)

Project Requirements (PR 1 - 11)

1. Environmental Review Process
2. Lifecycle Cost Analysis (LCCA)
3. Lifecycle Inventory (LCI)
4. Quality Control Plan
5. Noise Mitigation Plan
6. Waste Management Plan
7. Pollution Prevention Plan
8. Low Impact Development (LID)
9. Pavement Management System (PMS)
10. Site Maintenance Plan
11. Educational Outreach

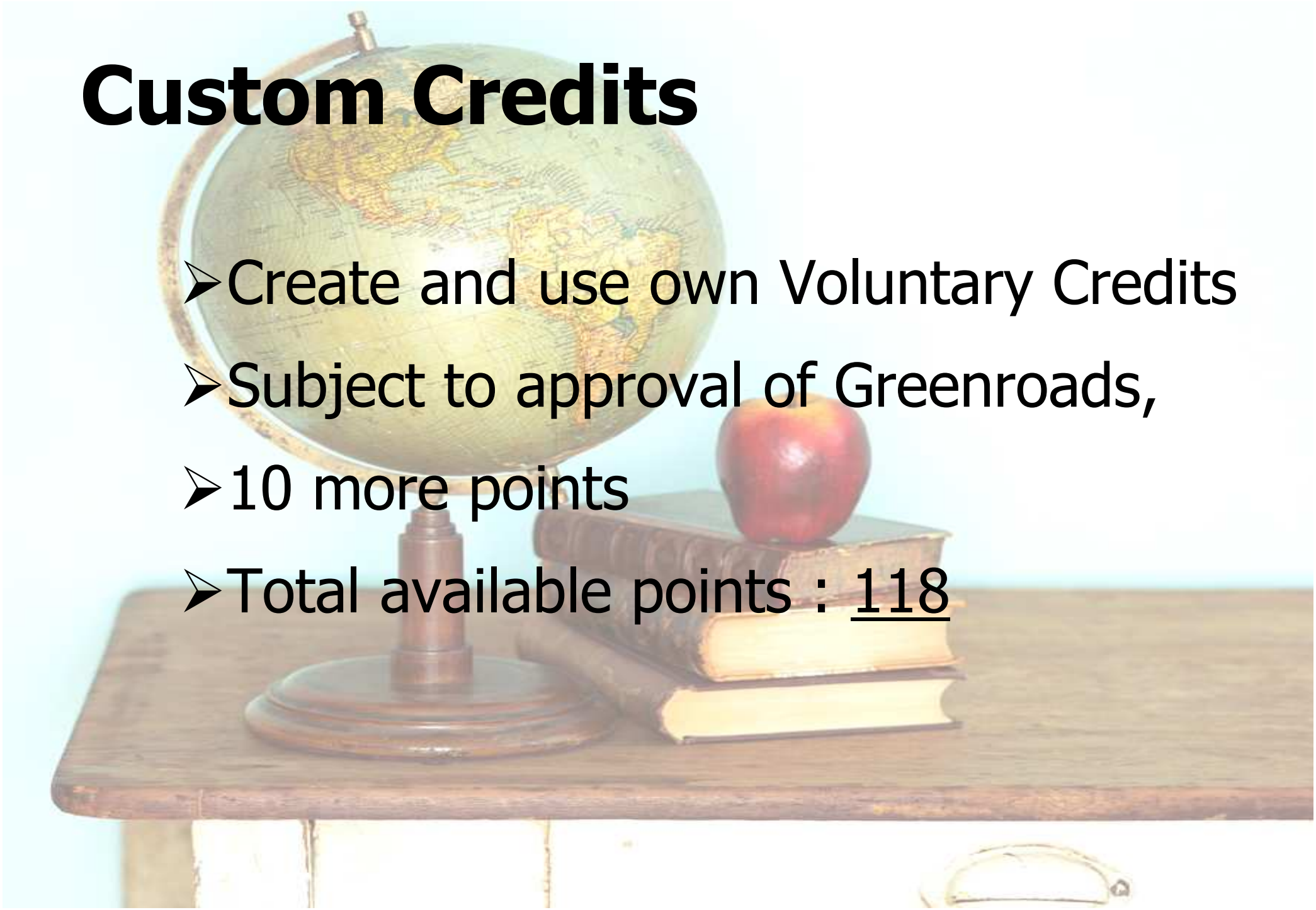
Voluntary Credits

- Optional
- Point value (5 max)
- Depend on sustainability impact
- Currently – 37 VC's
- Total available points : 108

Voluntary Credits

1. Goal
2. Credit requirement
3. Documentation
   - Approaches & Strategies
   - Examples
   - Potential issues
   - Research
1. References

Custom Credits



- Create and use own Voluntary Credits
- Subject to approval of Greenroads,
- 10 more points
- Total available points : 118

Voluntary Credits

1. Environment and Water
2. Access and Equity
3. Construction Activities
4. Material and Resources
5. Pavement Technologies

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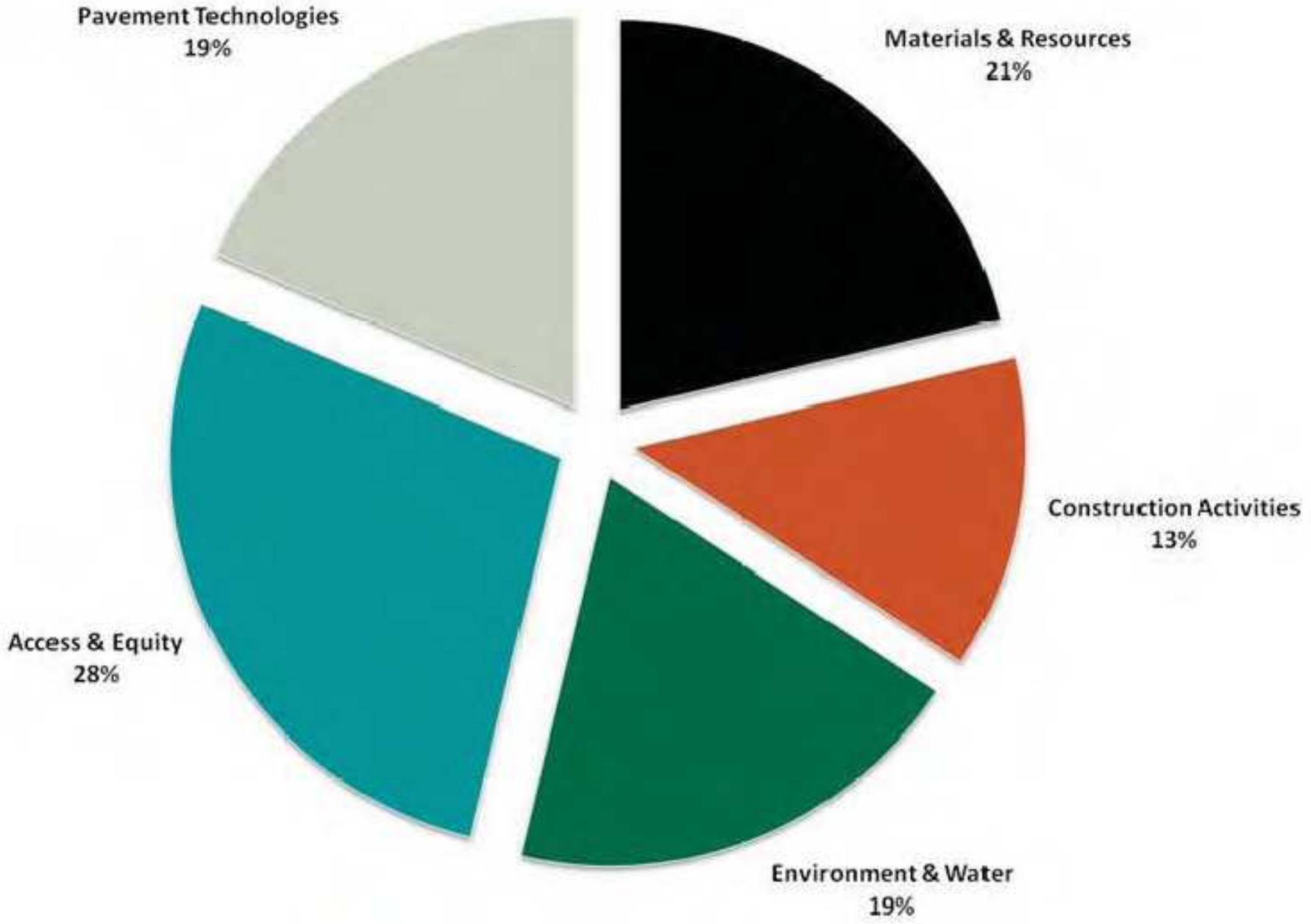
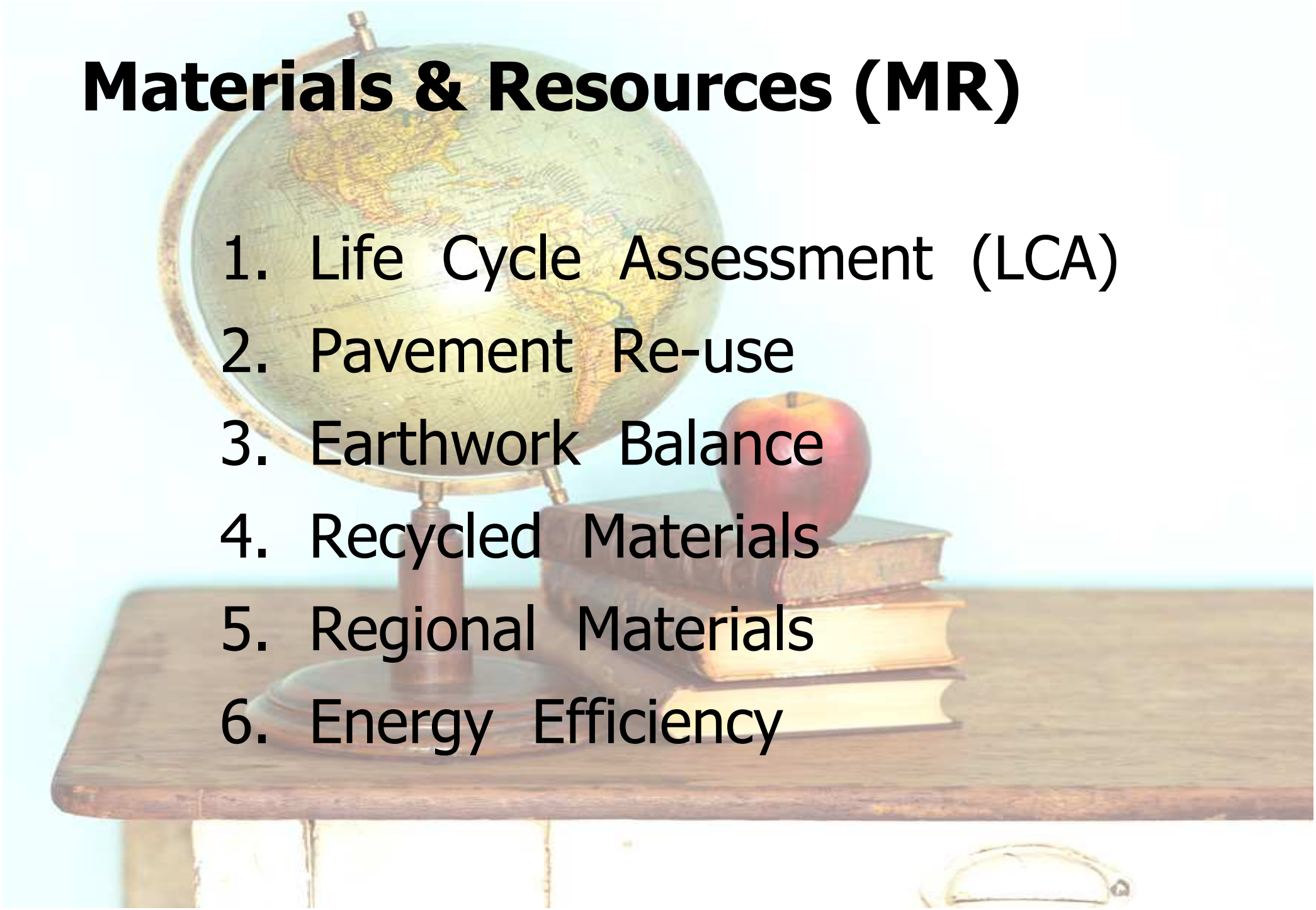
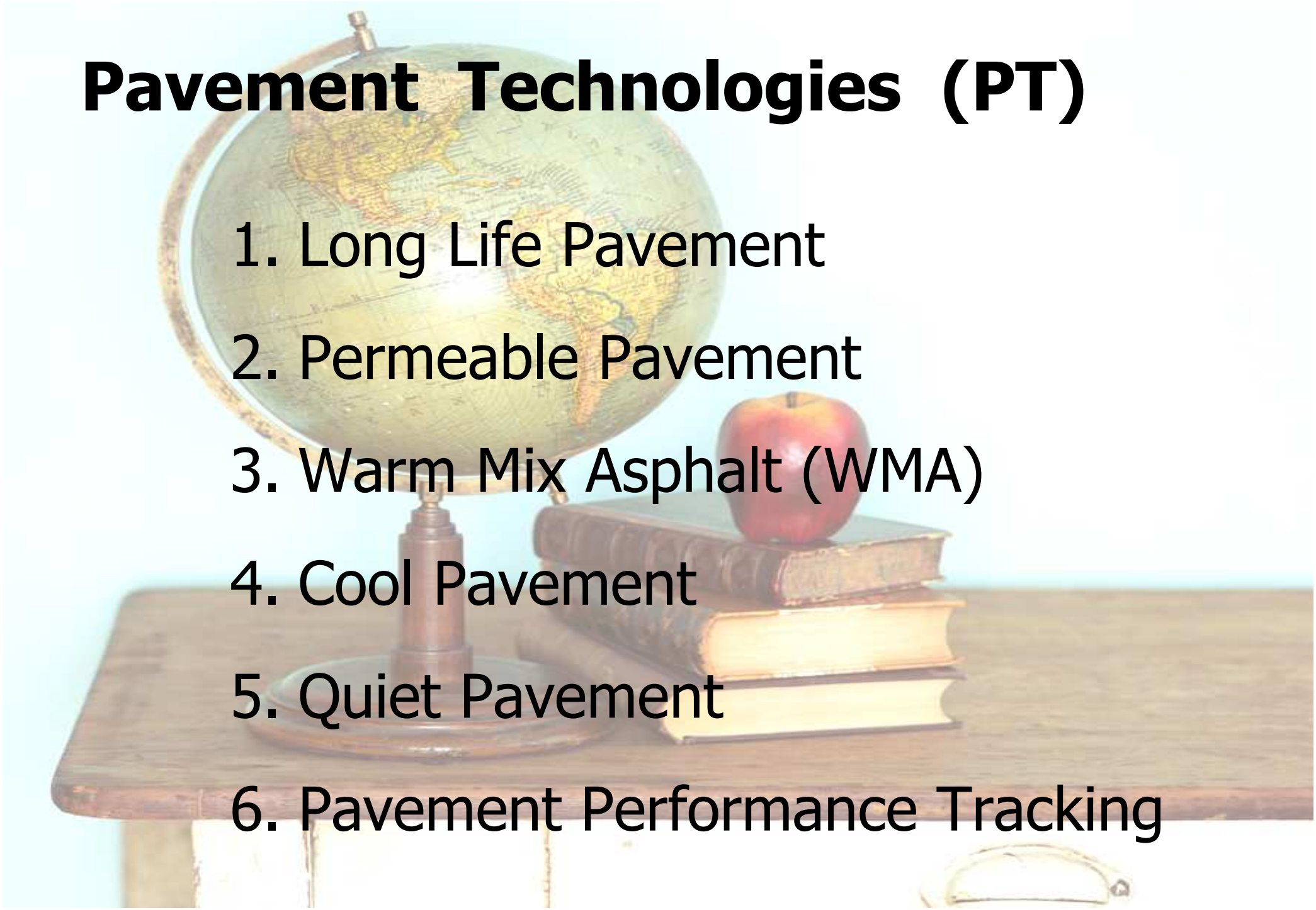
Voluntary Credit Category Weights



Materials & Resources (MR)



1. Life Cycle Assessment (LCA)
2. Pavement Re-use
3. Earthwork Balance
4. Recycled Materials
5. Regional Materials
6. Energy Efficiency



Pavement Technologies (PT)

1. Long Life Pavement
2. Permeable Pavement
3. Warm Mix Asphalt (WMA)
4. Cool Pavement
5. Quiet Pavement
6. Pavement Performance Tracking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LONG-LIFE PAVEMENT

PT-1

5 POINTS

GOAL

Minimize life cycle costs by promoting design of long-lasting pavement structures.

CREDIT REQUIREMENTS

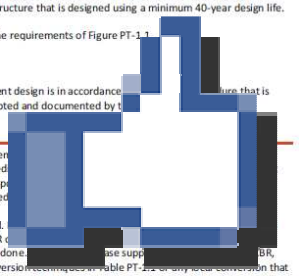
The first requirement AND EITHER of the following two requirements must be met to achieve points.

Requirement 1: Design at least 75% of the total new or reconstructed pavement surface area for regularly trafficked lanes of pavement to meet long-life pavement design criteria. Compute the total surface area of all trafficked lanes and show that a minimum of 75% of that area is designed for long-life. Do not include shoulders, medians, sidewalks and other paved areas in the computation. Long-life pavement is defined as a pavement structure that is designed using a minimum 40-year design life.

Requirement 2a: Meet the requirements of Figure PT-1.1

OR

Requirement 2b: Pavement design is in accordance [illegible] that is formally recognized, adopted and documented by t[illegible]



Details

Generally, not all paven[illegible] sections. Also, this cred[illegible] mix asphalt (HMA) or p[illegible] roads, and roads sealed[illegible]

Figure PT-1.1 Method. [illegible] and base material CBR [illegible] more than one test is done. [illegible] ase supp[illegible] BR, use the common conversi[illegible] Table PT-[illegible] that is commonly used in design and has a basis in empirical evidence. Soils testing data should support the conversion used.

Table PT-1.1: Commonly Accepted CBR Conversion Methods (AASHTO, 1993)

Conversion	Equation	Limitation
CBR - Resilient Modulus (M_R)	$CBR = \frac{M_R}{1500}$	Fine grained soils with a soaked CBR of 10 or less only
CBR - Resistance Value (R-value)	$CBR = \frac{555(R\ value) + 1155}{1500}$	Fine grained, non-expansive soils with a soaked CBR of 8 or less only

Design Procedure Method. The intention is to allow an owner agency to use its existing design procedure to design the pavement section as long as a sufficiently long design life is chosen (at least 40 years). Some common design procedures include (but are not limited to):

- **1993 AASHTO Method.** The method described in the 1993 version of the

RELATED CREDITS

- ✓ PR-2 Lifecycle Cost Analysis
- ✓ MR-2 Pavement Reuse

SUSTAINABILITY COMPONENTS

- ✓ Ecology
- ✓ Economy
- ✓ Extent
- ✓ Expectations
- ✓ Experience

BENEFITS

- ✓ Reduces Raw Materials
- ✓ Reduces Fossil Fuel Use
- ✓ Reduces Air Emissions
- ✓ Reduces Greenhouse Gases
- ✓ Reduces Solid Wastes
- ✓ Increases Service Life
- ✓ Reduces Lifecycle Costs
- ✓ Improves Accountability

(1993) and computerized in DARWin, and AASHTOware

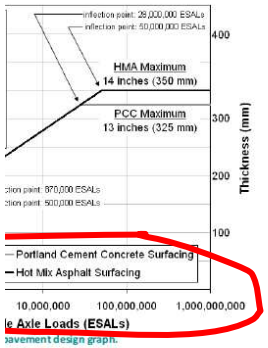
n the Asphalt Institute's MS-1 Asphalt Pavements for halt Institute's publication, SW-1 Asphalt Thickness eel Loads and other applications (1981).
(EPDG). The method described in AASHTO MEPDG-1 erim Edition: A Manual of Practice (2008). This method is ethod.

least partially remain in place (in any condition) can also s credit shall be based on the final pavement structure, place, and (2) any new pavement structure added. In this or an overlay of an existing HMA pavement can qualify ts the criteria of this credit.

d) and their associated pavement material type, surface nesses, subgrade CBR, and if design was intended to be f this credit. This may be included as part of the standard

ked lane pavement surface areas that are designed for

ent sections designed for long-life. These pavement uld be on the plan, and the total surface area of each e plan.



pavement design graph.

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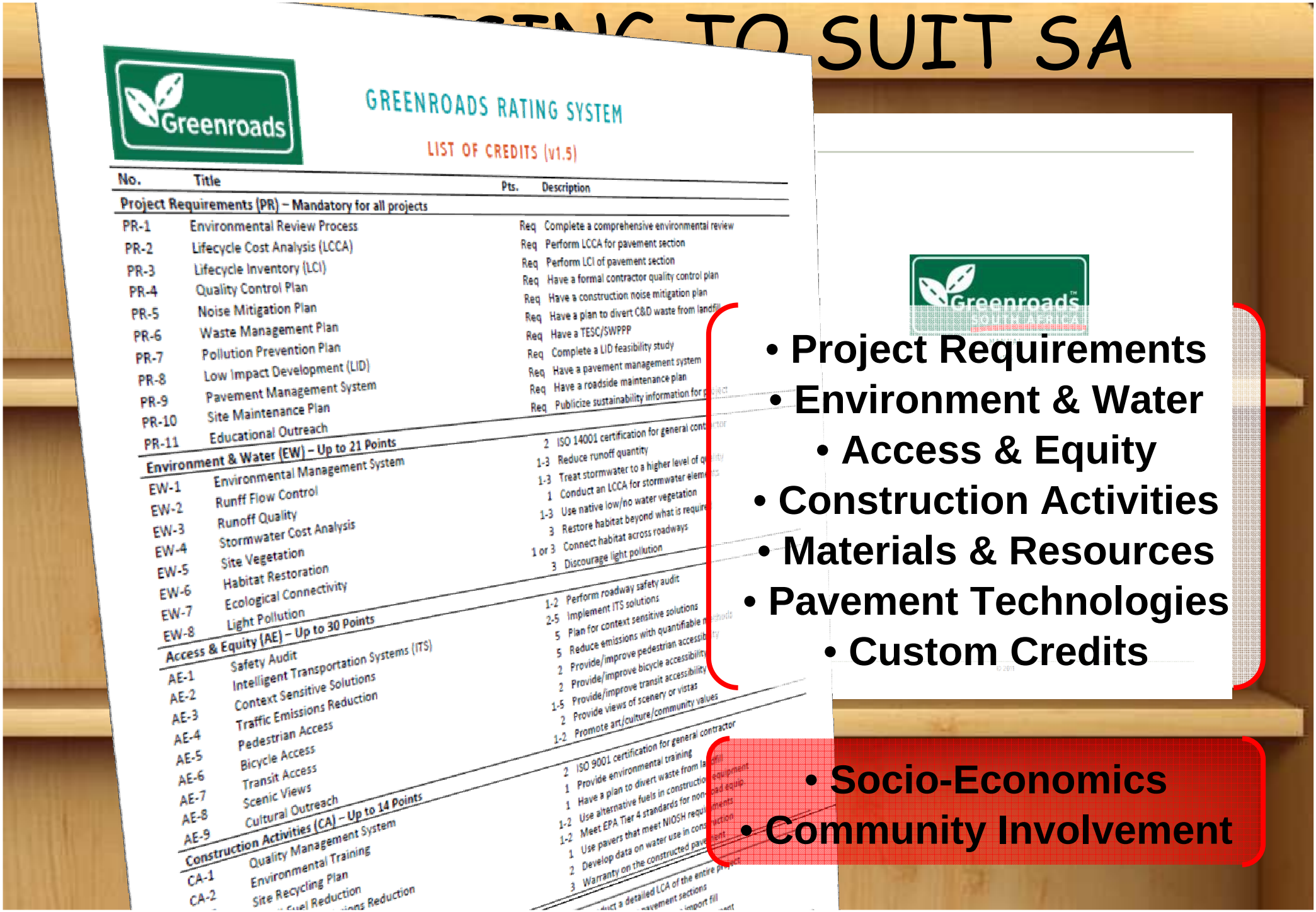
MANUAL

v1.5

...SIGN TO SUIT SA



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GREENROADS RATING SYSTEM

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	...ions Reduction	1-2	Meet EPA Tier 4 standards for non-road equip...
		1	Use pavers that meet NIOSH requirements
		2	Develop data on water use in construction
		3	Warranty on the constructed pavement
			...duct a detailed LCA of the entire project
			...pavement sections
			...import fill

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- **Project Requirements**
- **Environment & Water**
- **Access & Equity**
- **Construction Activities**
- **Materials & Resources**
- **Pavement Technologies**
- **Custom Credits**

- **Socio-Economics**
- **Community Involvement**

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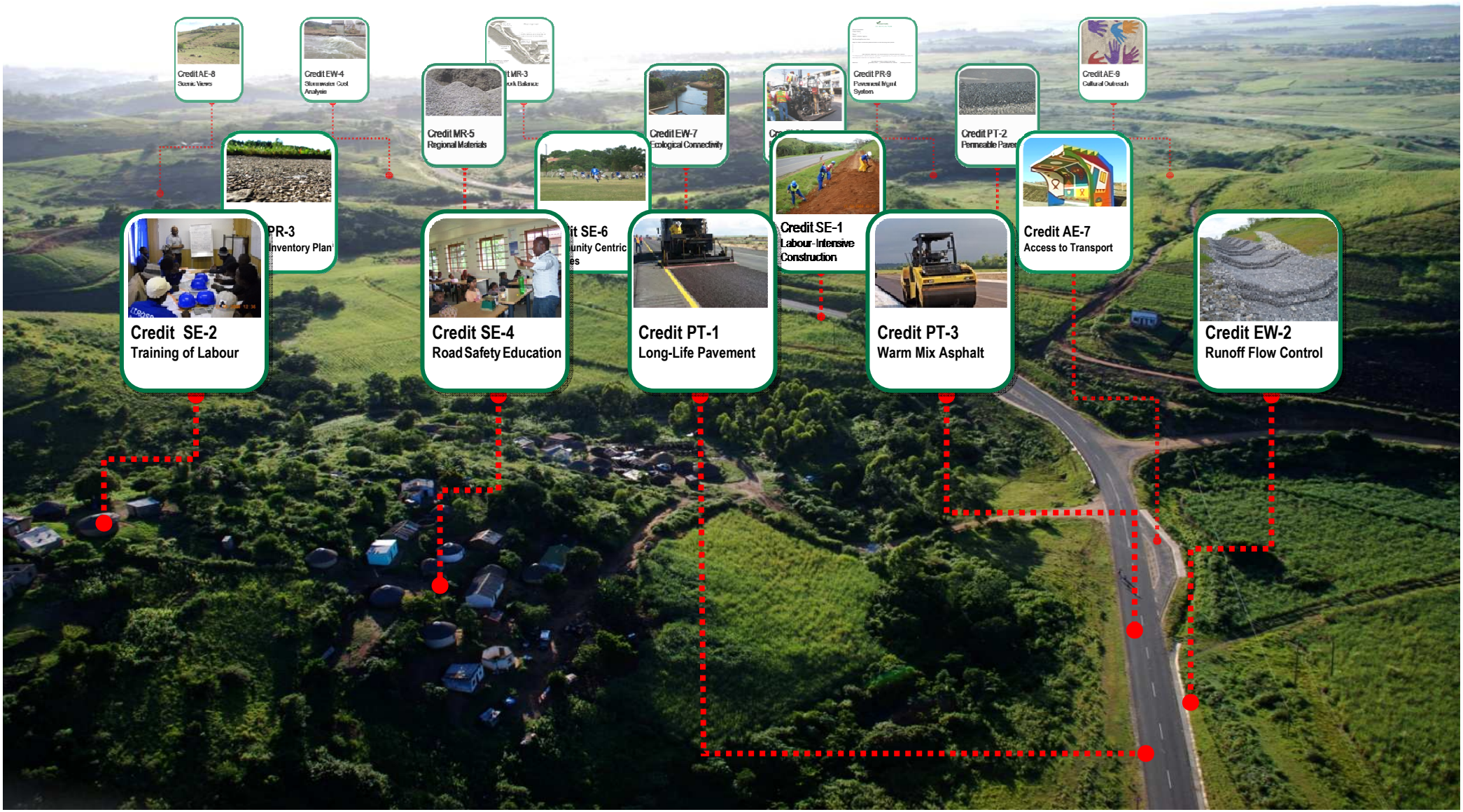
Why ROADS?


Credit AE-8
Credit EW-4
Credit MR-5
Regional Materials
Credit EW-7
Ecological Connectivity
Credit PR-9
Credit PT-2
Credit AE-9
Credit SE-2
Training of Labour
Credit SE-4
Road Safety Education
Credit PT-1
Long-Life Pavement
Credit SE-1
Labour-Intensive
Construction
Credit PT-3
Warm Mix Asphalt
Credit AE-7
Access to Transport
Credit EW-2
Runoff Flow Control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• Job Creation
• Skills Development
• Road Safety Education
• Maintenance Plans
• Pedestrian-Friendly Roads
Credit SE-4
Road Safety Education
Credit PT-1
Long-Life Pavement
Credit PT-3
Credit EW-2
Runoff Flow Control
Speedy R.O.I.

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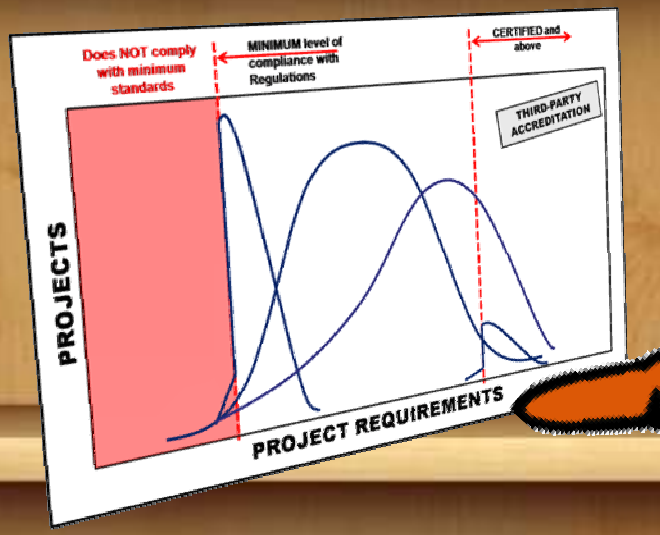


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transport
Department:
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labour
Department:
Labour
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environmental affairs
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Environmental Affairs
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Core Founding Group

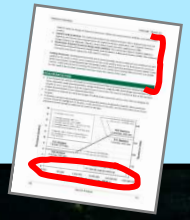
Founding Board

Members

Working Committees

New Credit Committee

Localisation Committee

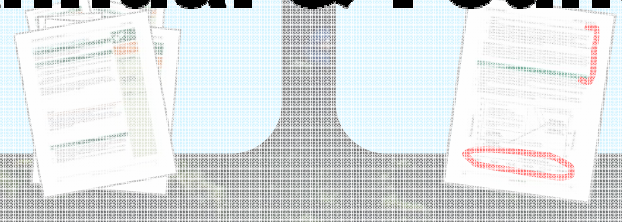


Third-Party Project Certification

Marketing & Training

GREENROADS COUNCIL of SOUTH AFRICA

- **Non-Profit Organisation**
- **Based on Existing Successful Models**
- **Fee-based Memberships**
  - **(Annual & Founding)**



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What is NEEDED?

- **Memberships**
- **Input & Feedback re: Greenroads Manual**
  - **Test Project Data**
  - **Pilot Projects**
- **Open-mindedness and Patience**
- **Working Committee Muscle**


Watch this space...
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