

*THE GREENROADS
METRIC AND
ROADWAY
SUSTAINABILITY*


TODAY'S TOPICS

1. WHY SUSTAINABILITY HAS BECOME A BIG BUZZ WORD
2. WHAT A SUSTAINABLE ROADWAY PROJECT LOOKS LIKE
3. LOOK AT A ROADWAY SUSTAINABILITY METRIC - GREENROADS
4. WHAT WE LEARNED FROM UA's GREENROADS EXPERIENCE
5. HOW TO EASILY MAKE ROADWAY PROJECTS SUSTAINABLE

SUSTAINABILITY

We all hear about it, but what does it mean in terms of roadway projects?

Sustainable Construction Projects

An aerial photograph of a lush green landscape. In the foreground, there are rolling green fields with visible tire tracks. A tall, metal lattice power line tower stands prominently in the middle ground, surrounded by clusters of trees and shrubs. The background shows more green fields and a line of trees under a clear sky.

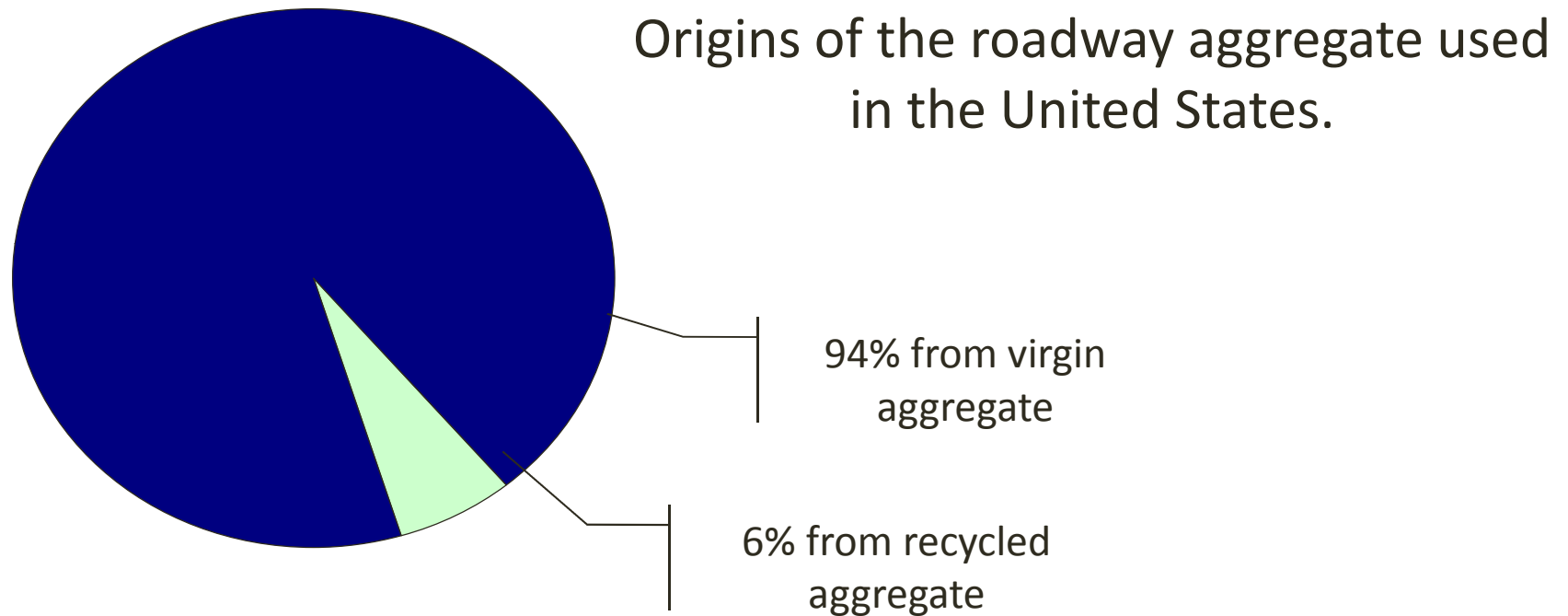
A construction project that will meet the needs of the present without compromising the ability of future generations to meet their own needs.

HOW DOES THE NEED FOR SUSTAINABILITY APPLY TO ROADWAY PROJECTS?

ROADWAYS REQUIRE THE USE OF LOTS OF NON-RENEWABLE MATERIALS EVERY YEAR

Individual materials	Amount Used per Year
Aggregate	1,300 million tons
Asphalt	40 million tons
Hot mix asphalt (HMA)	600 million tons

Non-Renewable Roadway Aggregates

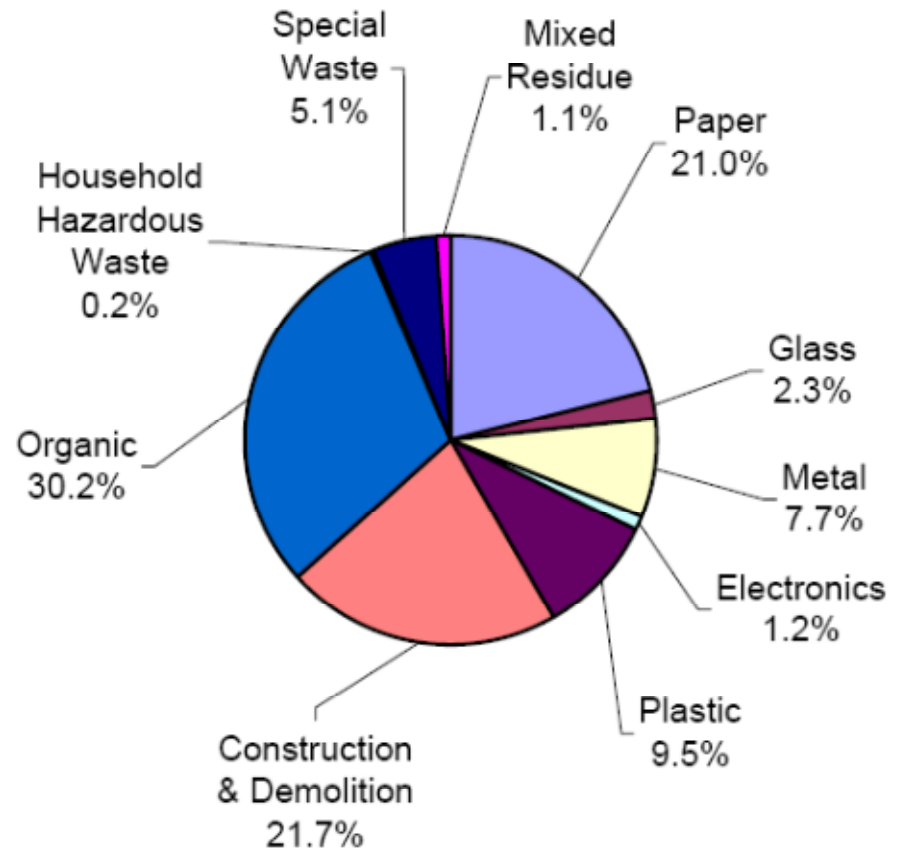


Roadway Construction Waste Management



Construction Waste is a big contributor to the municipal waste stream.

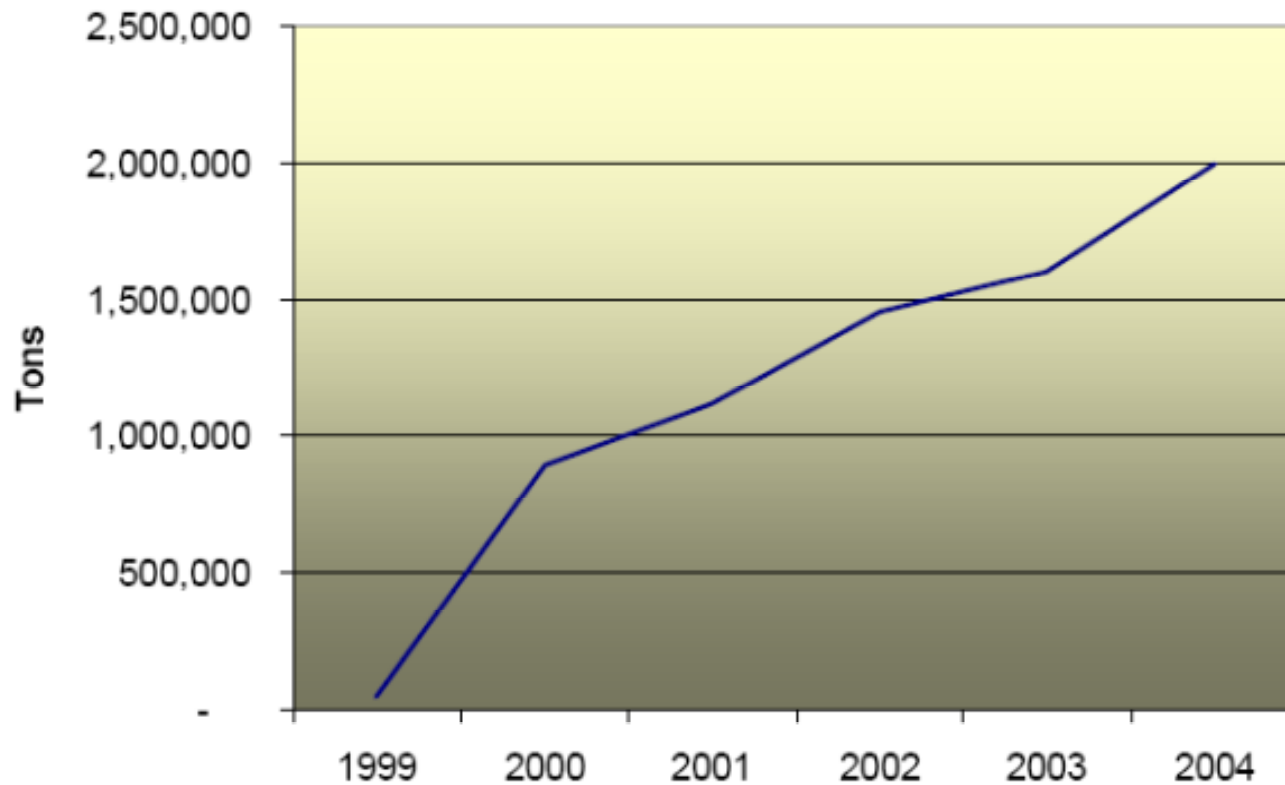
Figure ES-A: Material Classes in California's Overall Disposed Waste Stream, 2003



Most estimates place construction waste at between 20 and 40% of the municipal waste stream

Recycling HMA and PCC as part of road construction has steadily increased.

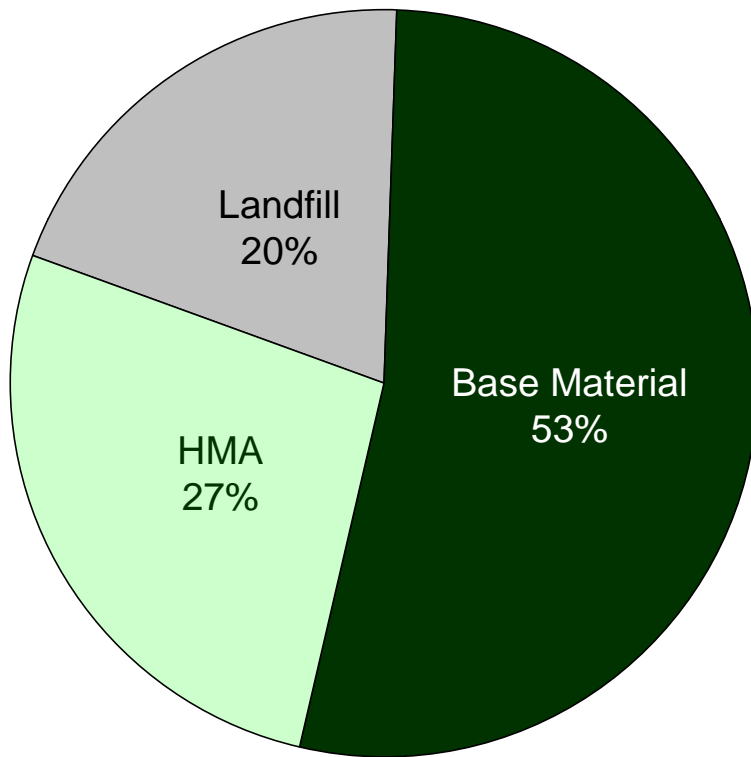
Asphalt and Concrete Recycled 1999 to 2004



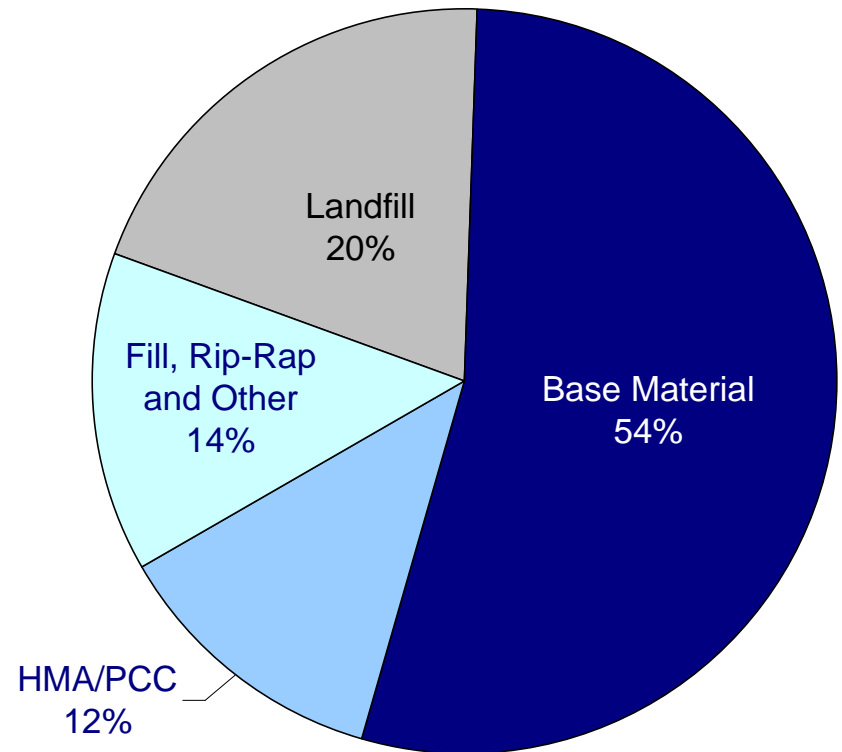
HMA/PCC recycling = 51% of waste material

We need to reduce the amounts taken to landfills and increase the amounts reused for roadway construction.

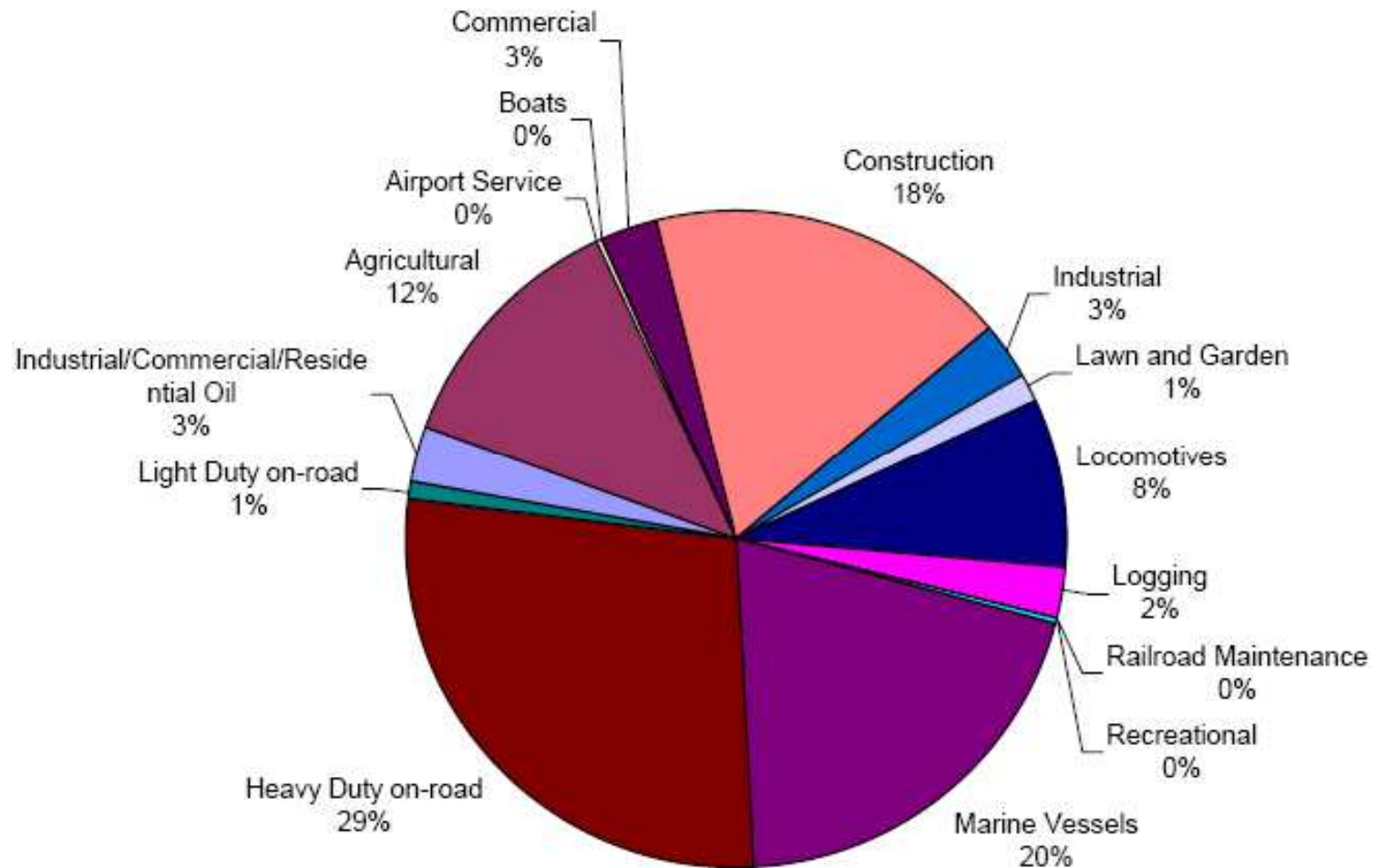
Ultimate Destination of Removed HMA



Ultimate Destination of Removed PCC

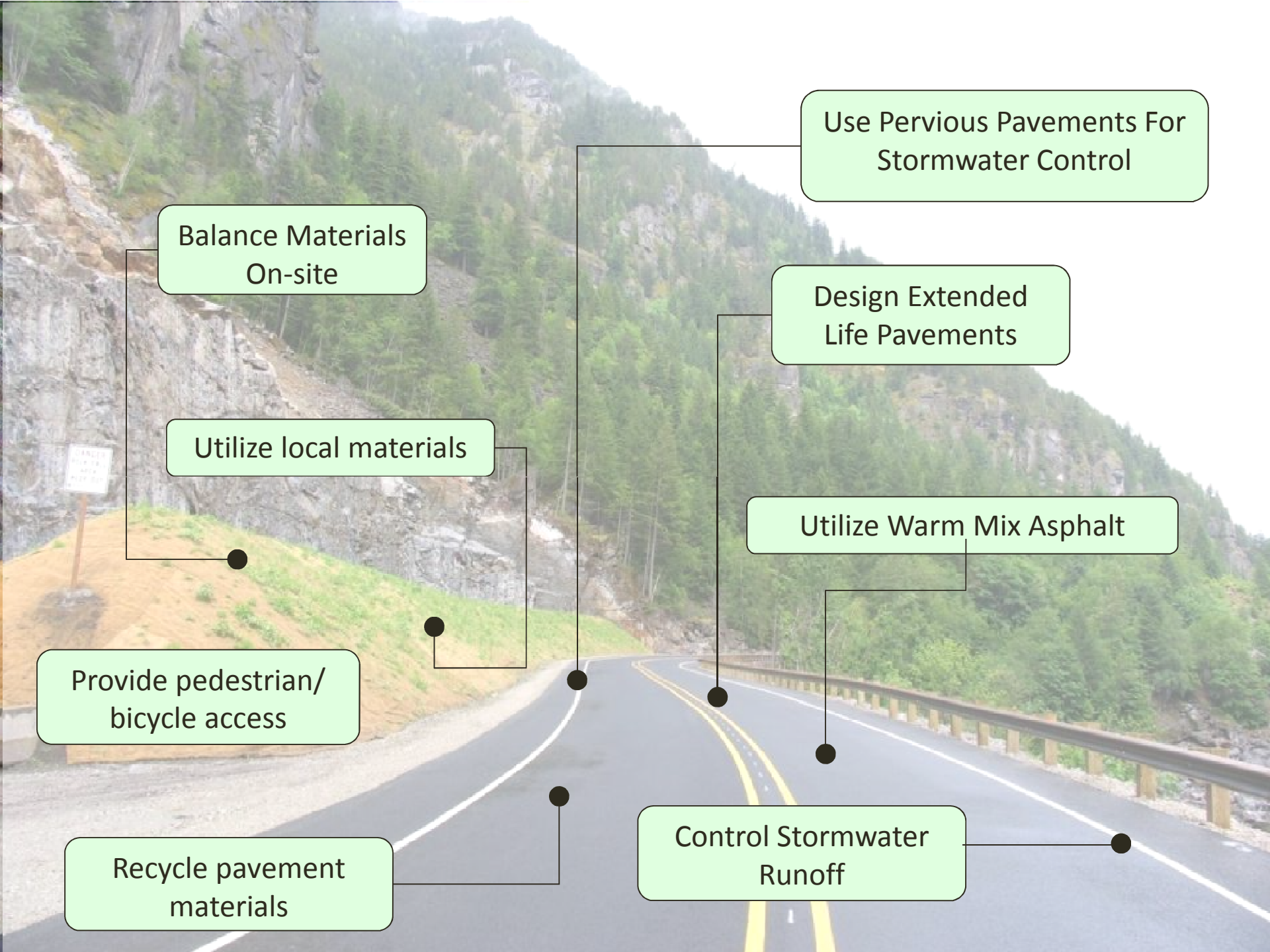


DIESEL EXHAUST



So what does a more sustainable
roadway look like?





Use Pervious Pavements For Stormwater Control

Design Extended Life Pavements

Utilize Warm Mix Asphalt

Control Stormwater Runoff

Balance Materials On-site

Utilize local materials

Provide pedestrian/
bicycle access

Recycle pavement materials

THE
GREENROADS
ROADWAY
SUSTAINABILITY
METRIC

Developed by the University of Washington Civil Engineering Department

WHAT IS A SUSTAINABILITY METRIC?

A Metric is a rating system that quantifies the degree of sustainability achieved by a construction project by awarding credits for sustainable choices made during the project's planning, design and construction phases.

HOW CAN THE GREENROADS METRIC BE USED?

The Greenroads Metric can be used to determine if a project qualifies for Greenroads certification.

The Greenroads Metric can also be used to learn how to design and construction a sustainable project.



more sustainable roads for a better transportation future

What are the major goals of the Greenroads metric?

Reduce project life cycle costs.

Reduce project energy use.

Reduce project fossil fuel use.

Reduce project exhaust emissions.

Reduce runoff rates & volumes.

Encourage Context Sensitive solutions.

Encourage use of recycled materials especially existing pavement materials

THE GREENROADS MANUAL

- Sustainability approaches are divided into two areas:
 - 11 Mandatory Requirements that all projects must meet.
 - 118 types of Voluntary Credits with varying credit values covering 38 different types of “green” design and construction approaches.
 - 32 Voluntary Credits are required to certify a project as a Greenroads Project.



The Mandatory Requirements





The Mandatory Credit Requirements

Requirement		Description / Purpose
PR-1	Environmental Review Process	Reviewed a 6-page WS D of E environmental checklist
PR-2	Life Cycle Cost Analysis (LCCA)	Performed LCCA using FHWA RealCost software
PR-3	Life Cycle Inventory (LCI)	Performed LCI using modified PaLATE software
PR-4	Construction QC Plan	Prepared an example contractor QC plan
PR-5	Noise Mitigation Plan	Prepared a construction noise mitigation plan
PR-6	Waste Management Plan	Identified waste material recycling opportunities
PR-7	Pollution Prevention Plan	Prepared a SWPPP template useful for all UA projects
PR-8	Low-Impact Development	Review of ways to potentially reduce runoff volumes
PR-9	Pavement Mgmt. System	Made sure that the City's PMS program meets the requirements of the Greenroads program
PR-10	Site Maintenance Plan	Identified the future maintenance needs for each of the constructed items over the life of the project
PR-11	Educational Outreach	Performing on-going Greenroads & project publicity

The Voluntary Credits





Voluntary Credits

Voluntary Credit Types		Potential Credits
EW	Environment & Water	21
AE	Access & Equity	30
CA	Construction Activities	14
MR	Material & Resources	23
PT	Pavement Technologies	20
CC	Custom Credits	10
Total Voluntary Credits		118



Materials & Resources

Voluntary Credit		Points	Description
MR-1	Life Cycle Assessment (LCA)	2	Conduct a detailed LCA of the entire project
MR-2	Pavement Reuse	4 – 5	Maximized reuse existing pavement materials
MR-3	Earthwork Balance	1	Balanced pavement section cut/fill quantities
MR-4	Recycled Materials	1 – 5	Maximized the % of recycled materials in the new pavement section
MR-5	Regional Materials	1 – 5	Encouraged use of nearby material sources
MR-6	Energy Efficiency	5	Improve energy eff. of operational systems
Total Materials & Resources Credits			7 - 16 Likely To Earn 13 Credits



Pavement Technologies

Voluntary Credit		Points	Description
PT-1	Long-Life Pavement	5	Designed new long-life (40-year) pavement section designs for residential, collector & arterial streets
PT-2	Permeable Pavement	3	Use permeable pavement as a LID technique
PT-3	Warm Mix Asphalt (WMA)	3	Utilized WMA in place of HMA
PT-4	Cool Pavement	5	Contribute less to urban heat island effect
PT-5	Quiet Pavement	2 - 3	Use a quiet pavement to reduce noise
PT-6	Pvmt. Performance Tracking	1	City will perform future reviews of pavement condition to monitor pavement performance
Total Pavement Technology Credits		9 - 9	Likely To Earn 9 Credits



Construction Activities

Voluntary Credit		Points	Description
CA-1	Quality Management System	2	ISO 9001 cert. or eq. for general contractor
CA-2	Environmental Training	1	Provided contractor environmental training
CA-3	Site Recycling Plan	1	Required on-site recycling and trash collection
CA-4	Fossil Fuel Use Reduction	1 – 2	Use alt. fuels in construction equipment
CA-5	Eqpt. Emission Reduction	1 – 2	Meet EPA Tier 4 stds. for nonroad equipment
CA-6	Paver Emission Reduction	1	Required pavers to meet NIOSH requirements
CA-7	Water Use Tracking	2	Required contractor to document the use and disposal of potable water used for construction
CA-8	Contractor Warranty	3	Required 3 year project warranty
Total Construction Activity Credits		8	Likely To Earn 8 Credits

Certification Levels

**Green Road
certified**



32-42 credits

**Green Road
certified**



SILVER

43-53 credits

**Green Road
certified**



GOLD

54-63 credits

**Green Road
certified**



EVERGREEN

64+ credits

THE PROBLEM WITH SUSTAINABILITY METRICS

Considerable effort, cost and fees are required

Infrastructure metrics compete with each other

Infrastructure Sustainability Initiative

New York City Infrastructure Manual

Currently there are no requirements to utilize metrics

DIRECTION WILL BE TOWARDS MORE SUSTAINABILITY

Will a national Energy Policy be the new Clean Water Act ?

Infrastructure funding will place more value on sustainable approaches

- Increased competition will make sustainability points important

How do we prepare for increased sustainability requirements?

- Upper Arlington's GREENROADS experience provided some answers

UPPER ARLINGTON'S GREENROADS EXPERIENCE

The City of Upper Arlington designed, bid and re-constructed five City streets able to be certified as Greenroads projects.

WHAT DID WE LEARN?

We learned that it is not necessary to pursue a metric certification to know whether or not a roadway project is sustainable.

Being sustainable doesn't mean HAVING to use certain types of "GREEN" construction approaches such as pervious pavement.

What makes a project Sustainable is the project's THOUGHT PROCESS.

ONCE SET UP, THIS THOUGHT PROCESS CAN EASILY BE APPLIED TO ANY FUTURE INFRASTRUCTURE PROJECT.

WHAT ARE THE DESIGN STAGE THOUGHT PROCESSES?

Involve & Educate the Public about Sustainability

- show that Public funds are being spent as cost-effectively as possible.

Request input from both public & private entities

- make sure project is meeting as many goals as possible.

Review a Specific List of Stormwater Control Options

- related to runoff volume, runoff peak flow and pollutant reduction.

Review Material Reuse or Recycling Options

- for each and every component of the project.

Perform **VERY BASIC** Life Cycle Cost Evaluations

- to insure alternative cost-effectiveness.

SUSTAINABLE ROADWAY APPROACHES

1. Design pavements for increased design life.
2. Identify materials that could be reused on-site.
3. Identify materials that could be recycled off-site.
4. Identify materials that will have to be landfilled.
5. Consider ability to recycle/reuse installed materials.
6. Make balancing materials on-site a priority.
7. Consider using higher RAP percentages
8. Specify the use of Warm Mix Asphalt

SUSTAINABLE ROADWAY APPROACHES

STORMWATER CONSIDERATIONS

1. Review list of ways to reduce runoff volumes
2. Review list of ways to reduce runoff peak flowrates
3. Review list of ways to reduce runoff pollutant quantities

Pervious pavements generally relate to stormwater controls

ROADWAY CONSTRUCTION STAGE

Sustainable approaches & practices must be specified.

Roadway specifications should include:

- Immediate revegetation of disturbed areas

- Contractor Quality Control Plan

- Extended contractor warranty

- Contractor employee sustainability training

- Motivation to expedite construction

PRESENTATION SUMMARY

USING A SUSTAINABILITY METRIC REQUIRES A LOT OF WORK

BEING SUSTAINABLE DOES NOT REQUIRE OBTAINING A CERTIFICATION

BEING SUSTAINABLE DOES NOT MEAN HAVING TO USE GREEN METHODS

BEING SUSTAINABLE ONLY REQUIRES USING A SPECIFIC THOUGHT PROCESS

THIS THOUGHT PROCESS REQUIRES AN EFFORT TO ESTABLISH
BUT CAN BE SIMPLE TO FOLLOW

IF THIS THOUGHT PROCESS IS FOLLOWED YOUR PROJECT
CAN BE CONSIDERED TO BE A SUSTAINABLE PROJECT