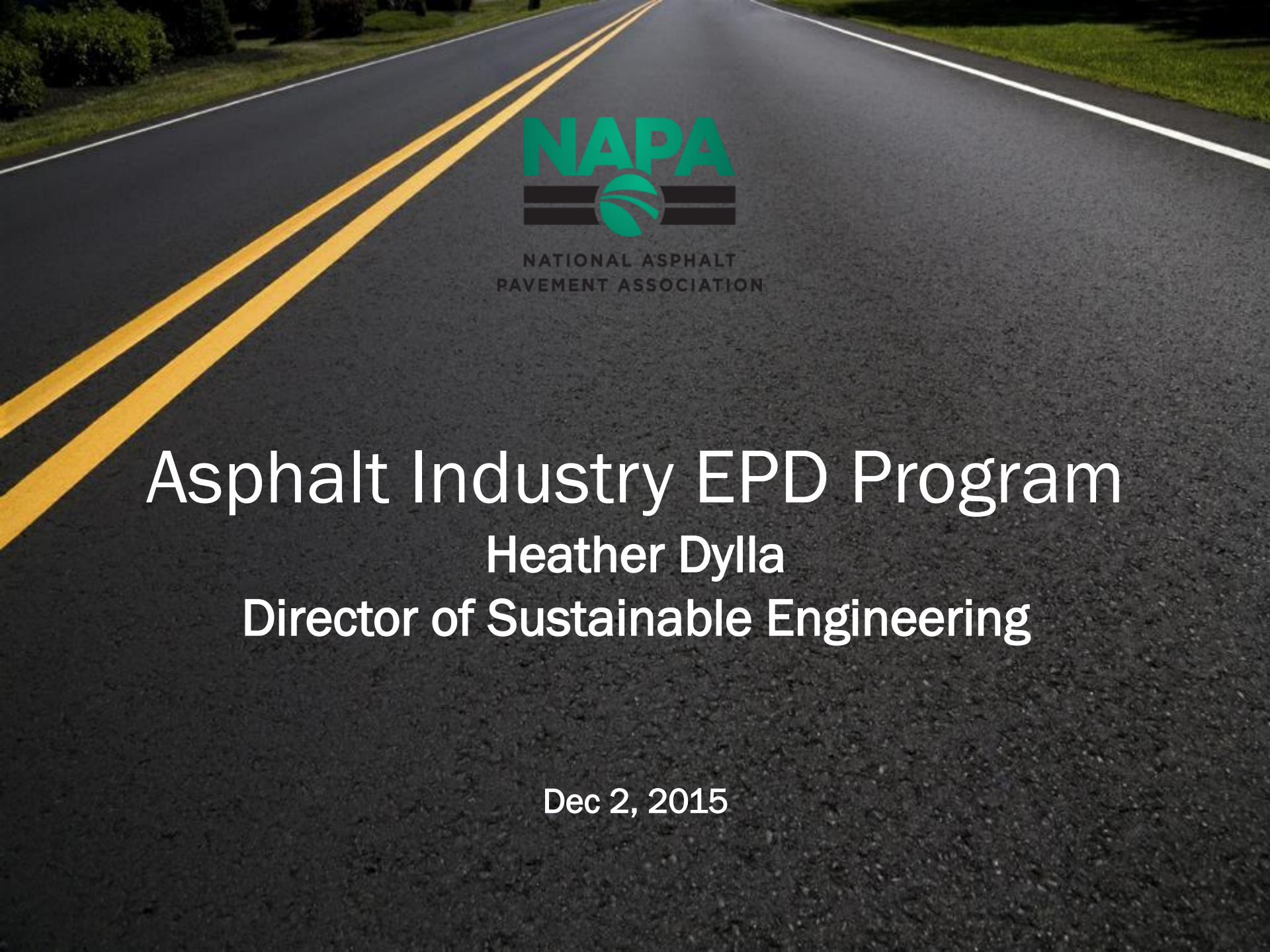


Asphalt Industry EPD Program

Heather Dylla
Director of Sustainable Engineering

Dec 2, 2015

Presentation Takeaways

- What is an EPD?
- How is an EPD created?
- Industry Efforts

NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION

Growing Public Demand

81% Executive Corporate Leaders believe they need to adopt sustainability principals

McGraw-Hill Construction 2012

>50% of State DOT's have adopted sustainability principles

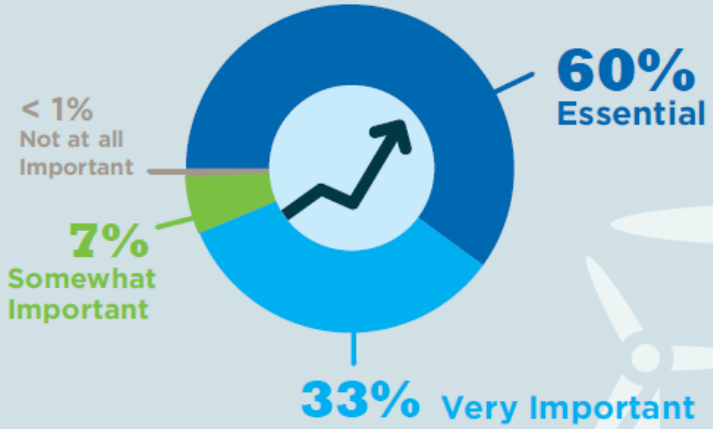
NCHRP 20-83 2012

NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION

Future Trends

Grad students look into the future of impact issues…

93% of students say **social/environmental issues are important to a business' long-term success.**



Students predict the **most important issues for business to get right in the next ten years:**

1. Climate & Energy [34%]
2. Sustainable Product Development & Marketing [23%]
3. Resource Conservation [17%]
4. Supply Chain Management [14%]
5. Human Rights/Fair Labor [13%]

Infrastructure Green Rating Systems

- National, State, Local
- Rating Tool
  - Best practices
  - Earn Credits
  - Indicator of sustainability

INVEST
ECONOMIC • SOCIAL • ENVIRONMENTAL

envision™

SUSTAINABLE

U.S. GREEN BUILDING COUNCIL
LEED CERTIFIED
USGBC

ISI
INSTITUTE FOR SUSTAINABLE INFRASTRUCTURE

STARS

PEACH Roads
Preserving Environment And Community Heritage

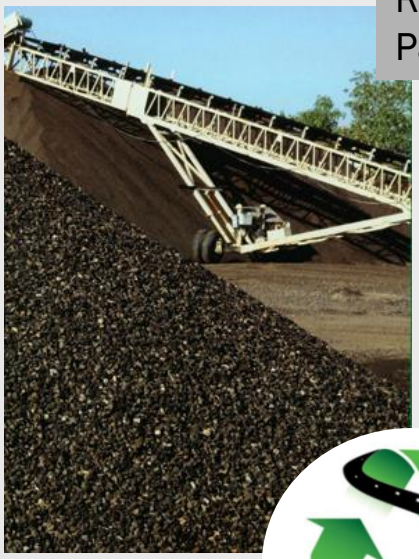
Greenroads™

GreenLITES
Evergreen

I-LAST™

NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION

New Era of Transparency



Reclaimed Asphalt Pavement (RAP)

Ground Tire Rubber (GTR)

Recycled Asphalt Shingles (RAS)

NATIONAL ASPHALT PAVEMENT ASSOCIATION

Material Credits

LEED 2009

- Recycled or Reuse Materials

LEEDv.4

- Environmental Product Declarations

Environmental Product Declarations

EPD declares quantified environmental data for a defined product

- Fair
- Comparable
- Third Party Reviewed
- Credible

Environmental Facts

Functional unit: 1 metric ton of asphalt concrete

Primary Energy Demand [MJ]	$3.9x10^3$
Renewable [MJ]	*$3.9x10^3$*
Non-Renewable [MJ]	*$3.5x10^2$*
Global Warming Potential [kg CO_2-eq]	79
Acidification Potential [kg SO_2-eq]	0.23
Eutrophication Potential [kg N-eq]	0.012
Ozone Depletion Potential [kg CFC-11-eq]	$7.3x10^{-9}$
Smog Potential [kg O_3-eq]	4.4

Boundaries: Cradle-to-Gate
Company: XYZ Asphalt
RAP: 10%

Source: PE International, Values are for illustration purposes only.

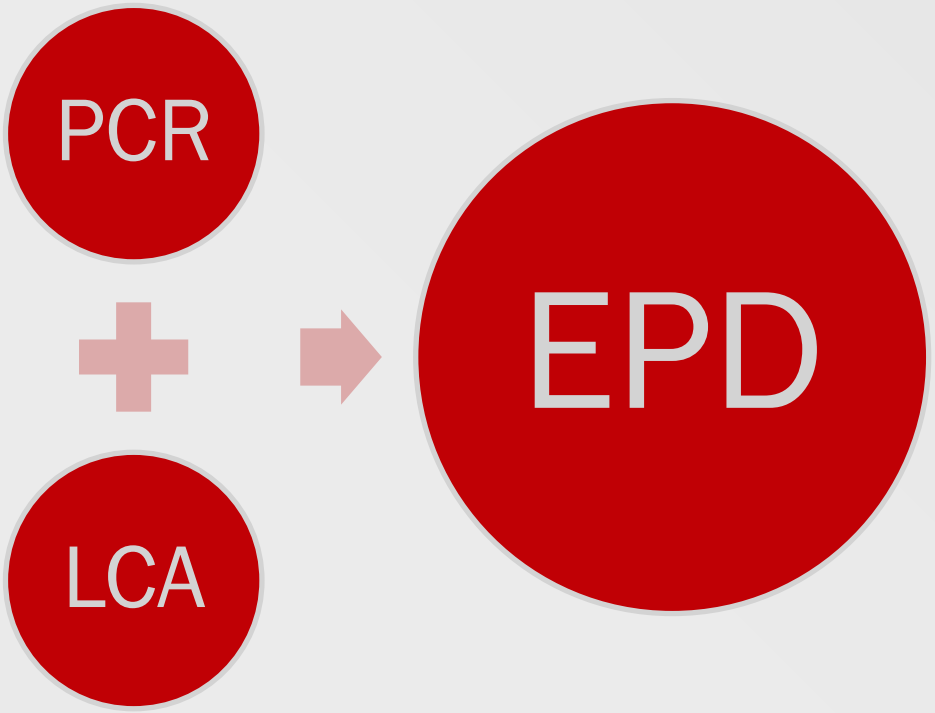
NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION

Environmental Product Declarations

Environmental Product Declarations (EPDs)

Standardized life cycle assessment (LCA) report defined by product category rules (PCRs)

- ISO 14040 - LCA
- ISO 14025 - EPD



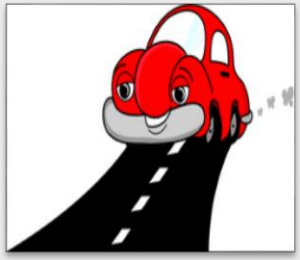
NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION

Pavement Life Cycle Assessment

LCA

Inputs – Materials, Energy, Water

Recycle/Reuse

Raw Material	Production	Construction	Use	End of Life
				
• Aggregates • Admixtures • Asphalt Binder • Transport	• Fuel • Water • Equipment	• Transport • Paving	• Vehicle Operation • UHI • Stormwater Runoff • Maintenance/ Workzone congestion	• Landfill • Recycle

Outputs – Solid Wastes, Emissions to Air, Emissions to Water

NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION

Impact Assessment

LCA

Per ton of HMA	Asphalt	Aggregates		Plant Oper.	Transport	Const.	Total
		Natural	Manuf.				
Emissions to Air (g/ton)							
SO_2	9.4E+01	----	----	1.7E+00	----	----	9.5E+01
NO_x	1.1E+02	1.3E+00	----	1.3E+01	4.4E+02	1.5E+02	7.1E+02
CO_2	1.5E+04	1.2E+03	----	1.7E+04	----	----	3.2E+04
CO	7.3E+00	----	----	6.5E+01	1.9E+03	6.0E+02	2.6E+03
HC	6.8E+01	----	----	----	1.5E+02	5.0E+01	2.7E+02
Metals not specified	2.3E-01	----	----	----	----	----	2.3E-01
HCl	5.7E-02	----	----	----	----	----	5.7E-02
PM2.5	----	----	5.6E-03	----			
PM10	----	----	4.7E+01	3.2E+			
Total PM	1.1E+01	8.1E+01	1.6E+02	1.4E+			
CH_4	----	----	----	6.0E+			
VOC	----	----	----	1.6E+			

Source: Hassan 2009

Potential Environmental Impact		
Global Warming Potential	Acidification	Eutrophication
Fossil Fuel Depletion	Water Use	Criteria Air Pollutants
Human Health- Noncancerous	Human Health- Cancerous	Photochemical Smog
Ozone Depletion	Terrestrial Toxicity	Resource Depletion
Land Use	Aquatic Toxicity	

- *Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI)*
  - Impact Assessment Tool for US
  - Developed by EPA

NATIONAL ASPHALT PAVEMENT ASSOCIATION

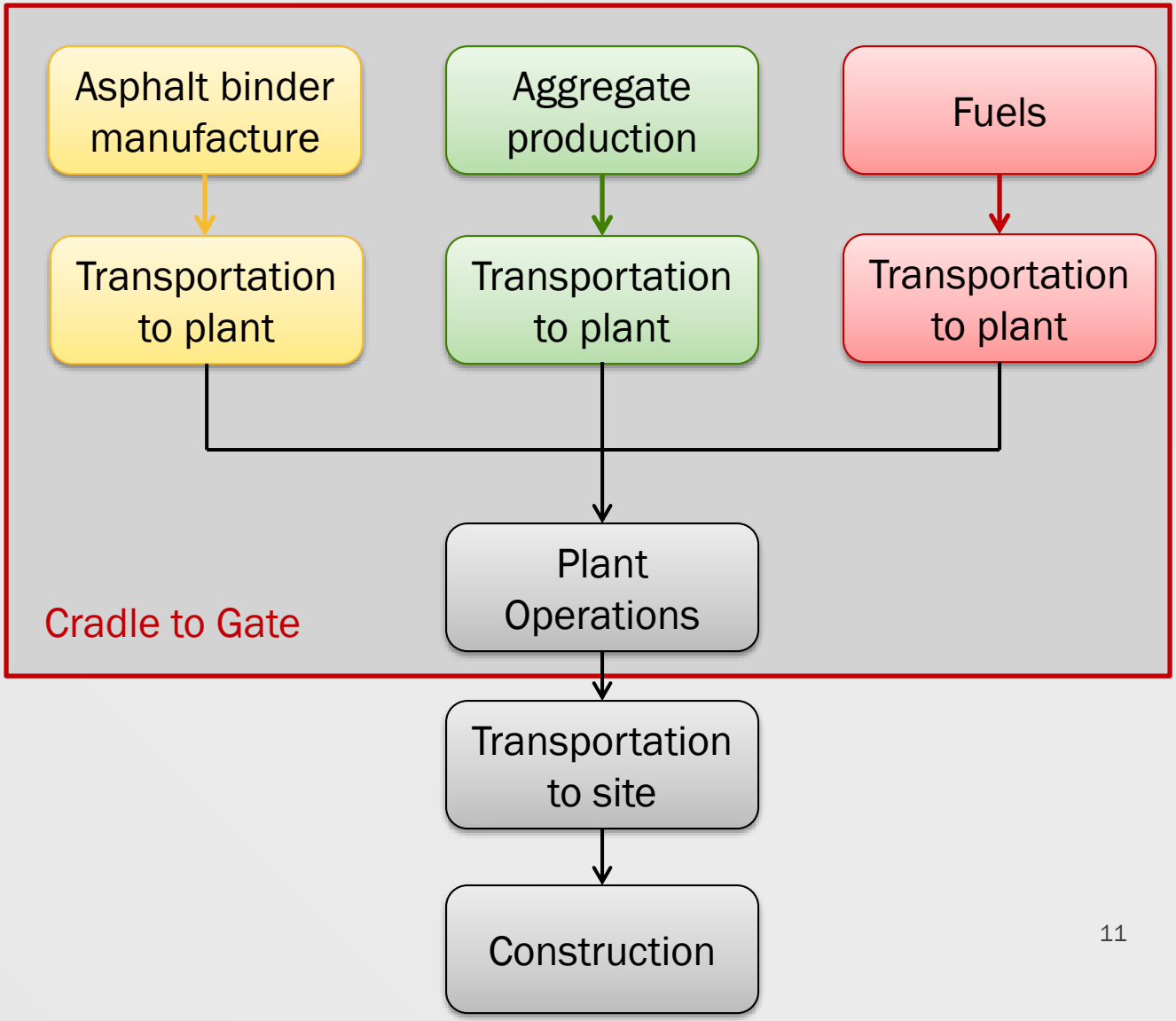
Product Category Rules (PCR)

PCR

Product Category Rules (PCRs)

Rules a product must follow to publish an EPD

- Defines Goal and Scope
- Sets LCA boundaries
- Delineates Acceptable Inventory Data
- Identifies Impact Categories



NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION

Chair EPD

Environmental Product Declaration
A presentation of quantified environmental life cycle product information for the **Think** work chair in North America.

Think

Life Cycle Inventory Analysis

The Life Cycle Inventory Analysis covers entire life cycle stages as shown below.

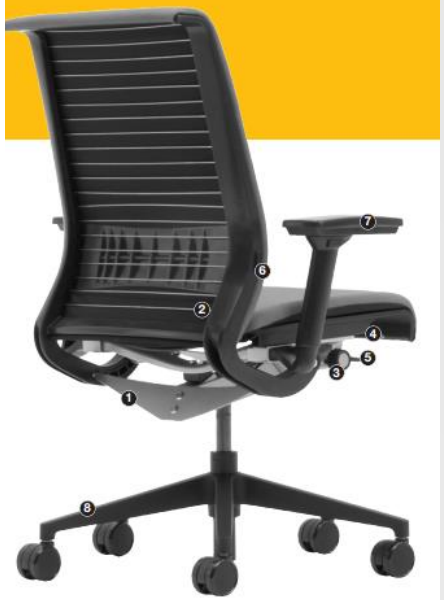
Materials
This stage includes raw materials extraction and transformation, as well as purchased parts, until delivery to the manufacturing site in Grand Rapids.

Production
This stage comprises all production and assembly processes. Data was obtained from the management system of the production site in Grand Rapids.

Transport
Transport from suppliers to Grand Rapids and transport from Grand Rapids to major North American markets is considered.

Use
No relevant environmental exchanges occur during the use of the product.

End of life
A product can be disposed of in different ways, or become a resource itself. Based on current North American averages, it was assumed that about 99% of the products are landfilled, 0% incinerated and 1% recycled at the end of their useful life.



Distribution of the environmental impacts for the relevant life cycle stages

Category	Unit	Total	Materials	Production	Transport	End of Life
Global warming	[g CO_2-eq.]	102 610.0	67 800.0	27 700.0	3 720.0	3 390.0
Acidification	[g SO_2-eq.]	836.6	535.0	266.0	35.3	0.3
Eutrophication	[g NO_3-eq.]	712.2	471.0	179.0	59.2	3.0
Photochemical smog	[g C_2H_4-eq.]	24.2	18.0	0.8	4.6	0.7

No relevant environmental exchanges occur during the use stage of the product.

Steelcase

NATIONAL ASPHALT PAVEMENT ASSOCIATION

How to get an EPD

1. Identify Program Operator
2. Identify or Develop a PCR – Program Operator
3. Conduct LCA study – LCA Consultant
4. Development of EPD – LCA Consultant
5. Verification of EPD and LCA study – Third Party Reviewers
6. Publish EPD – Program Operator

NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION

EPD Project

Environmental Sustainability

- Initial Goal Develop Industry Average EPD
- Determine Program Operator
  - Affordability
  - Credibility
  - Facilitates Innovation
- Conduct Underlying LCA – Amlan Mukherjee

NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION

Who are Program Operators?

LCA/EPD Consultants

NSF

UL

FPInnovations

Standard Developers

CSA Group

ASTM INTERNATIONAL

Non-Profit Associations

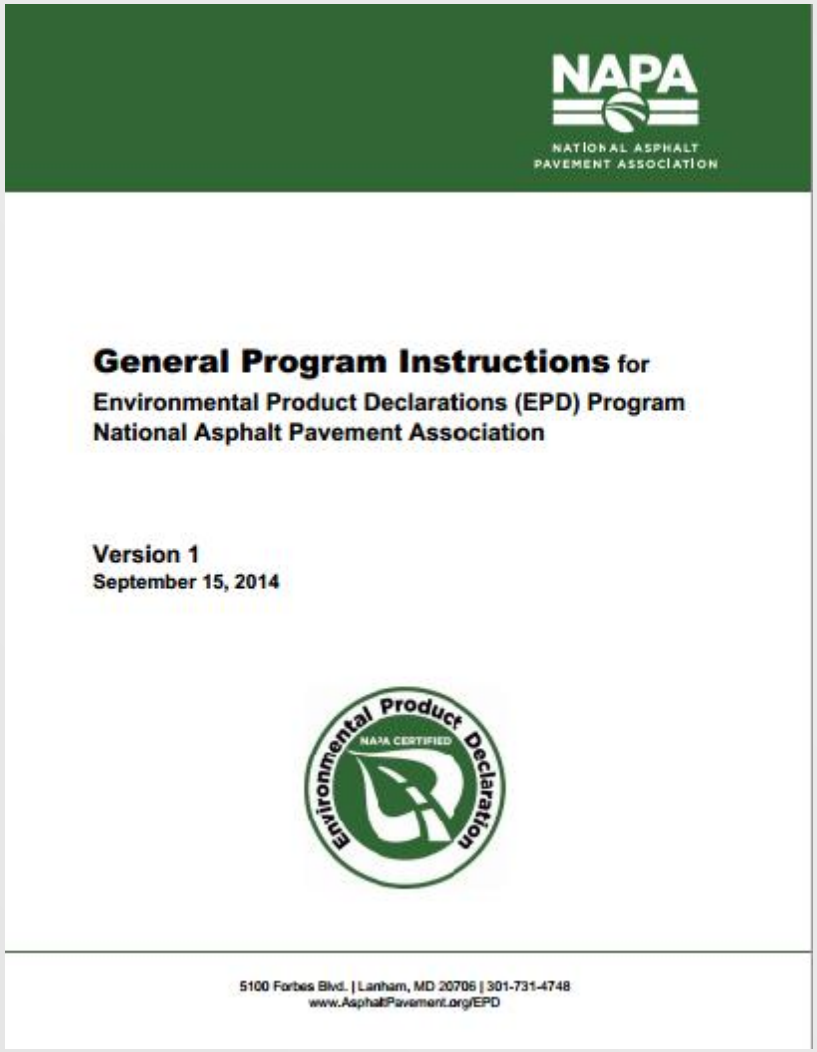
IERE

NRMCA

NAPA

NATIONAL ASPHALT PAVEMENT ASSOCIATION

NAPA EPD Program



- Program Overseen by the Sustainability Committee
  - Created in Sept. 2014
  - International Standards
- PCR for Asphalt Mixtures for use in North America
  - PCR Guidance Development Initiative
  - Starting Point –Norwegian PCR

www.asphaltpavement.org/epd

PCR Development Working Group

Customers

- Local
- State
- Federal

Industry

Asphalt Producers

Asphalt Binder Suppliers

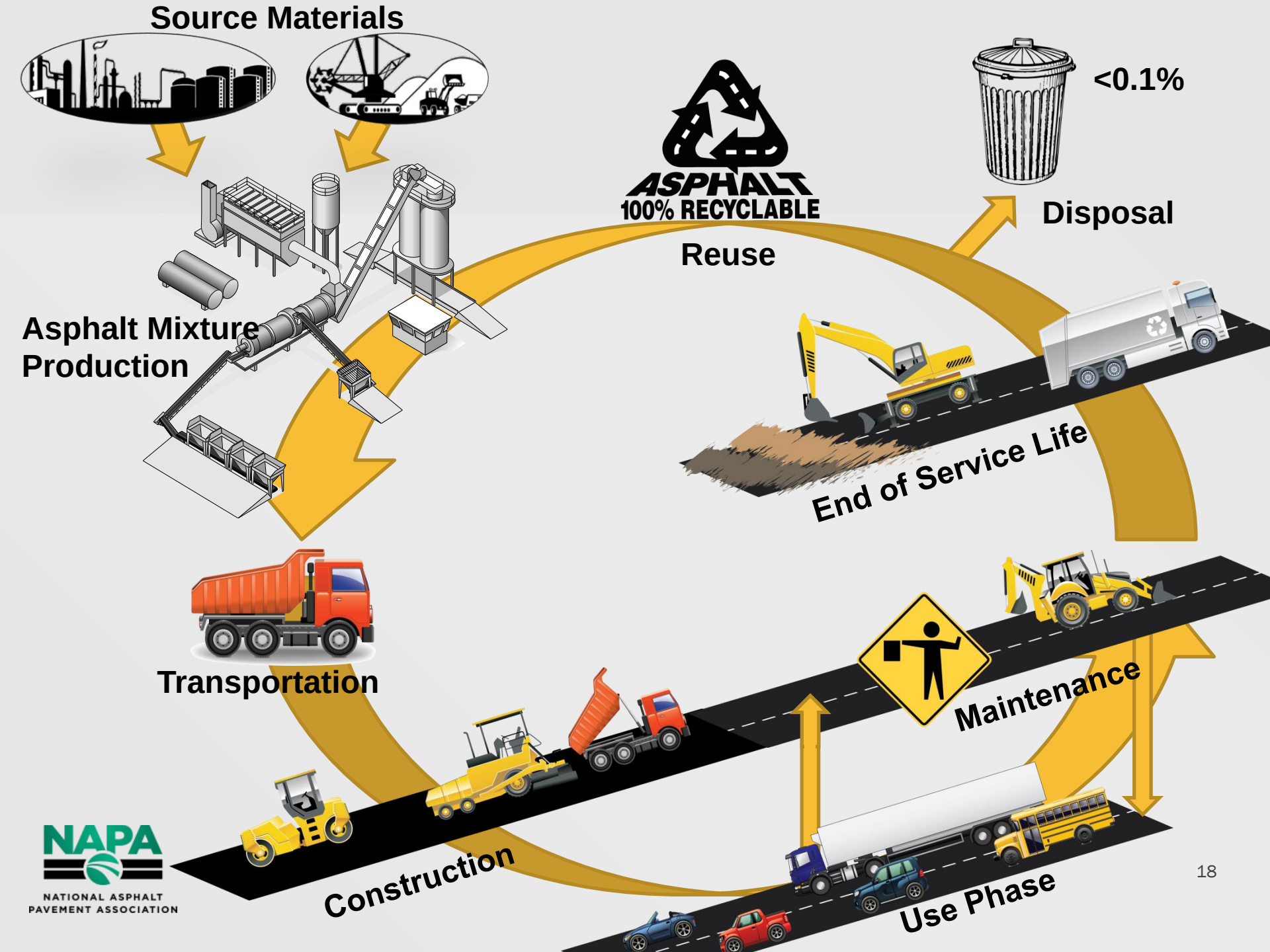
Asphalt Contractors

Other

Academic

LCA Expert

NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION



NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION

Underlying LCA – Data Collection

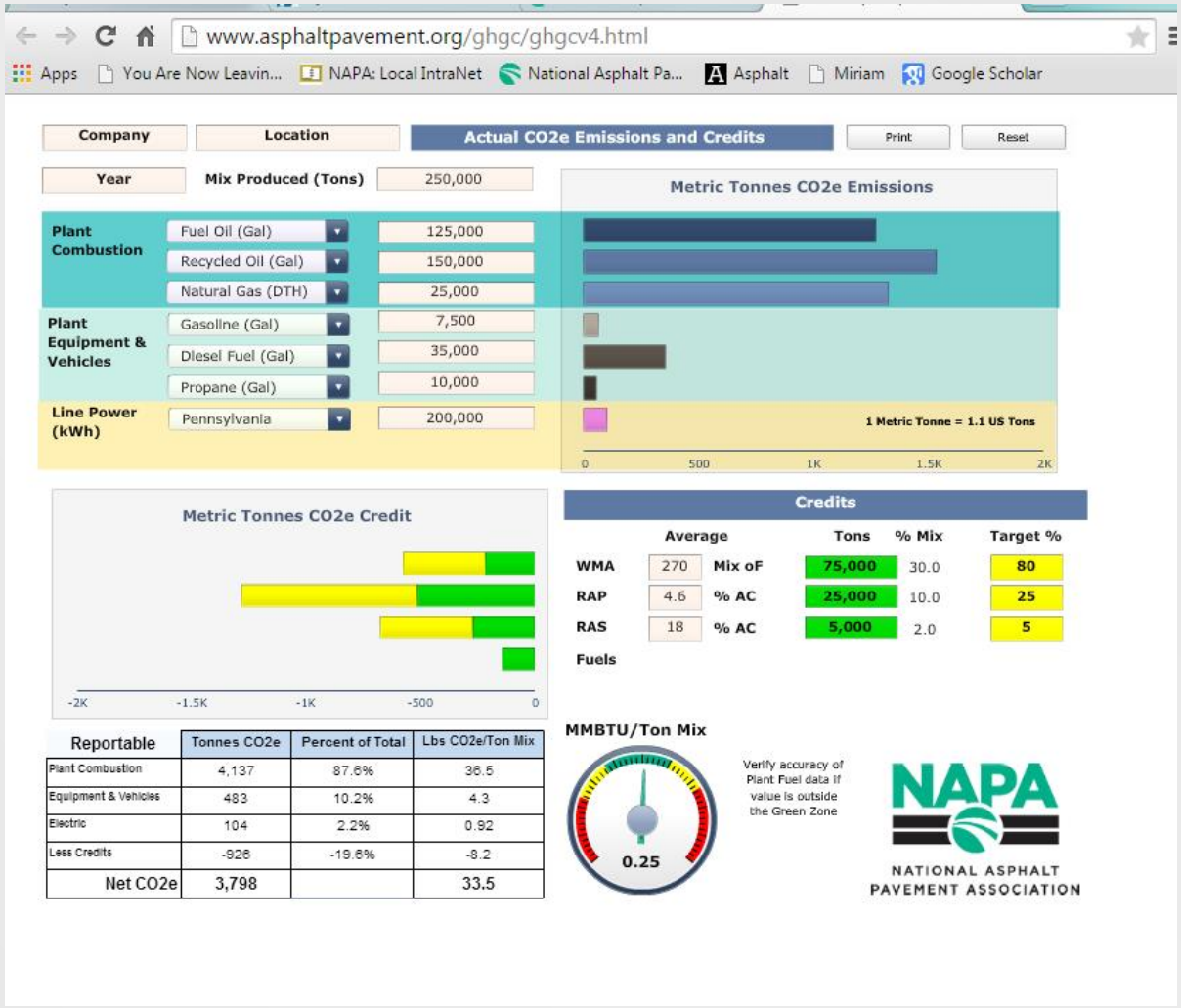
- Led by Dr. Amlan Mukherjee
- Surveyed nearly 40 plants
- Primary Data
  - Natural gas (in cu-ft) – annual
  - Electricity (kWh) – annual
  - Diesel oil used in boiler and equipment (gallons) – annual
  - Mix design data and percentage production
  - Transportation distances: raw materials to plant
  - Emissions: stack test in the last 5 years
  - Plant and region specific insights

NATIONAL ASPHALT PAVEMENT ASSOCIATION

EPD Tool

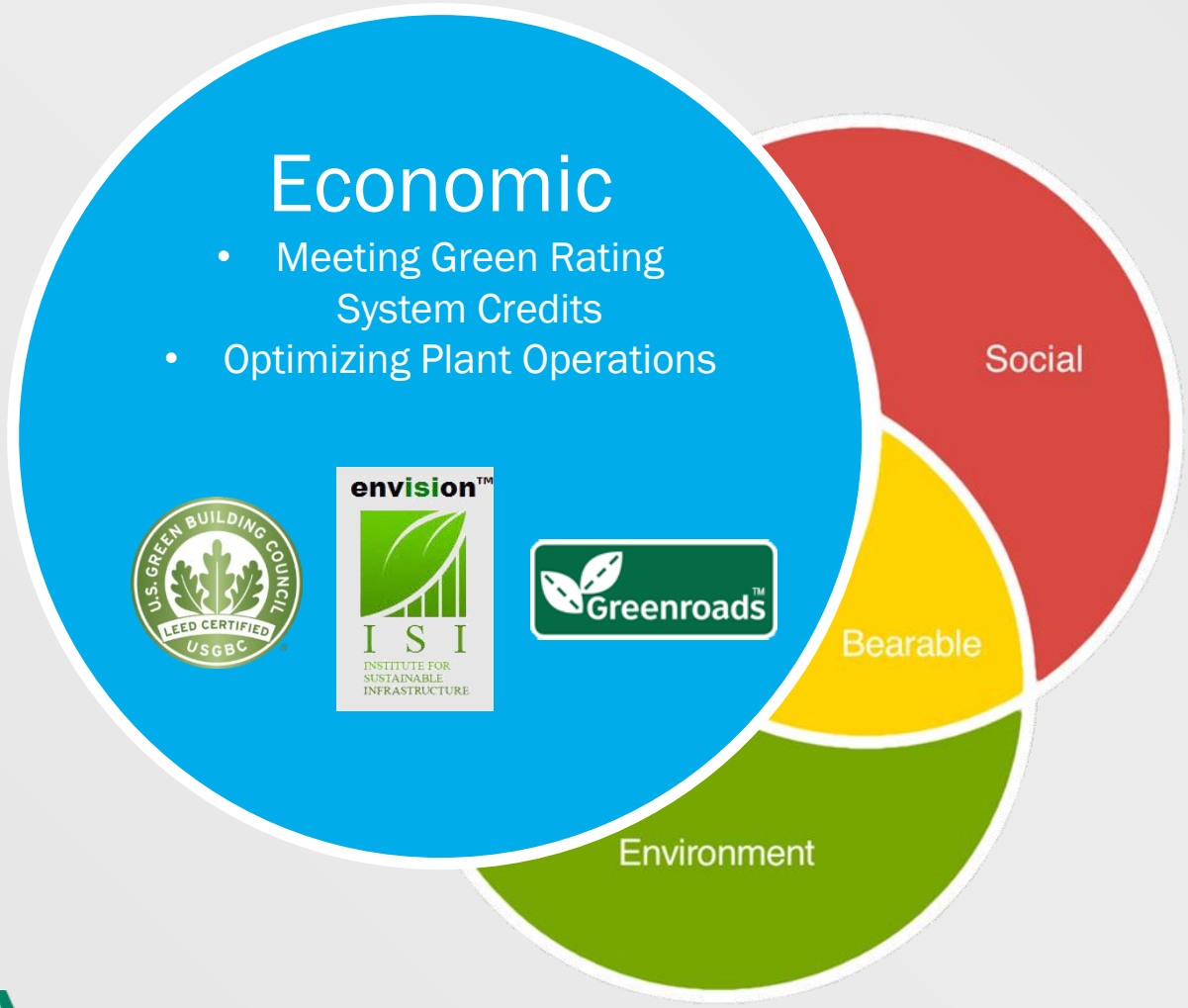
- Aid Contractors to Create EPD
- Online Tool
- Real-Time EPDs

triSIGHT



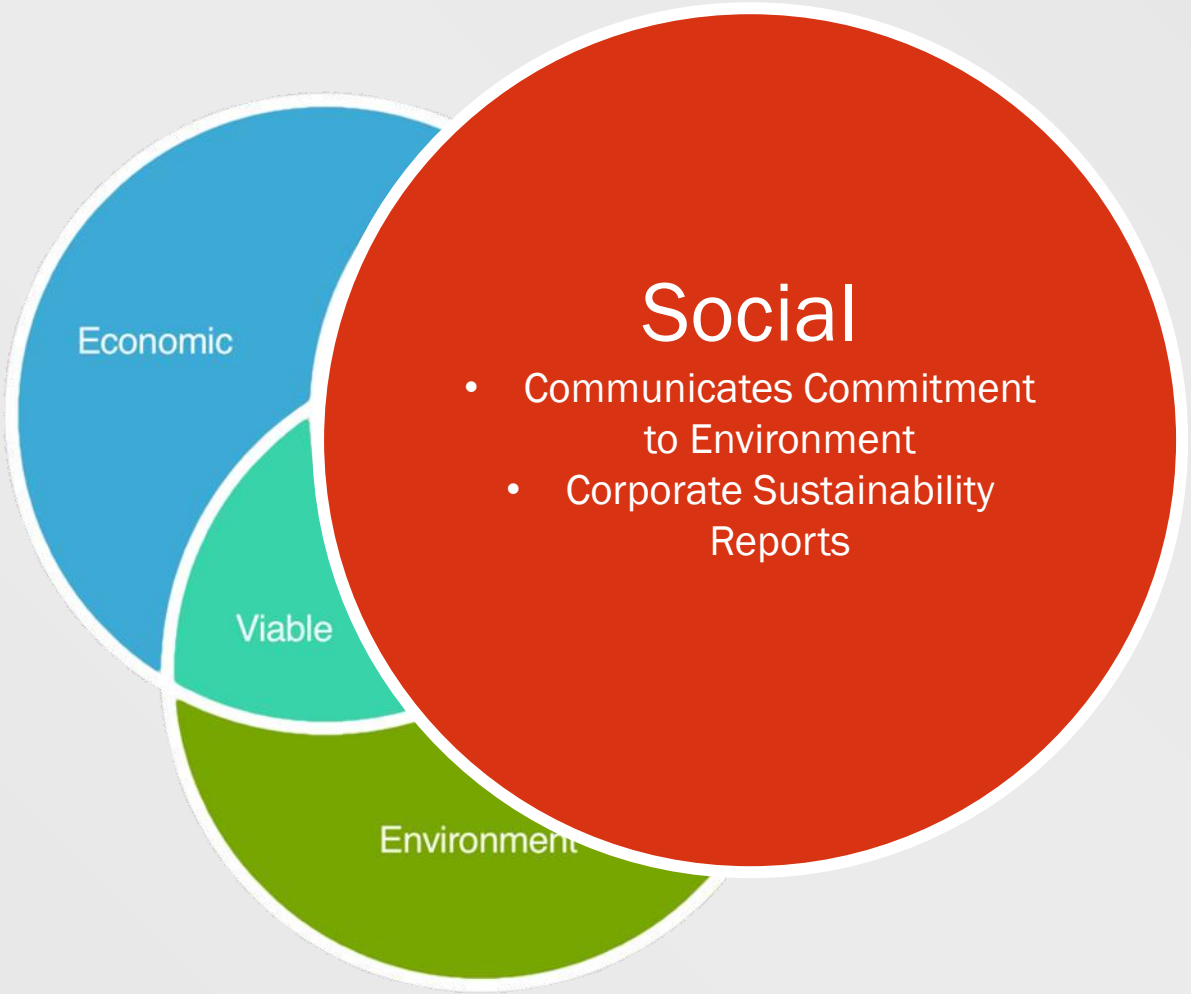
NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION

EPDs in Practice



NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION

EPDs in Practice

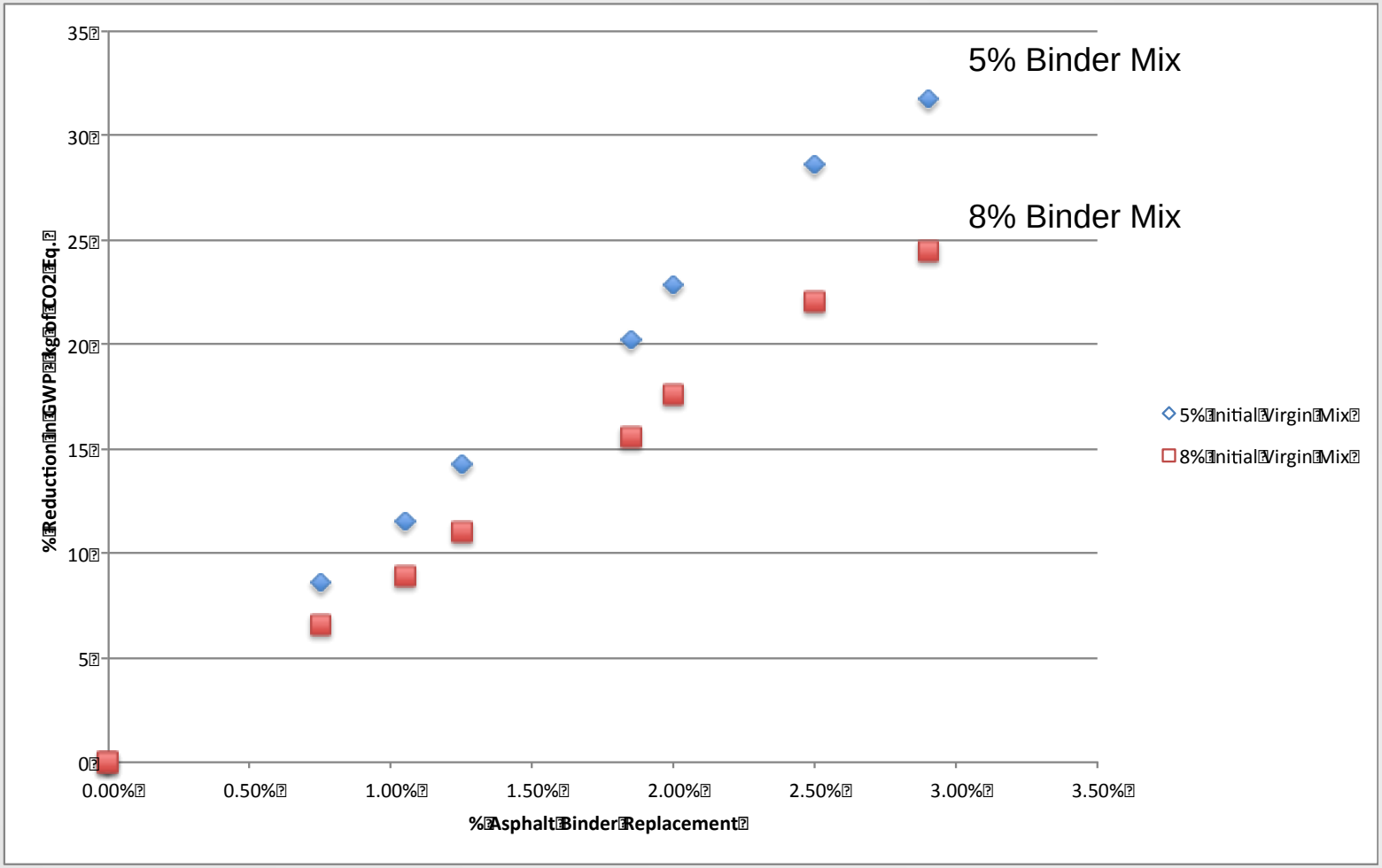


NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION

EPDs in Practice

NATIONAL ASPHALT PAVEMENT ASSOCIATION

Design Curves



NATIONAL ASPHALT PAVEMENT ASSOCIATION

Project Schedule

Environmental Sustainability

- PCRs
  - Public Review – Jan. 2016
  - Published – Spring 2016
- EPD Tool
  - Beta Version – Spring 2016
  - Final Version – End 2016

World of Asphalt 2016 SHOW & CONFERENCE

NAPA NATIONAL ASPHALT PAVEMENT ASSOCIATION

Thank You

Heather Dylla
hdylla@asphaltpavement.org

NATIONAL ASPHALT PAVEMENT ASSOCIATION