



U.S. Department of Transportation
Federal Highway Administration
Office of Infrastructure

Engineering More Sustainable Pavements

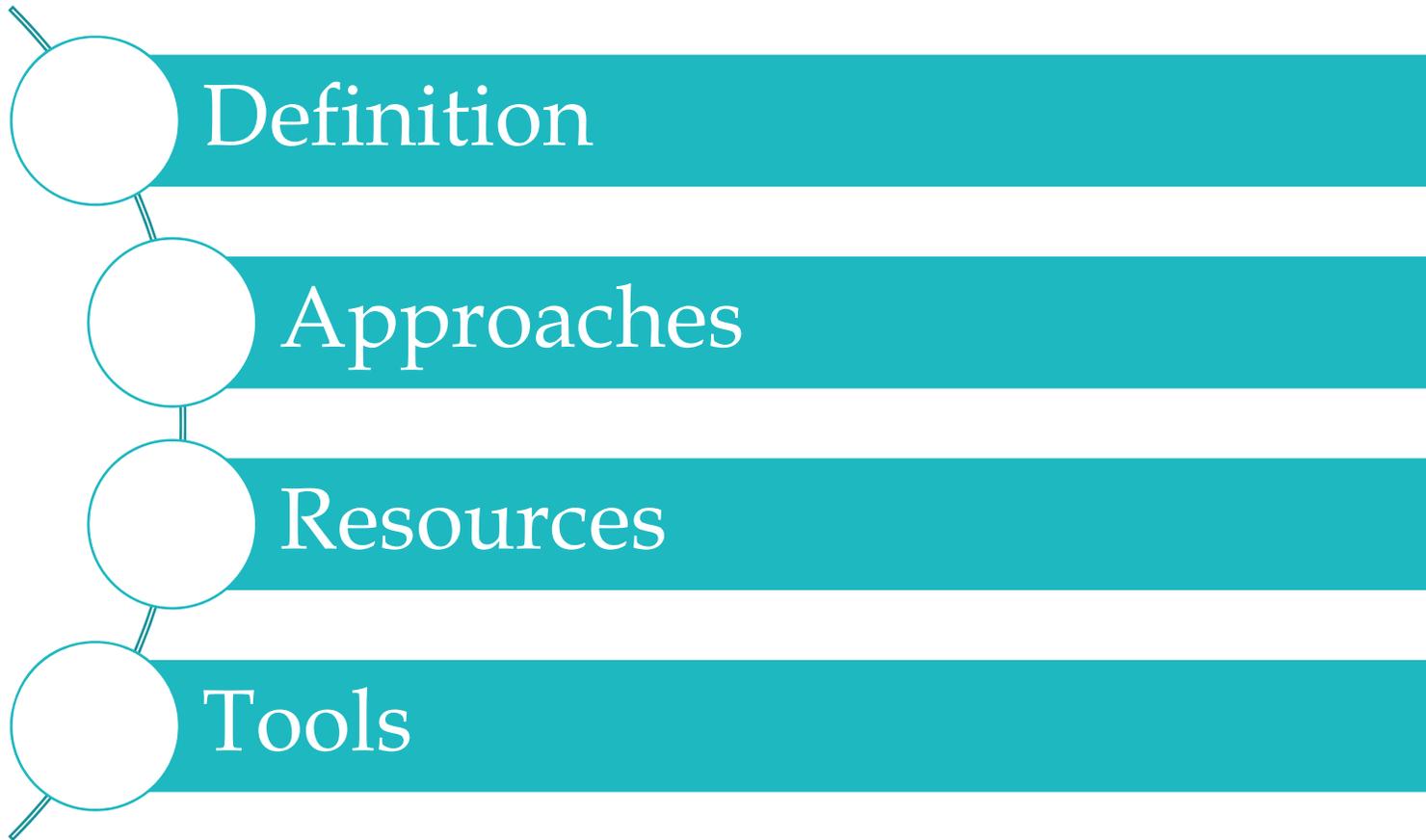
Heather Dylla

FHWA Office of Infrastructure

2018 Virginia Concrete Conference



Key Takeaways



Sustainable Pavements

Should:

- achieve the engineering goals for which it was constructed,
- preserve and (ideally) restore surrounding ecosystems,
- use financial, human, and environmental resources wisely, and
- meet basic human needs such as health, safety, equity, employment, comfort, and happiness.

Parallels VDOT's Core Values

FHWA Sustainable Pavements Program

Advance the knowledge and practice of:

- Designing
- Constructing
- Maintaining

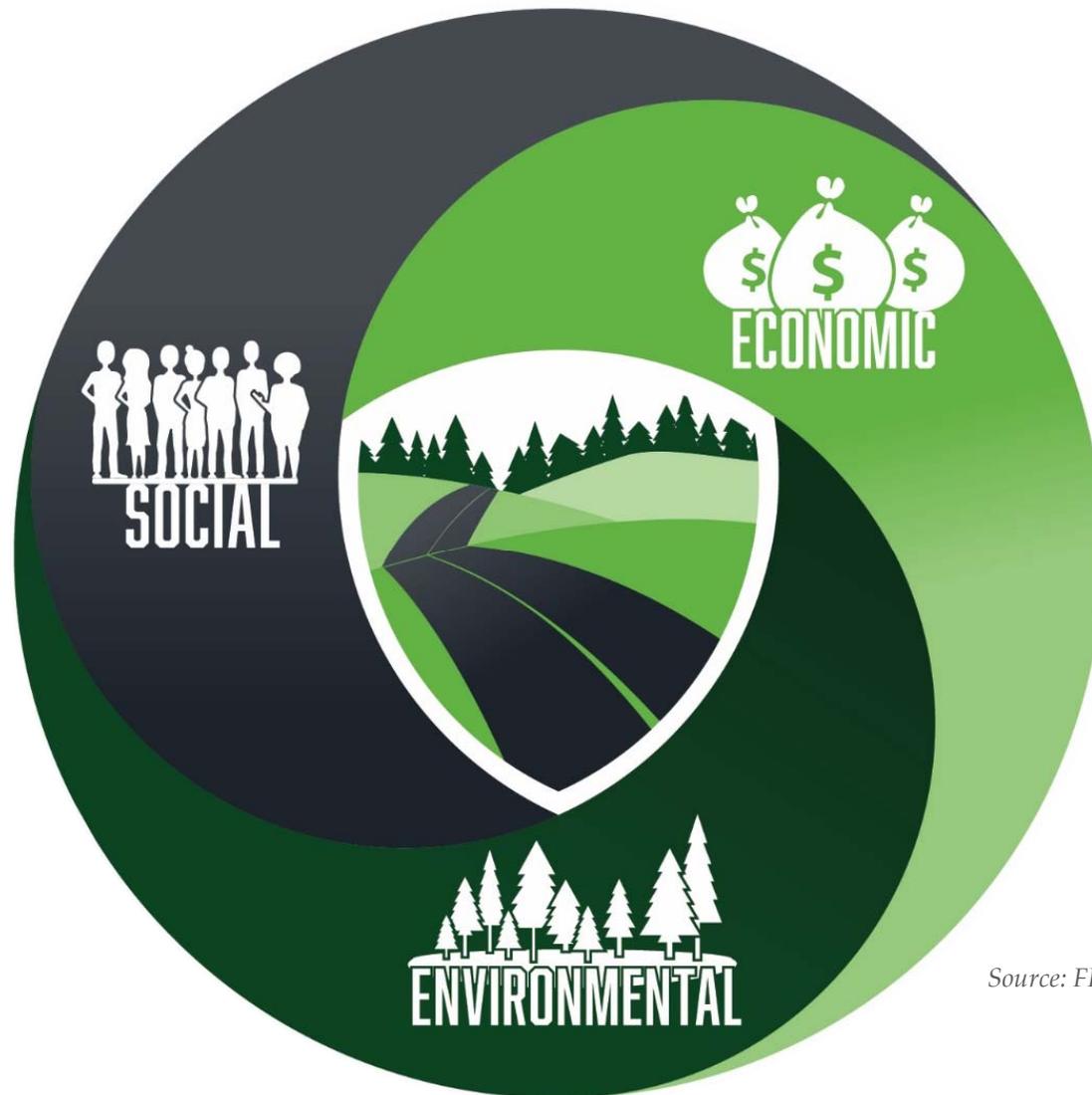


Source: FHWA

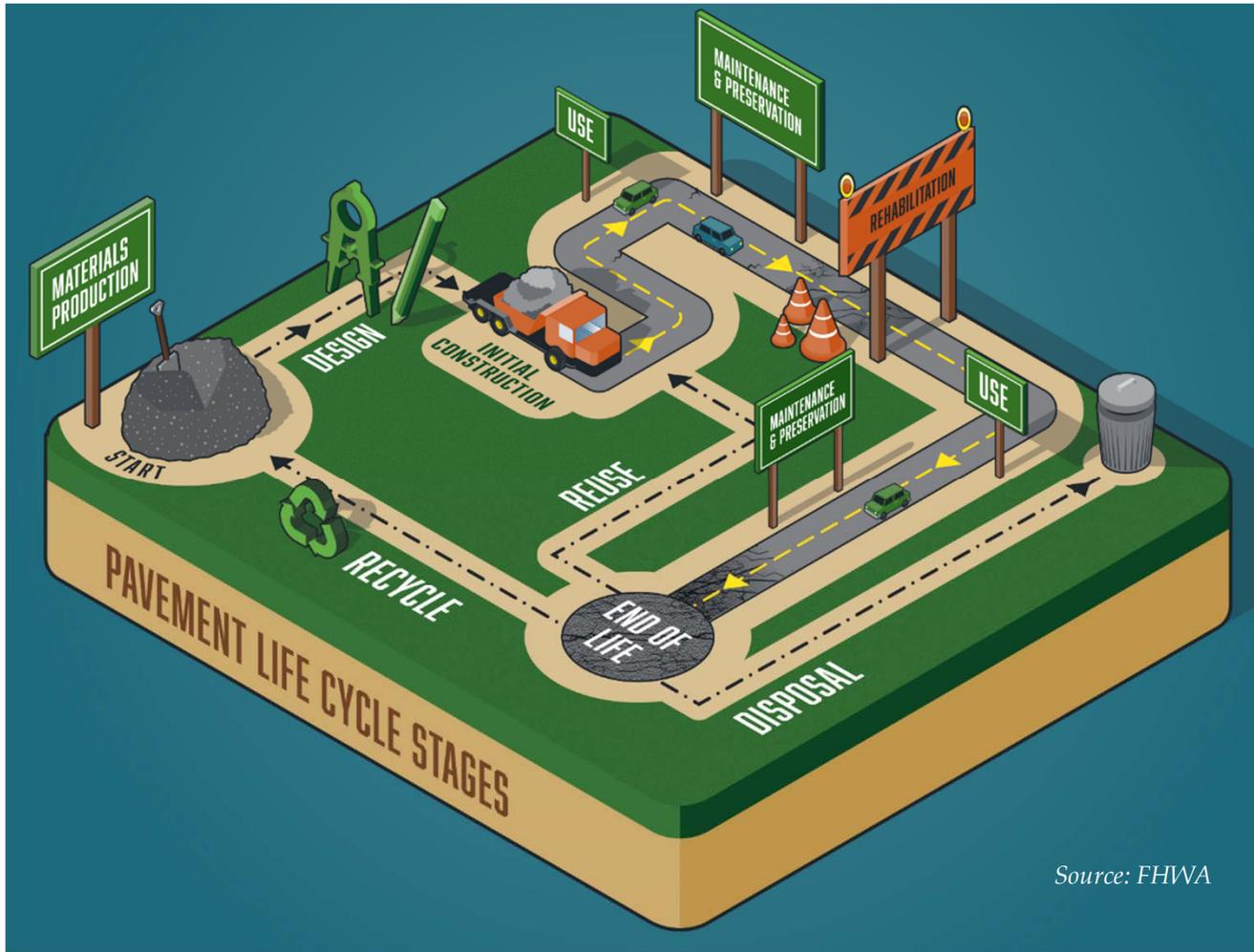
More sustainable pavements through:

- Stakeholder engagement
- Education
- Development of guidance and tools

Triple Bottom Line

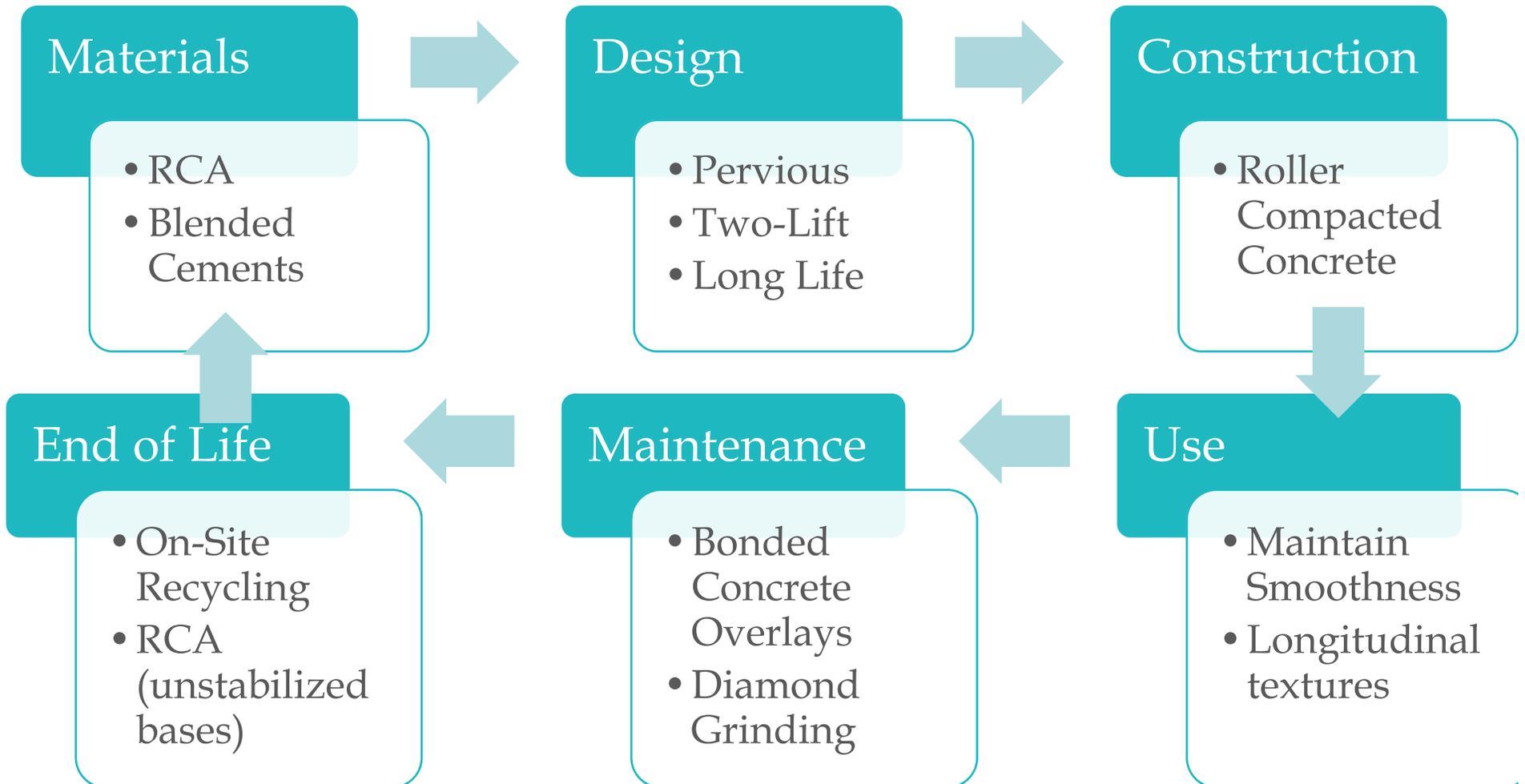


Pavement Life Cycle



Source: FHWA

Concrete Sustainable Approaches



Sustainability Approach Potential Impacts



Source: FHWA

Roller Compacted Concrete

Social

- Reduced fuel used during construction
- Reduced construction duration
- **Lower ride quality**

Environment

- Reduced material & construction environmental impacts
 - Cement
 - Admixtures
 - Fuel

Economic

- Significant construction cost savings
 - Material
 - Labor

Sustainability Performance Measures for Project-Level Analysis

Sustainability Rating Systems

- INVEST
- ENVISION



Performance Testing



Life-Cycle Cost Analysis (LCCA)

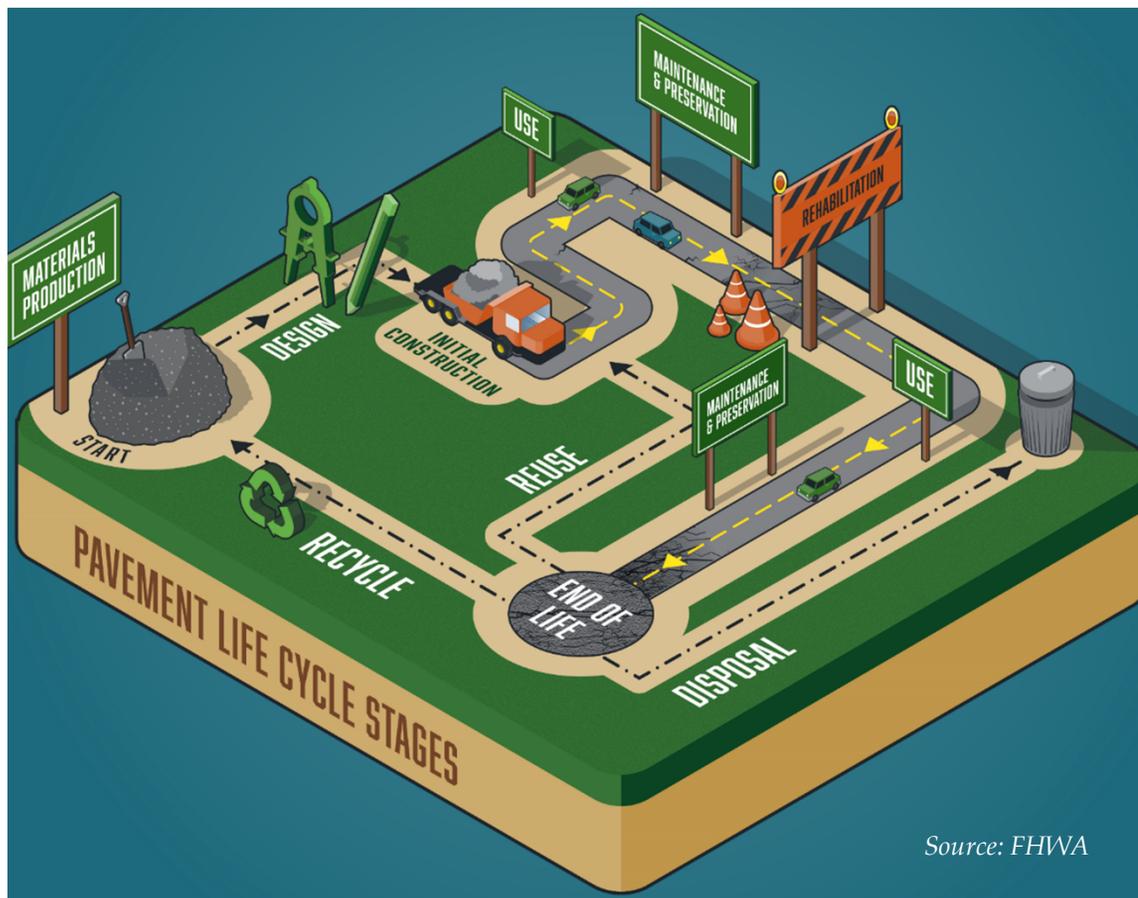
Performance Testing



Life-Cycle Assessment (LCA)

Note: This does not pertain to Life Cycle Planning requirements for Asset Management.

LCA for Pavement Design



Source: FHWA

Evaluates potential environmental impacts

- Eutrophication
- Acidification
- Smog
- Ozone depletion and others

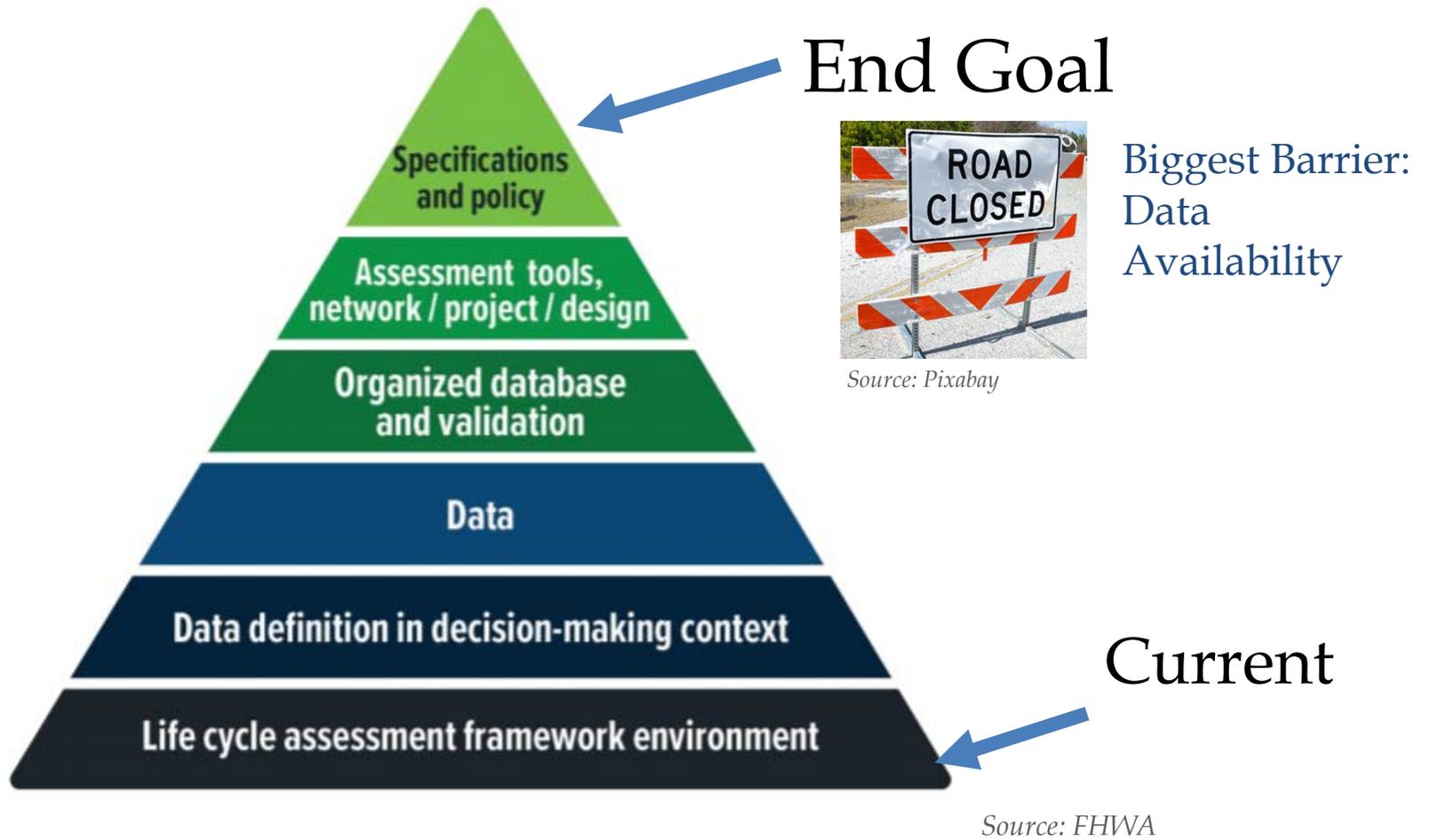
Inputs for all stages

- Material
- Fuel

Outputs for all stages

- Pollution to water
- Pollution to soil
- Pollution to air

Pavement LCA Implementation Elements



Environmental Product Declarations

Like nutrition label but with environmental impacts

- Eutrophication
- Acidification
- Smog
- Ozone depletion and others

An LCA that follows industry product specific rules (Product Category Rules)

- Functional unit
- System boundaries

Allows for some sort of comparison

Nutrition Facts	
8 servings per container	
Serving size	2/3 cup (55g)
Amount per serving	
Calories	230
% Daily Value*	
Total Fat 8g	10%
Saturated Fat 1g	5%
<i>Trans</i> Fat 0g	
Cholesterol 0mg	0%
Sodium 160mg	7%
Total Carbohydrate 37g	13%
Dietary Fiber 4g	14%
Total Sugars 12g	
Includes 10g Added Sugars	20%
Protein 3g	
Vitamin D 2mcg	10%
Calcium 260mg	20%
Iron 8mg	45%
Potassium 235mg	6%
<small>* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.</small>	

Source: FDA

LCA/EPD Implementation

✦ Policy

- Caltrans
- California High Speed Rail Authority

✦ Pilots

- Minnesota DOT
- Arizona DOT

✦ Benchmarking

- Texas DOT
- Illinois DOT

✦ Tools

- Louisiana DOT
- Illinois Tollway

EPD Challenges and Barriers

Barriers

- Education
- Top-down support
- Public data sets

Challenges

- Incentives
- Harmonization

FHWA Sustainable Pavements Program

Advance the knowledge and practice of:

- Designing
- Constructing
- Maintaining



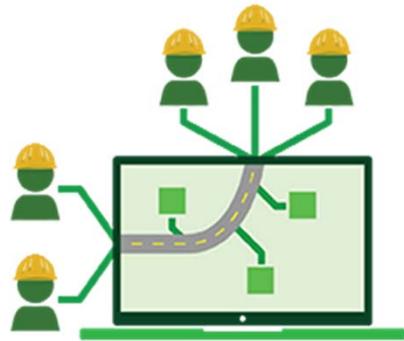
Source: FHWA

More sustainable pavements through:

- Stakeholder engagement
- Education
- Development of guidance and tools



Current Program Resources



Source: FHWA

Sustainable Pavement Technical Working Group

- Public bi-Annual meeting

References

- Reference Manual

Technical Guidance

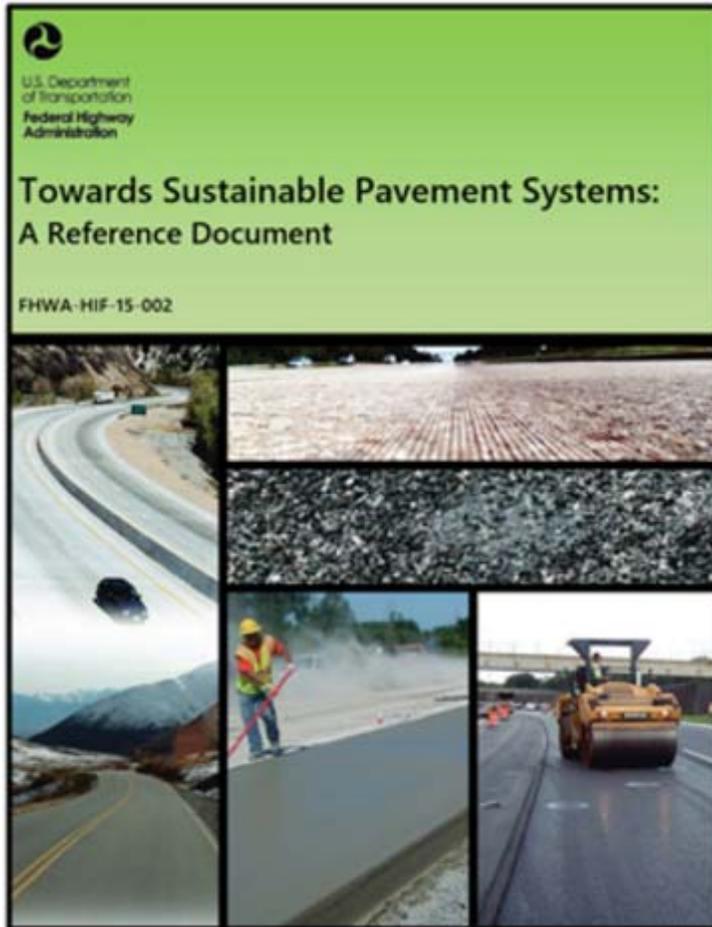
- LCA Framework

Technology Transfer

- Webinars
- Tech Briefs



Sustainable Pavements Reference Document



Education

- Shows how to incorporate sustainability concepts into pavement design, construction and maintenance

Technical Guidance

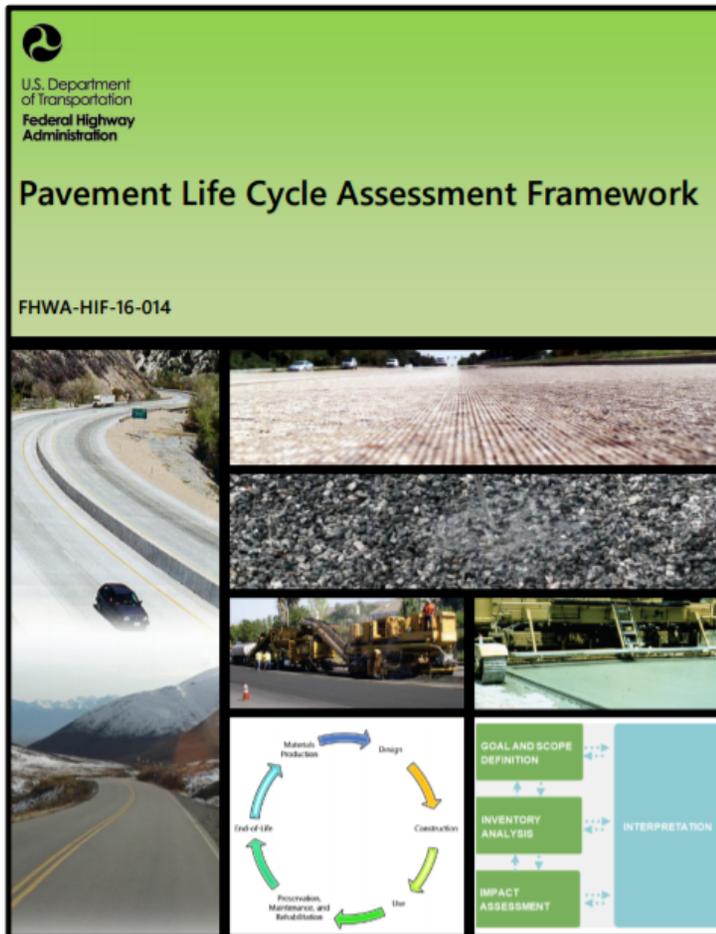
- Incorporates life cycle thinking
- Identifies more sustainable approaches
- Benchmarks current understanding

Deployment

- Encourages adoption of more sustainable practices



LCA Framework



Education

- Informs agencies on pavement LCA methodology and application
- Shares LCA principles with practitioners

Technical Guidance

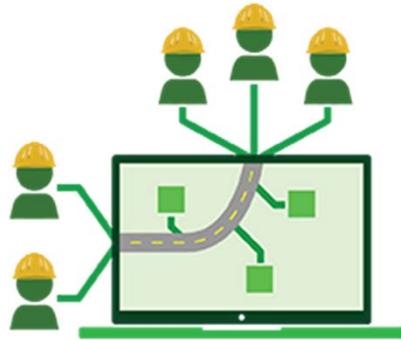
- Shares guidance on implementation of pavement LCA within the U.S.
- Documents current practices and gaps

Deployment

- Encourages progress in pavement LCA



Future Program Resources



Sustainable Pavement Technical Working Group

- May 8-9, 2018 – Seattle, WA

Source: FHWA

References

- Case Studies

Tools

- LCA Benchmarking Tool

Technical Guidance

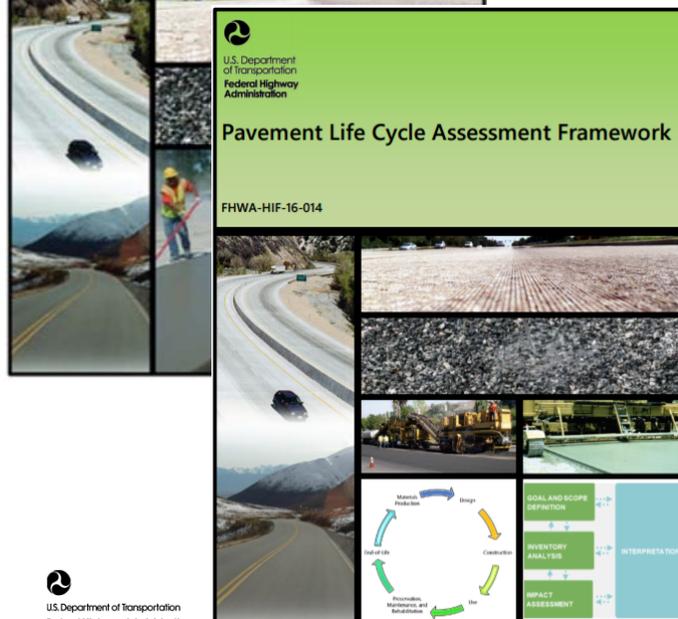
- LCA Pilot Study

Conclusion

- Sustainable Pavements is good engineering



- Current practices include many sustainable approaches



- Now we need to begin measuring and communicating our progress
 - LCA, LCCA, and green rating systems

Want More?

- Visit Website
www.fhwa.dot.gov/pavement/sustainability
 - Review available resources
 - Join the Sustainable Pavements Program Friends List
- Attend a Sustainable Pavement TWG meeting
- Contact me with questions, comments, or suggestions

Heather Dylla,
heather.dylla@dot.gov