



The Road
Forward

A Vision for Net Zero Carbon Emissions
for the Asphalt Pavement Industry

The Road Forward and Other NAPA Research & Innitiatives

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NAPA

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- Trade Association representing asphalt industry

- NAPA's Mission
 - Support
 - Advocate
 - Advance

**What Is
NAPA?**

Thank you, Pennsylvania!

Gold Club (50+ Years)

- Genco-Sellers Gencor
- Volvo Construction Equipment
- Warden Asphalt Co.
- York Building Products Co. Inc.

30-Plus Club

- Joseph McCormick Construction Co. Inc.
- Meeker Equipment Co.
- Riverside Materials Inc.
- Russell Standard Corp.
- Walter R. Earle Corp.

Pennsylvania Members

- Abatech
- Allan Myers
- Blaw-Knox
- Charlestown Paving & Exc., Inc.
- Cumi America Inc.
- Donegal Construction Corp.
- FORTA
- Glenn O. Hawbaker Inc.
- Golden Eagle Construction
- Grannas Bros. Stone & Asphalt Co.
- H&K Group
- Hanson Aggregates
- Harsco Environmental
- Highway Equipment Co.
- Joseph McCormick Construction Co. LLC
- Liberty Tire Recycling LLC
- Lindy Paving Inc.
- Multitherm, LLC

State Advisor: Owen McCormick, Joseph McCormick Construction Co. Inc.



Thank you, Pennsylvania!

Pennsylvania Members

- Paratherm a division of Lubrizol
- Pennsy Supply Inc., a CRH Co.
- Peter J. Caruso & Sons
- Phoenix Services LLC
- Pine Test Equipment
- Plant Demand
- Quaker Sales Corp.
- Riverside Materials Inc.
- Russell Standard
- Schlouch Inc.
- Superior Tire & Rubber Corp
- United Employment Associates LLC
- Volvo Construction Equipment
- Walter R. Earle Corp.
- Warden Asphalt Co.
- York Building Products Co. Inc.

An Industry-Wide Vision

THE ROAD FORWARD PARTNERS



The Future
is Riding on AJAX.®



KOKOSING
MATERIALS, INC.



Helping
the world
thrive



TEICHERT



KRATON





Industry Goals



Net Zero Production and Construction

- Key drivers for emissions during production and construction
- Alternative construction scheduling
- Align policies, procedures, and specs
- WMA technology
- Advanced logistical technologies
- Best practices
- Alternative fuels
- Capital investments

Industry Goal 1

Scope 1 Emissions

Achieve net zero carbon emissions during asphalt production and construction by 2050.



Pavement Quality, Durability, and Use

- Perpetual pavements
- Rolling resistance
- Contract incentives for improved quality and improved vehicle fuel economy
- Crack & Seal, Break & Seal, & Rubblization

Industry Goal 2

Downstream Scope 3 Emissions

Partner with customers to reduce emissions through pavement quality, durability, longevity, and efficiency standards by 2050



Net Zero Materials Supply Chain

- More recycled material
- Balanced Mix Design
- Industry summits
- New technology and materials

“We are America’s No. 1 most recycled product,”
NAPA’s Jay Hansen told *The New York Times*.

Industry Goal 3

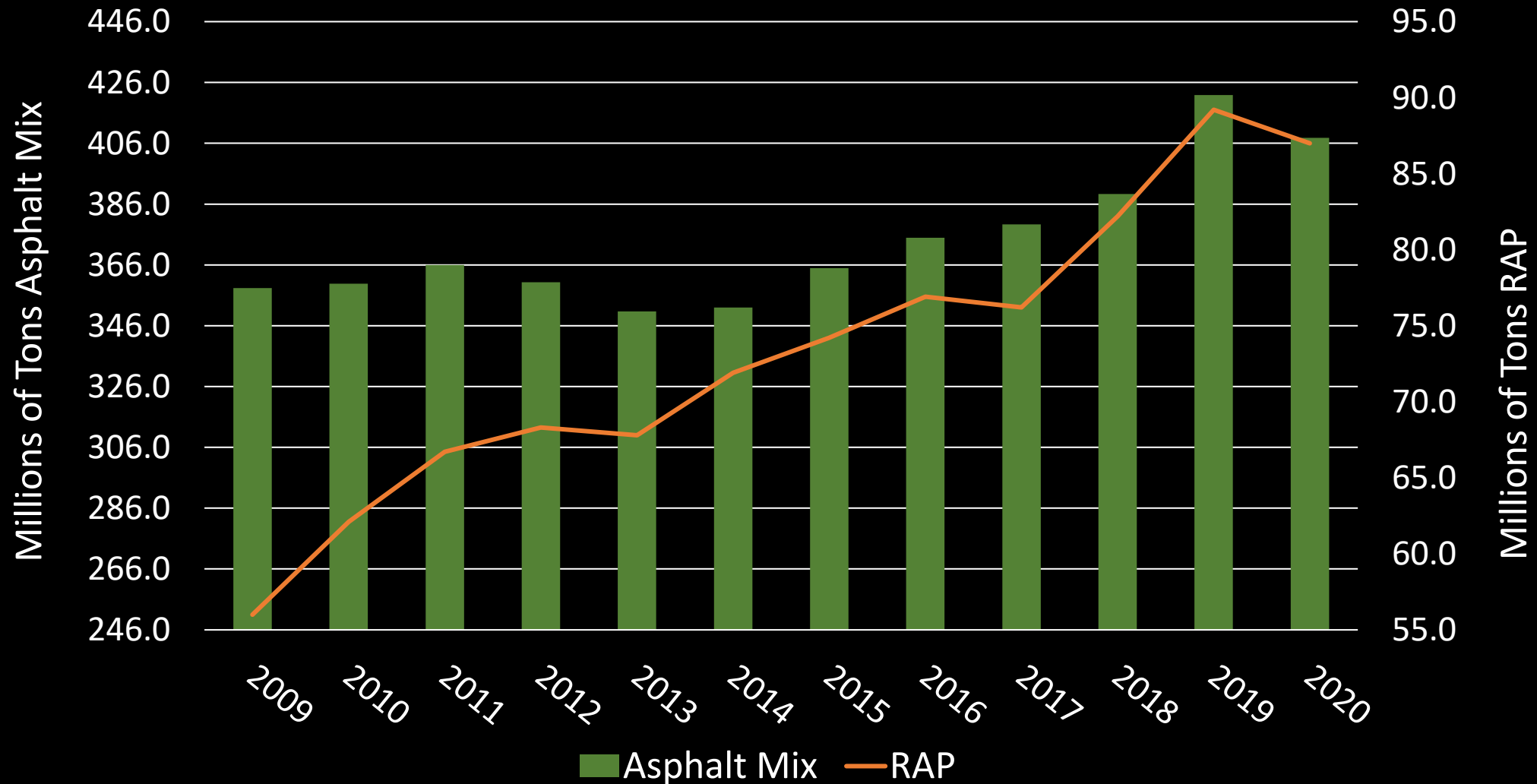
Upstream Scope 3 Emissions

Develop a net zero materials supply chain by 2050



Asphalt Mix and RAP Tonnage

Total Production and Use in the U.S.



Habit #2 – Begin with the end in mind - Covey

- How do we maximize research and implementation \$\$\$
- Track Record is not good for implementation
 - NCHRP 9-46 – NCHRP Report 752 – High RAP Mix Design
 - NCHRP 9-55 – RAS with WMA
- TRIP Database Search
 - \$49,049,615

Balanced Mix Design Definition

- ***“Asphalt mix design using performance tests on appropriately conditioned specimens that address multiple modes of distress taking into consideration mix aging, traffic, climate and location within the pavement structure.”***
- Use the right mix for the job!



BMD Approaches

A. Volumetric Design with Performance Verification

- Volumetric mix design + performance testing at OBC

B. Volumetric Design with Performance Optimization

- Volumetric mix design + performance testing to adjust OBC

C. Performance-Modified Volumetric Design

- Performance testing to optimize mix components and proportions + volumetric verification

D. Performance Design

- Performance testing to optimize mix components and proportions

Volumetric Design with Performance Verification

Little Debbie Mix Design



Volumetric Design with Performance Optimization

Home Cook School of Mix Design



Alton Brown School of Mix Design

Performance-Modified Volumetric Design



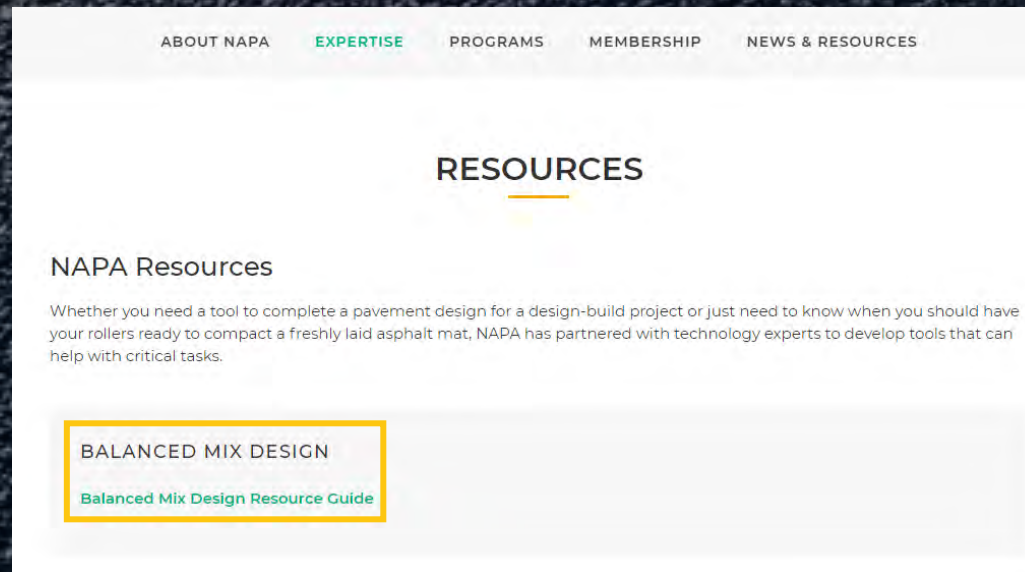
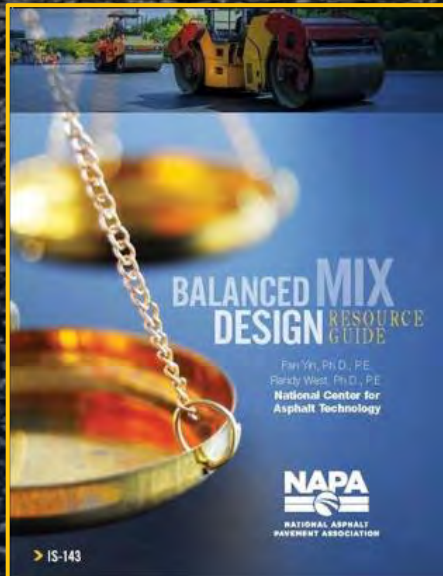
Performance Design Thomas Keller School of Mix Design



BMD Approaches

Approach A → B → C → D

- Degree of strictness on meeting volumetric criteria ↓
- Potential for innovation in meeting performance criteria ↑



Net Zero Grid

- Net zero energy
- Increase efficiencies

Industry Goal 4

Scope 2 Emissions

Transition to electricity from renewable energy providers in support of net zero carbon electricity generation by 2050 and reduce electrical intensities



Carbon Offsets

- Net zero, not total zero
- Last resort – after we do everything we can do



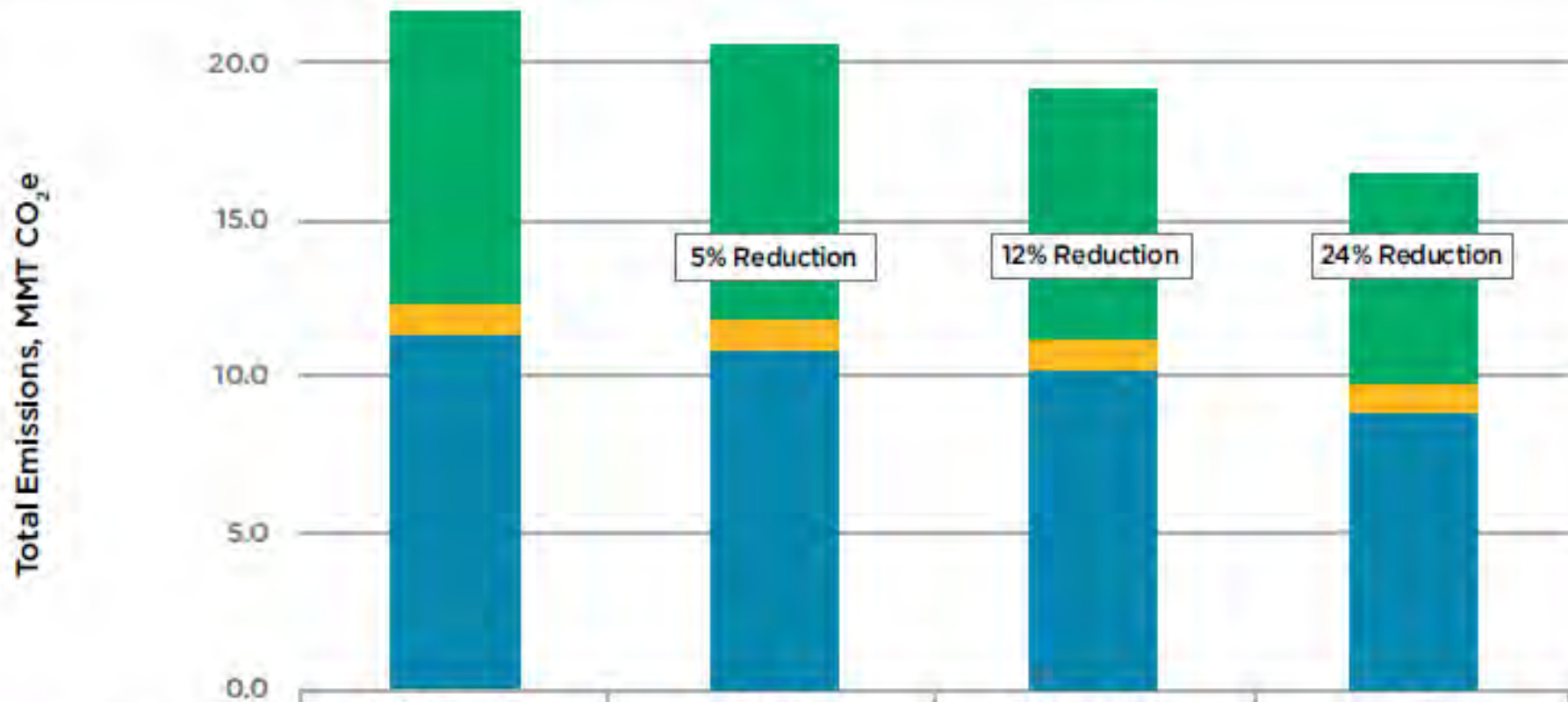
Benefits of Using More RAP

Nationwide, increasing the amount of RAP in new asphalt mixtures by one percentage point (e.g., from 21.1% to 22.1%) would result in 0.14 MMT CO₂e in avoided emissions, equivalent to approximately 30,000 passenger vehicles assuming typical passenger vehicle emissions of 4.6 tonne CO₂e per year (U.S. EPA, 2018).

Emissions Reduction Scenarios

Parameter	2019 Baseline	Short-Term	Intermediate	Long-Term
RAP Content	21%	25%	30%	40%
Natural Gas Consumption as Percentage of Fuel Combusted	69%	72%	75%	90%
Aggregate Moisture Content Reduction	N/A	0.25%	0.50%	1.0%
Asphalt Mix Production Temperature Reduction	N/A	10 °F	25 °F	40 °F
Reduction in Electricity Consumption Intensity	3.32 kWh/ton	5%	10%	20%

Results - Emissions Reduction Scenarios



	2019 Baseline	Short	Intermediate	Long-Term
Total (A1-A3)	21.7	20.6	19.1	16.5
Mix Production (A3)	9.4	8.8	8.0	6.8
Transportation (A2)	1.0	1.0	1.0	0.9
Raw Materials (A1)	11.3	10.8	10.1	8.8

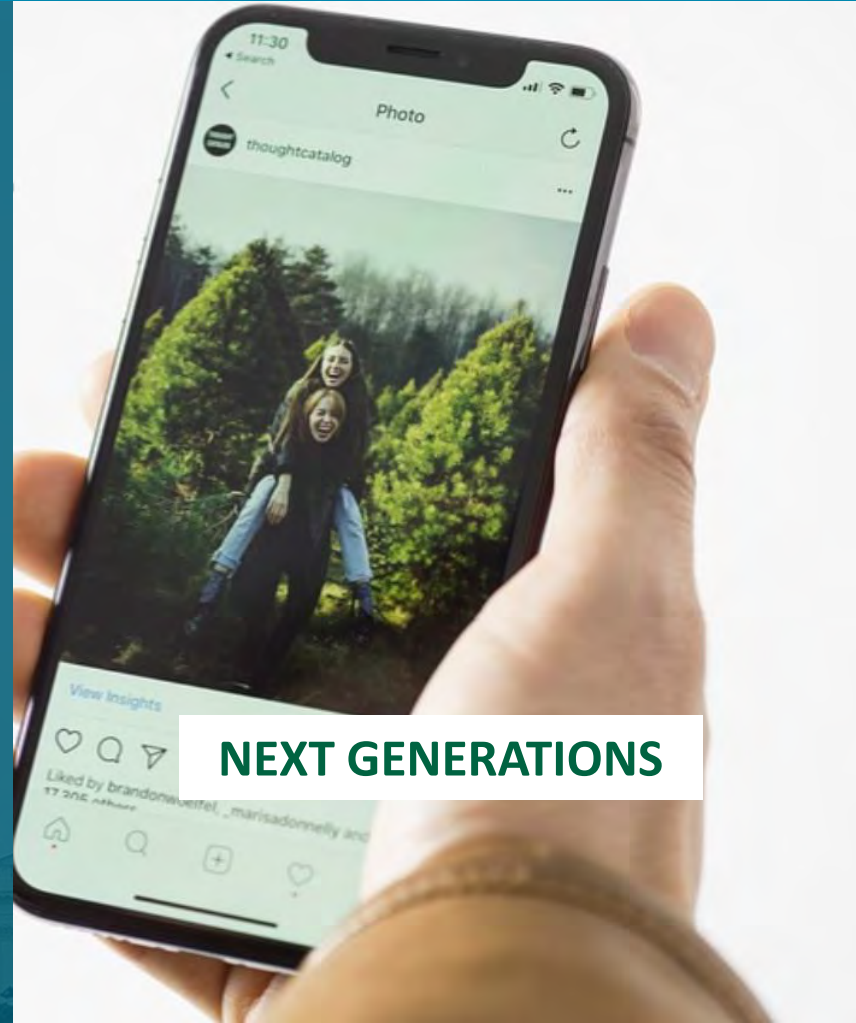
Why?



PROFIT



LEGISLATION



NEXT GENERATIONS

Understanding Carbon



Embodied Carbon

Manufacture, transport and installation of construction materials

Operational Carbon

Building Energy Consumption

What is an EPD?

- **Environmental Product Declaration**
 - **Quantified** environmental information on the **life cycle** of a product to enable **comparisons** between products fulfilling the **same function***
- **“Nutrition label” for environmental impacts**
 - ISO Type III Environmental Label
- **Independently verified**



EPD “Nutrition” Label

Your Building Product

Amount per Unit	
LCA IMPACT MEASURES	TOTAL
Primary Energy (MJ)	12.4
Global Warming Potential (kg CO ₂ eq)	0.96
Ozone Depletion (kg CFC-11 eq)	1.80E-08
Acidification Potential (mol H ⁺ eq)	0.93
Eutrophication Potential (kg N eq)	6.43E-04
Photo-Oxidant Creation Potential (kg O ₃ eq)	0.121

Your Product's Ingredients: Listed Here

<https://westcoastclimateforum.com/cfpt/concrete/strategy1>

*Source: ISO 14025:2006. EPDs from different Product Categories should NOT be compared to each other.

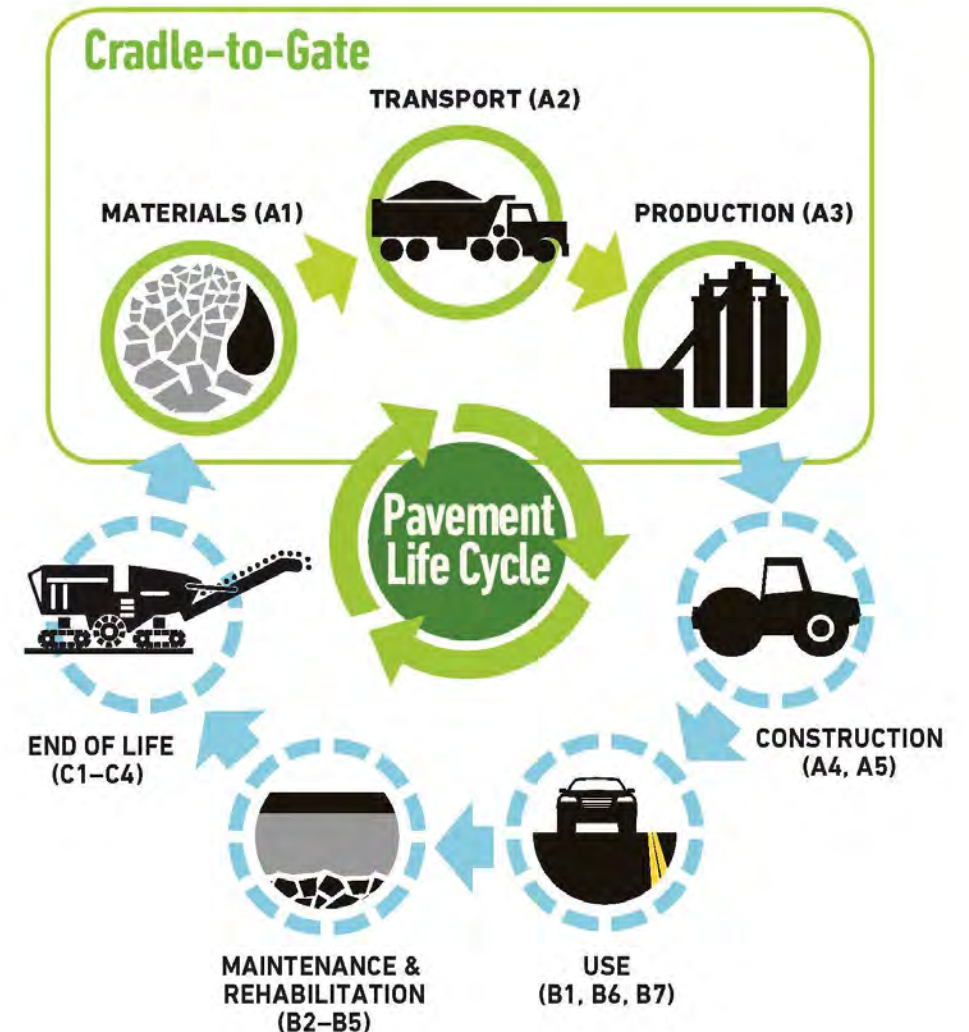
EPDs for asphalt mixtures have a **Cradle-to-Gate** scope

- **Included:**

- Materials
- Transport
- Production

- **Other life cycle stages are not included**

- Mix producers have little control over them

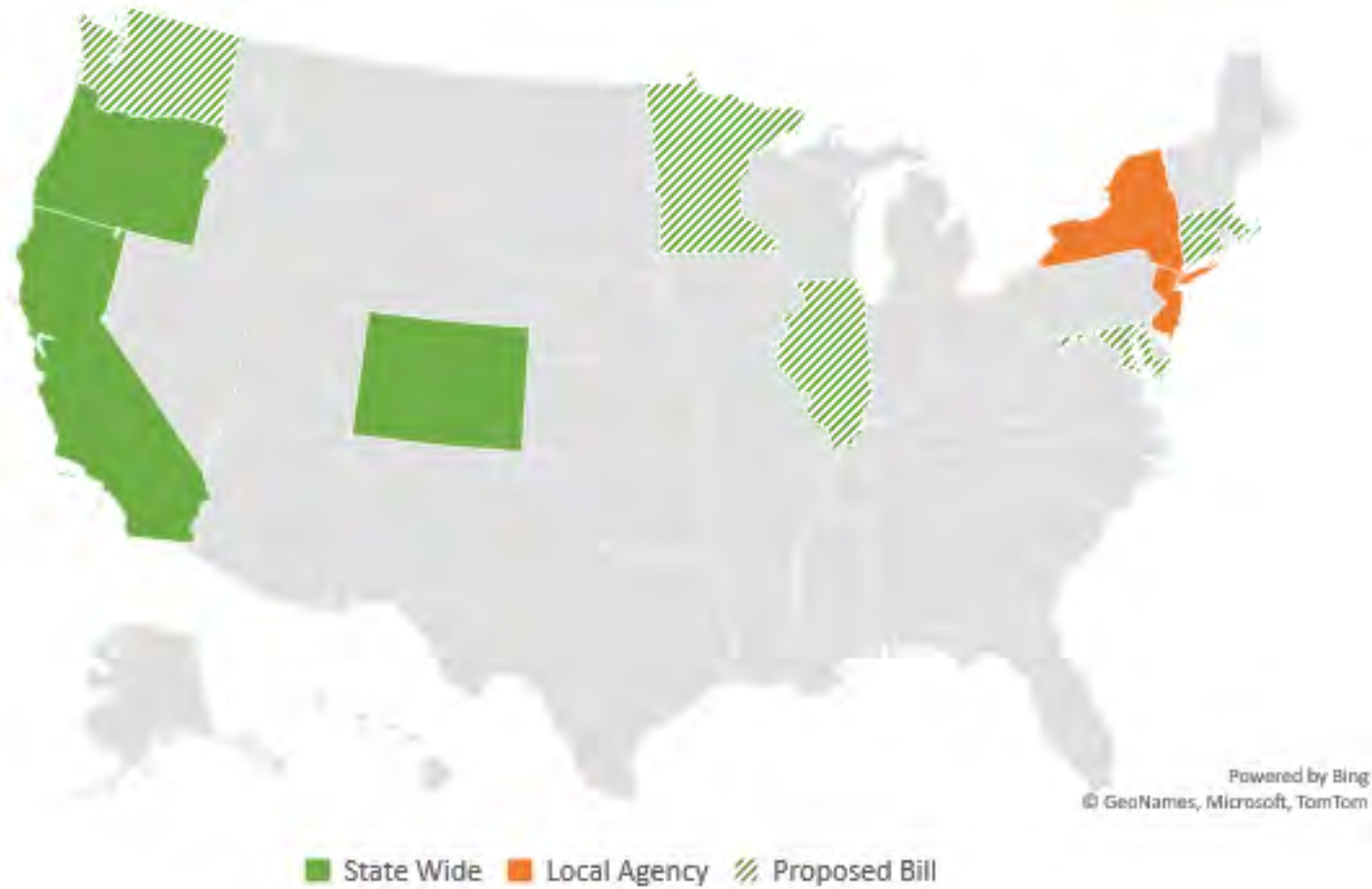


How and Why are Pavement Owners Using EPDs?

“Buy Clean” Legislation

Jurisdictions with Buy Clean policies that include asphalt mixtures

- Caltrans
- Colorado
- Oregon
- Port Authority of New York and New Jersey
- Illinois, Minnesota, other states are considering policies





Environmentally Preferable Asphalt and Standard

- Federal office buildings, courthouses, and land ports of entry
- Requirements
 - Submit an EPD for each mix
 - Use 2 environmentally preferable techniques
 - At least 20% RAP content
 - Warm mix technology (reduced onsite mix temperature)
 - Non-pavement recycled content (roof shingles, rubber, or plastic)
 - Improved energy/carbon efficiency of plants or equipment (e.g., natural gas)
 - Other environmentally preferable techniques (contractor can propose)

<https://www.gsa.gov/real-estate/design-construction/engineering-and-architecture/facilities-standards-p100-overview>





The White House Council on Environmental Quality

Buy Clean Task Force

- Coordinating across 17 Federal agencies
 - 90% of federally financed and purchased construction materials
- U.S. DOT Buy Clean Policy Statement
 - Explore the use of EPDs
 - Develop a Buy Clean Policy based on EPDs
- Partnering with State DOTs to align Buy Clean Policies

Carbon Reduction Program



President Biden, USDOT Announce New Guidance and \$6.4 Billion to Help States Reduce Carbon Emissions Under the Bipartisan Infrastructure Law

Thursday, April 21, 2022

Key program will fund projects that help fight climate change and save Americans money on gas

- Focus is on vehicle fuel consumption/emissions
- FHWA Guidance made “paving activities” eligible
 - Projects must use LCA to quantify carbon emissions reductions
- Enhanced pavement smoothness may also be eligible



Inflation Reduction Act

EPA

- \$250 million to standardize EPDs and help industry develop EPDs
- \$100 million to develop “low-embodied carbon construction material labeling program”

*** How will low-embodied carbon materials be defined ???

DOT/FHWA

- \$2 billion to procure low carbon construction products
 - Federal-aid Highways, Federal Lands, etc.
 - Differential Cost or Incentive

Where To Begin?



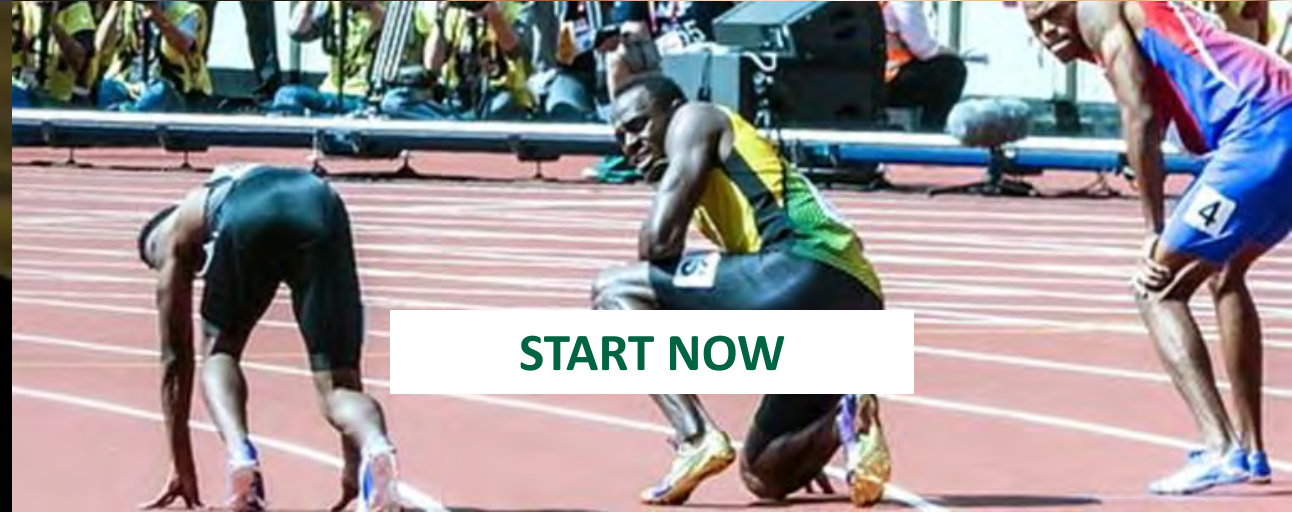
EDUCATE YOURSELF



GET INVOLVED



BE A PARTNER



START NOW



INDUSTRY GOALS
PARTNERS



RESEARCH
LEARN MORE



THANK YOU

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