



U.S. Department of Transportation
Federal Highway Administration

FHWA's Concrete Pavement Materials Sustainability Efforts

National Concrete Consortium

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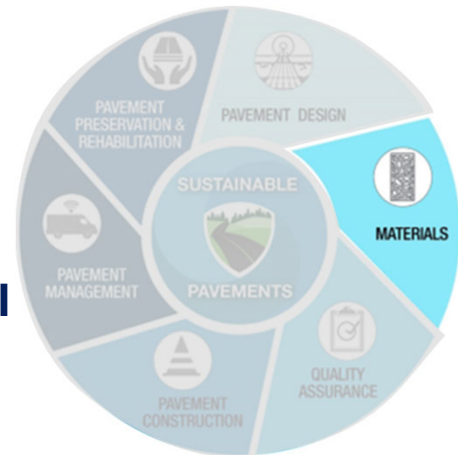
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Agenda

- 1** Define Sustainability
- 2** Ongoing Activities with CP Tech
- 3** Broader FHWA Activities

FHWA's Vision for Pavements

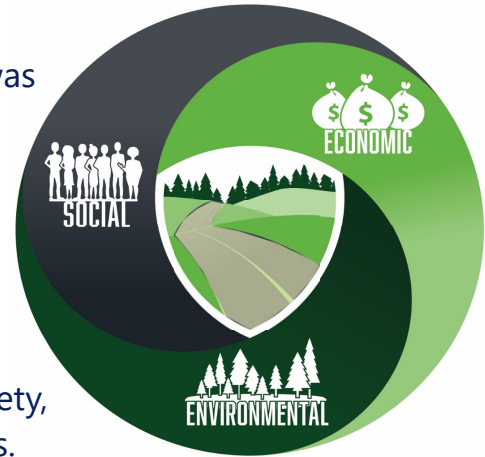
Pavements are **designed, constructed, preserved, and maintained** to accommodate current and predicted traffic needs in a **safe and sustainable** manner considering **economic, environmental, and social** impacts **throughout the pavement's life-cycle.**



Sustainability
=
Good
Engineering

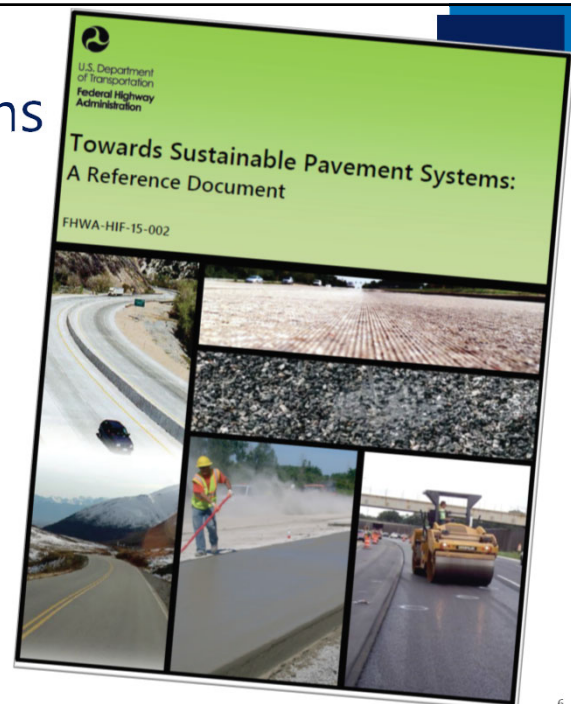
What is Sustainable?

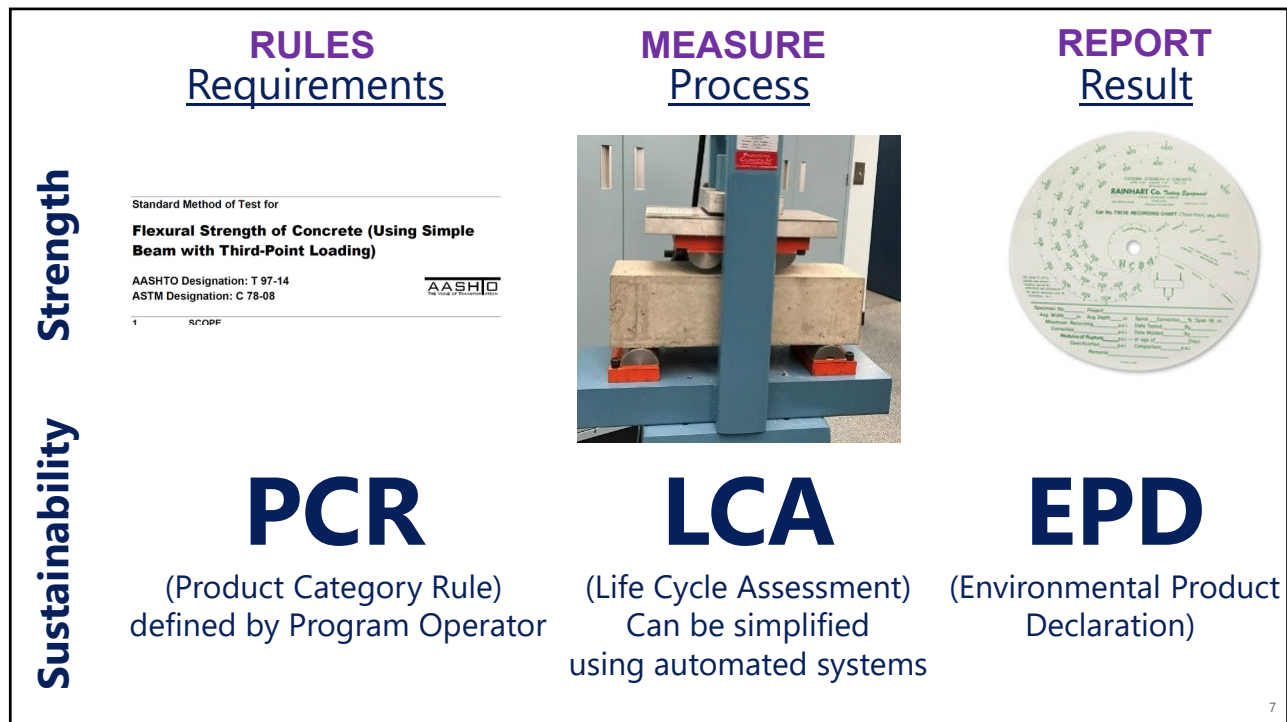
- Achieve the engineering goals for which it was constructed. **(performance)**
- Preserve and (ideally) restore surrounding ecosystems.
- Use financial, human, and environmental resources economically.
- Meet basic human needs such as health, safety, equity, employment, comfort, and happiness.



Important considerations

- Sustainable is an aspirational goal.
- Sustainability is context sensitive.
- Sustainability pertains to all areas related to pavement and materials.
- Sustainability assessment is an evolving field.
- Considerations of trade-offs is important.






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Current North American EPDs are limited to upfront carbon. Such, they can help make choices within **similar materials**¹. EPDs from current North American PCRs are inappropriate for decision making and comparison between **dissimilar materials**.

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EMISSIONS FROM HIGHWAY TRANSPORTATION SYSTEMS



What are tailpipe emissions?
Tailpipe emissions are pollutants from exhaust gases discharged from vehicles equipped with an internal combustion engine. Tailpipe emissions incurred during the use stage of the pavement life cycle are considered operational emissions.




What are embodied emissions?
Embodied emissions include emissions from manufacturing, material transport, construction, maintenance, and disposal of transportation infrastructure building materials. Embodied emissions of greenhouse gases (GHG) are also known as embodied carbon.

Source: Emissions from Highway Transportation Systems

Goal:

- **Quantifiable:** Demonstrate with EPD (using PCR that is ISO 14025/21930 conformant).
- **Practical:** An agency needs to be able to use it and incorporate it into their programs.
- **Implementation-Ready:** Needs a defined framework (i.e., more than foundational concept).



Evolving science... Pavement PCR?

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CPM - Technical Feedback Group



Novem

nt, IL

<https://cptechcenter.org/cpm-tfg/>

AASHTO Guide

Standard Specifications for
**Transportation Materials and
 Methods of Sampling and Testing
 and AASHTO Provisional Standards**

CLICK
 HERE

**Guide to Reducing
 Carbon Content of
 Paving Concrete**

Guide for
**Reducing the Embodied Carbon
 Content of Concrete**

ECC 1 – 2024

[4/10/23 Note – This follows the format of the AASHTO
 Titanium Guide. Parts 1-2 are in draft format. Parts 3-5 are
 mostly in outline format.]

For Cover see AASHTO Guide for Near Surface Mounted Titanium Alloy Bars – 2020 Edition.
 This cover provides a good example of what we would like. We will send in different photos at
 the appropriate time.]

AASHTO
 American Association of State Highway and Transportation Officials
 555 12th Street, N.W., Suite 1000
 Washington, D.C. 20004

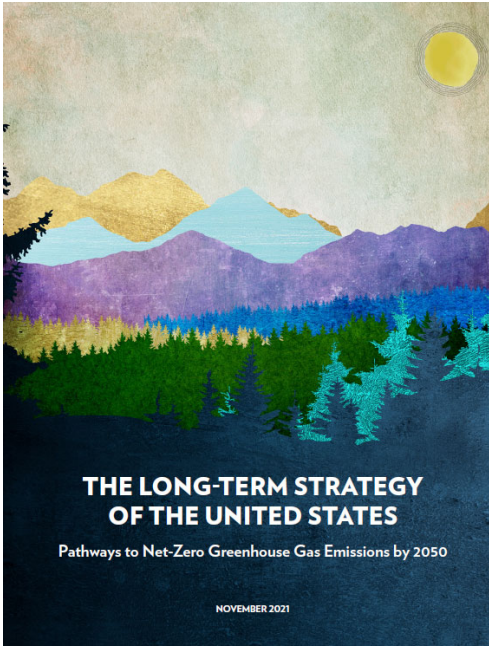
Source: CPTech Center: Felag, Van Dam

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Partnership with MnROAD

- FHWA contributed 300k to this project.
- MCTC collected data typical of 3 site visits.
- TFHRC collected samples for laboratory analysis.

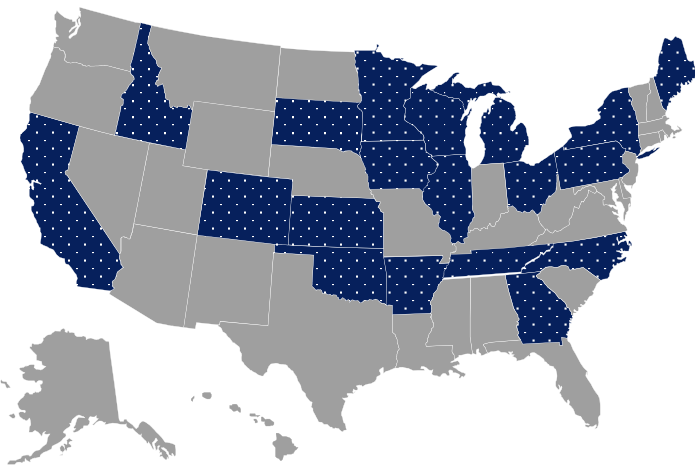




**Economy-wide
CO₂ Targets:
50% by 2030
100% by 2050
(2005 baseline)**

<https://www.whitehouse.gov/wp-content/uploads/2021/10/US-Long-Term-Strategy.pdf>

Performance Engineered Mixtures...



U.S. Department of Transportation
Federal Highway Administration

 Pooled Fund Members

National Concrete Pavement
Technology Center



IOWA STATE UNIVERSITY
Institute for Transportation



U.S. Department
of Transportation
Federal Highway
Administration

Oregon State
University



OKLAHOMA STATE
UNIVERSITY



P3C:

Performance Centered Concrete Construction

Actions between the batch plant and opening to traffic can significantly impact the performance of a concrete pavement.



Pooled Fund:
IA, CO, KS, MO, PA, ID

Pavement Smoothness

- Solves Economic, Social, and Environmental issues.
- Fuel Efficiency Gain for Trucks*: 50 in/mile = 1.5 %.
- **Real Time Smoothness Equipment Loan Program targeting contracting community.**
- A working group in collaboration with Sustainable Pavements Program, Asphalt Program, and Concrete Program.

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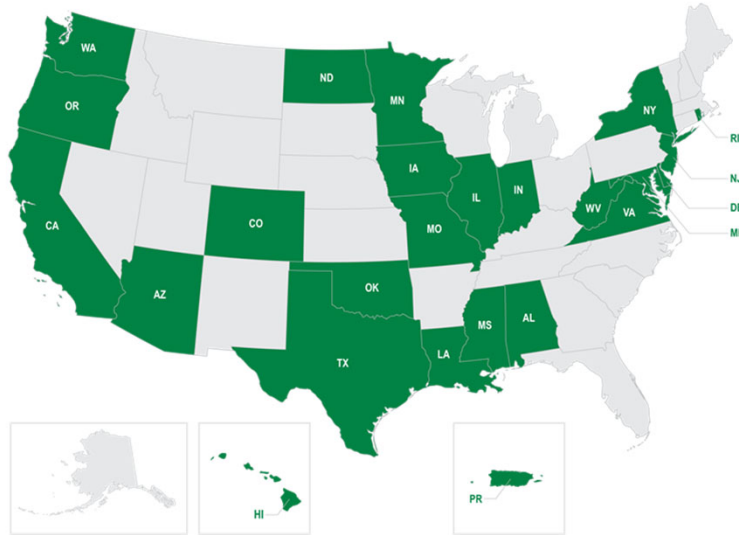
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DOT Buy Clean Policy

“So today, as we work to implement President Biden’s historic Bipartisan Infrastructure Law, which will modernize our infrastructure and create good paying jobs across the nation, the U.S. Department of Transportation will launch a Buy Clean Initiative that will assess and address the embodied **carbon emissions** that come from the **engineering, design, construction, procurement, maintenance, and disposal** of transportation projects.”

-- USDOT Secretary Pete Buttigieg

FHWA Climate Challenge



U.S. Department of Transportation
Federal Highway Administration

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Iowa DOT



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Use of EPDs and LCA to quantify emissions and associated impacts of material and design decisions to enhance sustainable pavement practices in Iowa

Project Goals:

- (1) Understand what is involved in requiring contractors to use EPDs and informing sustainable decision-making.
- (2) Establish strategies to collect EPDs, implement LCA, and reduce impacts of pavements through changes in materials, design, and maintenance.
- (3) Provide training/workshop to Iowa contractors and Iowa DOT Staff.
- (4) Develop a state-of-the-art estimates of embodied emissions, use phase emissions, end-of-service emissions, and use phase excess fuel use and costs.

Project Tasks:

- Establish what type of adjustments will be necessary to adequately capture portable plants
- Enable Iowa DOT and Iowa paving industry to better understand the level of effort required to generate EPDs
- Identify areas where improvements in data collection, education and training are needed to facilitate possible routine EPD generation in the future.
- Inform a benchmarking analysis of current Iowa DOT concrete paving operations.
- Enhance Iowa DOT understanding of the complete life cycle impacts (including use-phase) associated with pavement assets and inform improved decision-making in the pavement arena to lower the GHG emissions associated with Iowa's pavement assets.



EPDs for Sustainable Project Delivery



Environmental product declarations, or EPDs, are reports that provide the life cycle assessment results of sustainable pavements.

Environmental Products Declarations (EPDs) will transform the procurement process by communicating GHG emissions in a transparent and standardized manner to reduce the environmental burdens of transportation infrastructure throughout the project delivery process. This initiative will work with agencies, contractors, consultants, and industry to increase their knowledge and identify successful practices for applying EPDs.

FHWA's Center for Accelerating Innovation at:
www.fhwa.dot.gov/EDC

Low-Carbon Transportation Materials Grants

- Established under IRA (Pub. L. 117-169 § 60506) - [link](#)

*FEDERAL HIGHWAY ADMINISTRATION APPROPRIATION.— **\$2B** to remain available until **September 2026**, to reimburse or provide incentives for the use, of construction materials and products that have substantially **lower levels of embodied greenhouse gas emissions** associated with all relevant stages of production, use, and disposal as compared to **estimated industry averages of similar materials or products**, as determined by **the Administrator of the Environmental Protection Agency.***

EPA Interim Determination:

- Energy Star Performance Score for Upstream Manufacturing
- EPD. (Type III, Facility/Product Specific)
- In than the best 20%, 40%, 50%. (Project Location)



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<https://www.epa.gov/inflation-reduction-act/inflation-reduction-act-programs-fight-climate-change-reducing-embodied>

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Mr. Andrew Wisnia
Deputy Assistant Secretary for Climate Policy
U.S. Department of Transportation
1200 New Jersey Avenue, SE
Washington, D.C. 20590

Mr. Kevin Kampcheuer
Chief Sustainability Officer and Director of the Office of Federal
High-Performance Green Buildings
U.S. General Services Administration
GSA Building
800 F Street, NW
Washington, D.C. 20405

Dear Messrs. Wisnia and Kampcheuer:

Under the Inflation Reduction Act Sections 60503 and 60506, the Department of Transportation Federal Highway Administration and the General Services Administration are appropriated funds to spend on materials and products "that have substantially lower levels of embodied greenhouse-gas emissions associated with all relevant stages of production, use and disposal as compared to estimated industry averages of similar materials or products, as determined by the Administrator of the U.S. Environmental Protection Agency."

The EPA is issuing this interim determination¹ to provide your agencies with actionable determinations on selecting materials and products that meet the standards of Sections 60503 and 60506, which will reduce greenhouse-gas emissions of federally funded building, infrastructure and construction projects, with a particular emphasis on reducing major industrial emissions from production² of U.S. construction

¹ The EPA expects that its determination may evolve as the EPA gains a better understanding of the relevant industry averages and develops better methodologies for assessing what materials and products embody "substantially lower" greenhouse-gas emissions. At the same time, the EPA acknowledges that your agencies must enter binding contracts and anticipate that any revisions to this determination will apply only prospectively to contracts awarded after any new or revised determinations is issued. This determination does not govern, bind or limit any potential future EPA standards or programs on low-carbon, greenhouse-gas materials or EPDs and should not be construed to direct contractual or procurement Buy Clean policies.

² In this determination the EPA is prioritizing upstream products that have the highest global-warming potential impact in the production stage. The EPA recognizes that the IRA also directs it to consider the embodied greenhouse-gas emissions impacts related to the use and disposal stages and that there are significant climate mitigation opportunities in taking these stages into account. The EPA is prioritizing the production stage in this interim determination due to data availability in



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