EPDs for Sustainable Project Delivery
Every Day Counts (EDC) - 7

Illinois Bituminous Paving Conference
December 6, 2023

Dennis Bachman, P.E.
FHWA Illinois Division
Asset Management/
Pavement & Materials Engineer

Kelly Morse
Illinois DOT
Chief Chemist

Sustainable Pavements Program (SPP)

Vision: Sustainable thinking is embraced throughout the life-cycle of all publicly owned pavements in the United States.

Mission: To advance the knowledge and practice of designing, constructing, and maintaining more sustainable pavements through:

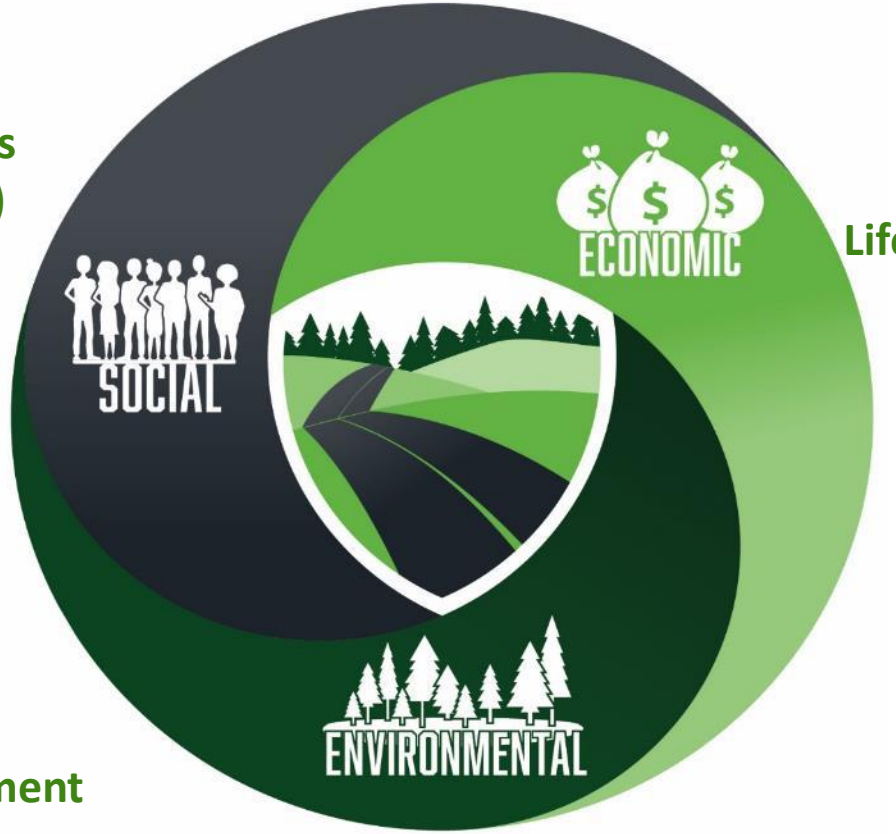
- Stakeholder engagement
- Education
- Development of guidance and tools

Sustainability - Balance of the "Triple Bottom Line"

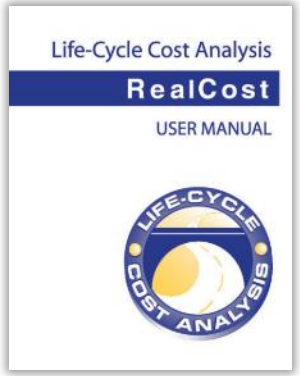
INVEST
ECONOMIC • SOCIAL • ENVIRONMENTAL

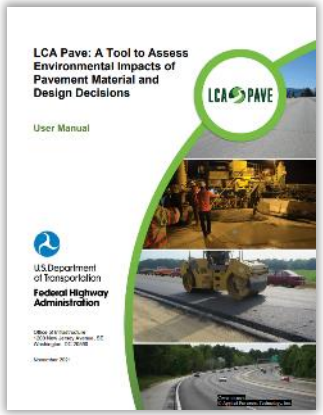
Sustainability Rating Systems (e.g., INVEST)

Social LCA (S-LCA)



Life-Cycle Cost Analysis (LCCA)





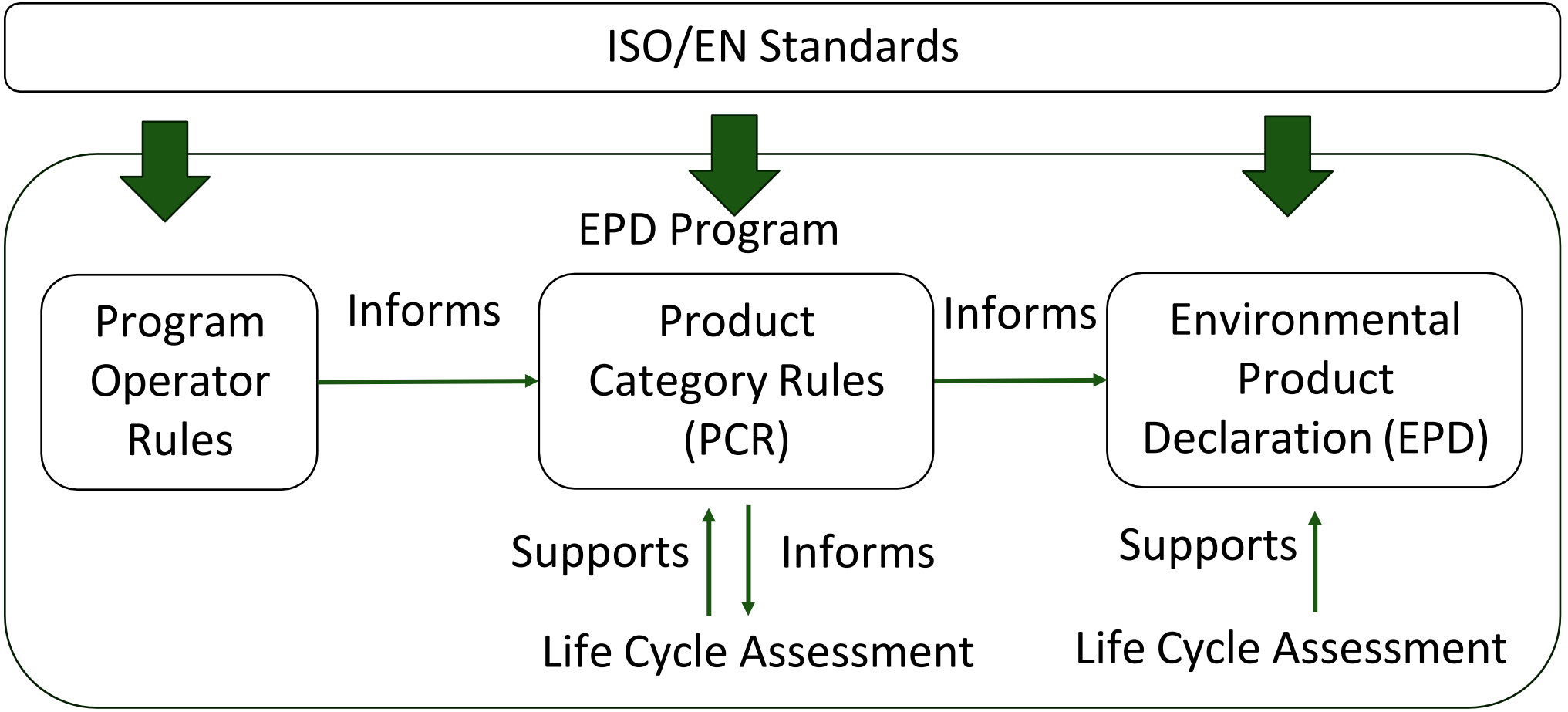
Life-Cycle Assessment (LCA)

Icon Image Source:
FHWA/APTech

- **Benefits of Pavement Sustainability**
  - **Economic**
    - Reduced pavement life-cycle costs
  - **Environmental**
    - Reduced energy use
    - Reduced noise emissions
    - Improved air quality
    - Improved water quality
  - **Social**
    - Improved safety
    - Improved ride quality
    - Resource conservation
    - Reduced landfill space

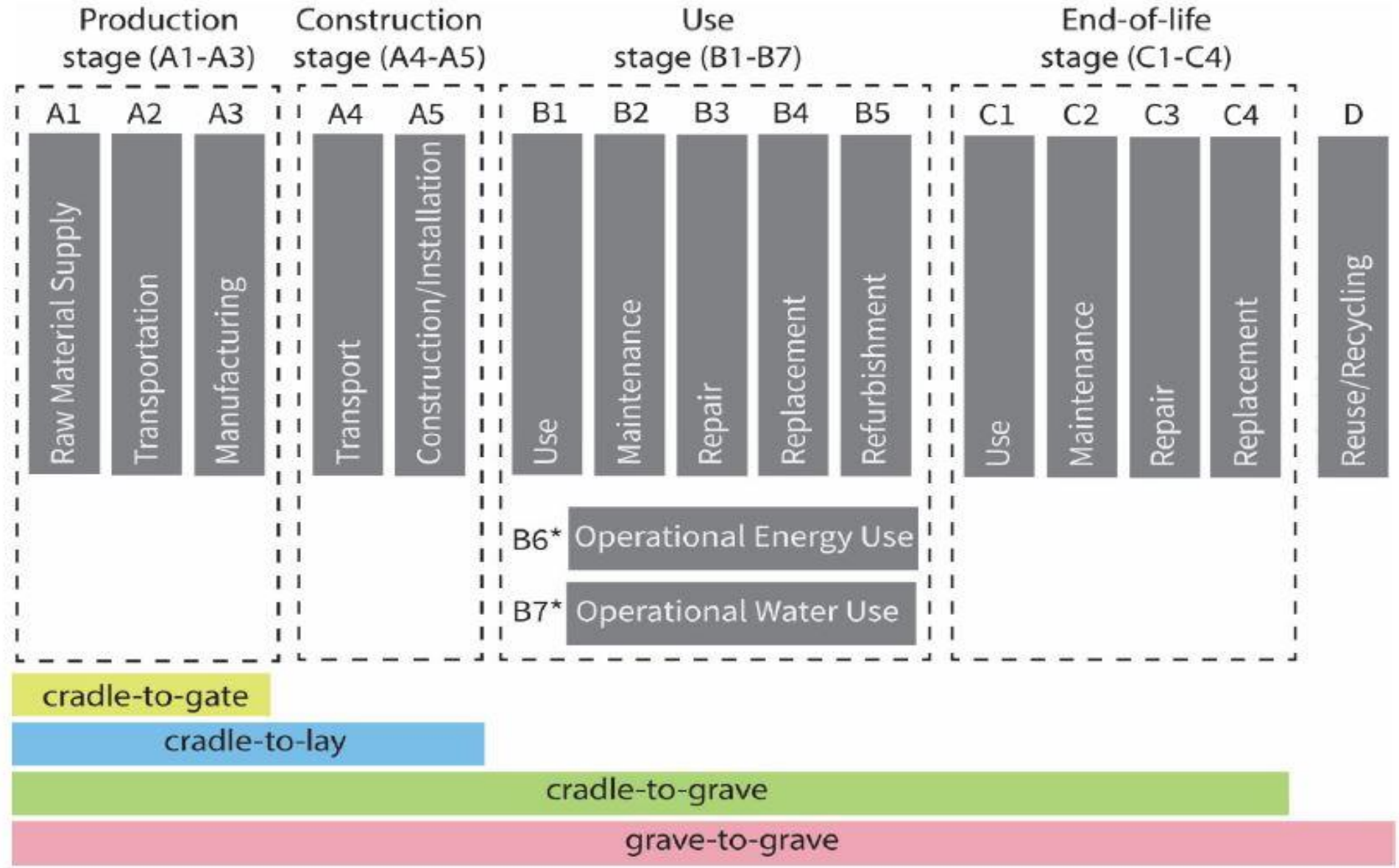
- **Assessment of Pavement Sustainability**
  - Economic
    - Life Cycle Cost Analysis (LCCA)
    - Life Cycle Planning (LCP)
  - **Environmental**
    - **Life Cycle Assessment (LCA)**
  - Social
    - Sustainability Rating Systems (SRS)
    - Social LCA (SLCA)

What are EPDs?



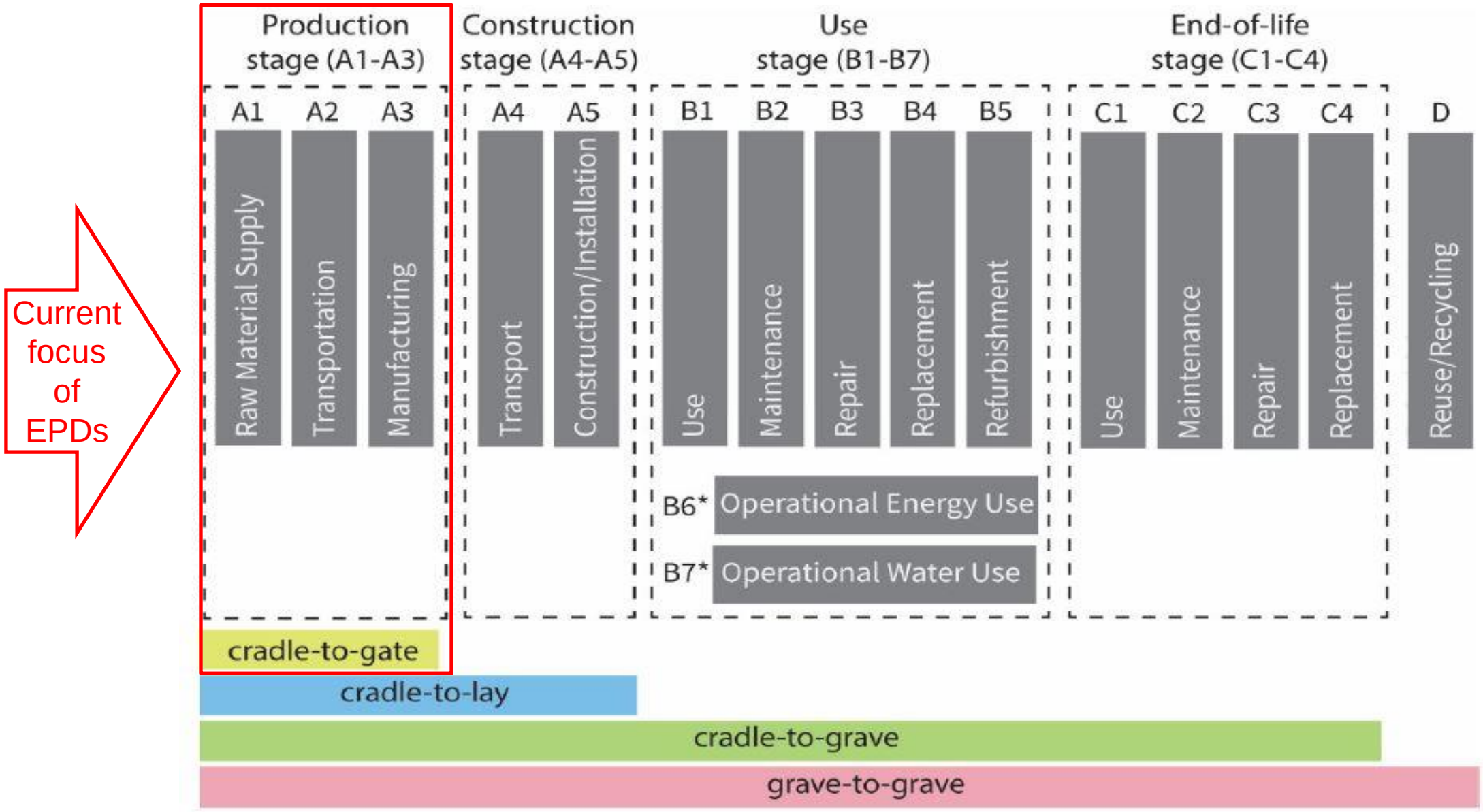
- **Life Cycle Assessment (LCA)**
  - Analyzes and quantifies environmental impacts of a product, system or process
    - **Global warming potential (GWP)**
    - Ozone depletion, acidification, eutrophication, and smog formation
  - Examines material and energy inputs over the life cycle of the product, system or process
  - **Results of LCA → Environmental Product Declarations (EPDs)**

Life-cycle Stages of EPDs



Source: University of Colorado-Boulder

Life-cycle Stages of EPDs

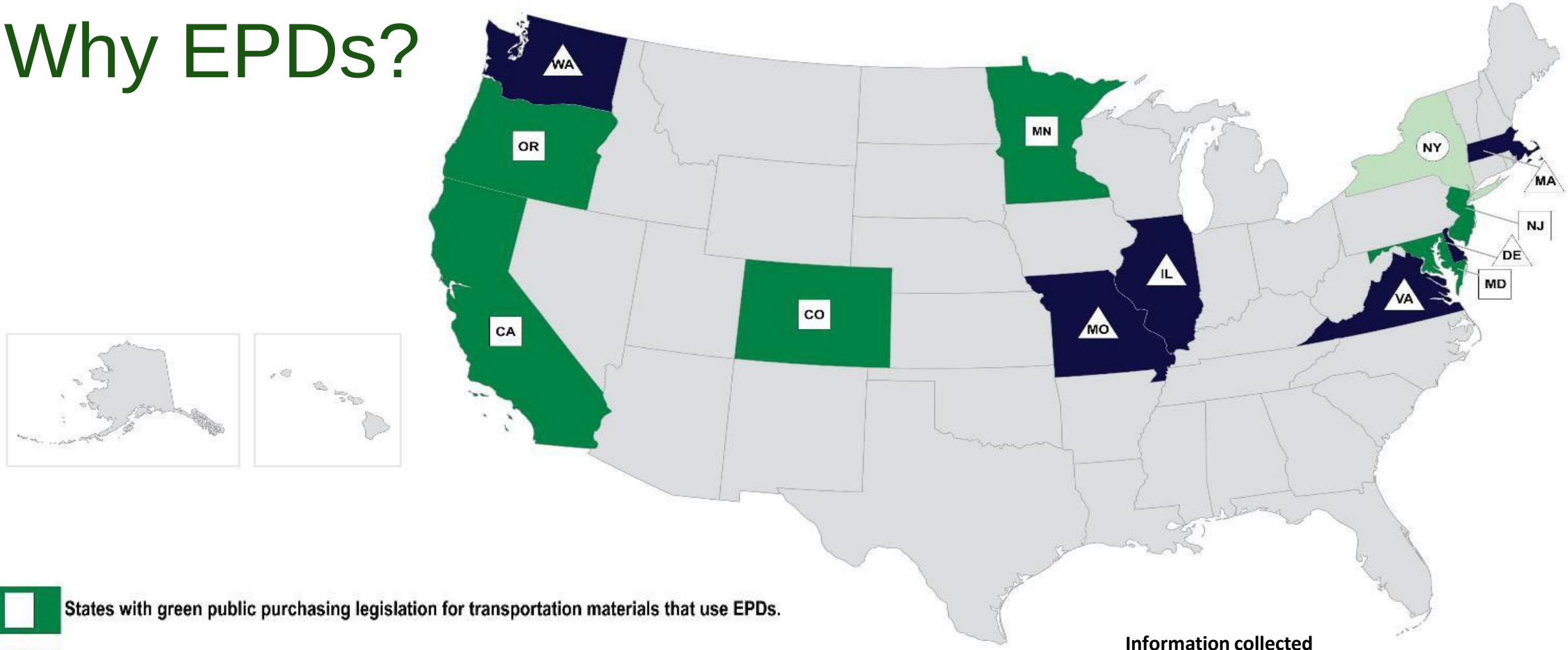


Source: University of Colorado-Boulder

Why EPDs?

- **Executive Oder 14057 – 12/08/2021**
  - Carbon pollution-free electricity sector by 2035
  - Net-zero emissions economy-wide by 2050
- **Agencies are looking for tools** that quantify environmental impacts.
- EPDs are the most widely available tool that communicate quantified environmental impacts.
- EPDs are transparent and standardized.
- **EPDs provide an opportunity to reduce negative environmental impacts by transforming the project delivery process.**
- **Note: EPDs are not currently required by Federal law or regulation**

Why EPDs?



States with green public purchasing legislation for transportation materials that use EPDs.

States with green public purchasing legislation, requirements to be determined.

States that have considered green public purchasing legislation for transportation materials that use EPDs.

Information collected from State legislative websites.

SPP Progress – Current Initiatives

EO 14057
specified goal of Net Zero Federal Procurement

CLIMATE CHALLENGE

25 States (+2 Local agencies) Participating
35+ projects from 27 agencies
$7.1M

IRA
INFLATION REDUCTION ACT

Inflation Reduction Act
(Pub. L. No. 117-169)
$2 Billion for FHWA
Low-carbon transportation materials grants

EPD
ENVIRONMENTAL PRODUCT DECLARATION

EDC-7
EPDs for Sustainable Project Delivery

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FHWA Climate Challenge:
Quantifying the Emissions of Sustainable Pavements

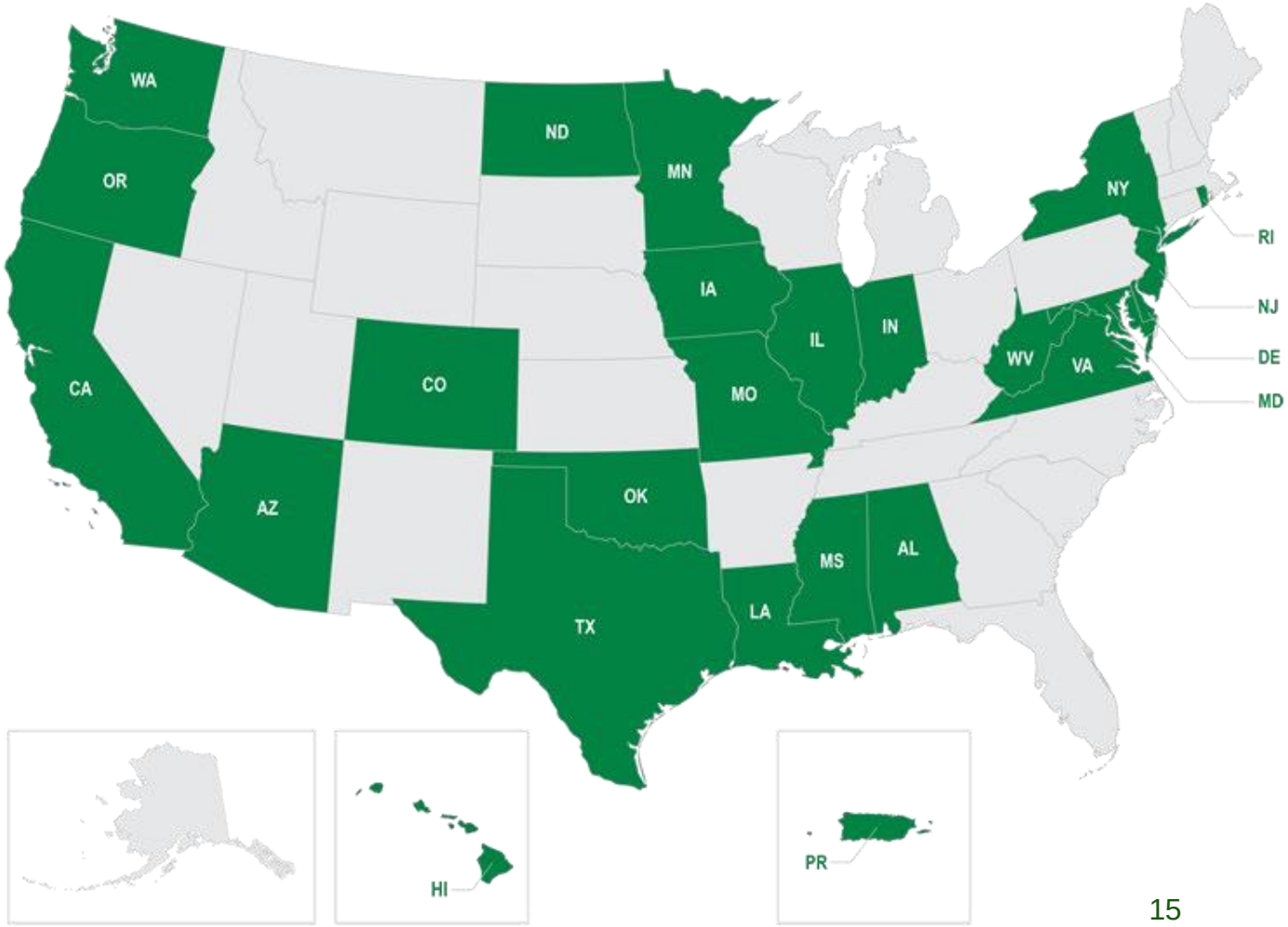
State DOTs and other public agencies explore the use of LCA and EPDs as a standard practice to inform pavement material and design selection for enhancing sustainable pavement practices and quantify the emissions and impacts of those practices.

CLIMATE CHALLENGE

For the latest information, visit the website: https://highways.dot.gov/climatechallenge

Climate Challenge Participants

- 30+ proposals from 27 agencies (including 2 local agencies)
  - Education, implementation, benchmarking, fundamental research projects
- Providing technical and funding ($7.1 million) assistance



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EDC-7
EPDs for Sustainable Project Delivery

Every Day Counts

Innovation for a Nation on the Move

A State-based model that identifies and deploys proven, yet underutilized innovations — saving time, money and resources that can be used to deliver more projects.

- EDC History
  - EDC-1 (2011-2012) – 14 innovations
  - EDC-2 (2013-2014) – 13 innovations
  - EDC-3 (2015-2016) – 11 innovations
  - EDC-4 (2017-2018) – 11 innovations
  - EDC-5 (2019-2020) – 10 innovations
  - EDC-6 (2021-2022) – 7 innovations
  - **EDC-7 (2023-2024) – 7 innovations**

- EDC-7 Innovations (2023-2024)
  - Nighttime Visibility for Safety
  - Next Generation TIM: Technology for Saving Lives
  - Integrating GHG Assessment and Reduction Targets in Transportation Planning
  - Enhancing Performance with Internally Cured Concrete (EPIC^2)
  - **EPDs for Sustainable Project Delivery**
  - Rethinking DBE for Design-Build
  - Strategic Workforce Development

SPP Progress – Current Initiatives

EO 14057
specified goal of Net Zero Federal Procurement

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EDC-7
EPDs for Sustainable Project Delivery

IRA Sections

Which parts relate to low-carbon construction materials?

IRA Section	Agency	Funding	Purpose	Funds obligation deadline
60503	GSA Federal Buildings Fund	$2.15B	To acquire and install materials/products for use in the construction or alteration of buildings that have substantially lower levels of embodied GHG emissions (*as determined by EPA*)	9/30/26
60506	DOT FHWA	$2B	To reimburse or provide incentives (up to 2% of incremental costs) to eligible recipients for the use of construction materials/products that have substantially lower levels of embodied GHG emissions (*as determined by EPA*)	9/30/26
60116	EPA	$100M	For administrative costs to develop (*with GSA and DOT-FHWA*) a program to identify and label construction materials/products that have substantially lower levels of embodied GHG emissions, based on EPDs and determinations by State agencies, as verified by EPA.	9/30/26
60112	EPA	$250M	Grants and technical assistance to businesses, states, tribes and nonprofit organizations to support the development, enhanced standardization and transparency, and reporting criteria for EPDs for construction materials/products that include measurements of the embodied GHG emissions across all life cycle stages	9/30/31
50161	DOE	$5.812B	For financial assistance for advanced technology retrofits for US industrial or manufacturing facilities that produce iron, steel, steel mill products, aluminum, cement, concrete, glass, and other energy intensive industrial processes	
	DOE	$10B	For the 48C tax credit to expand clean technology manufacturing	
30002	HUD	$837.5M	For direct loans and grants to improve climate resilience of affordable housing, including low- emission building materials/processes	
70006	FEMA		May provide financial assistance for costs associated with low-carbon materials	

Source: https://www.epa.gov/ (March 2, 2023).

Low Carbon Transportation Materials (IRA § 60506)

- **Sec. 60506 – $2 billion** to the DOT-FHWA to reimburse/incentivize eligible recipients for the use of construction materials/ products that have substantially lower embodied carbon (as determined by EPA)
- The program also will help transportation agencies:
  - **Develop specifications for collecting documentation of a materials embodied greenhouse gas emissions**
  - **Develop or update technical specifications to allow for use of materials, products, and strategies that result in lower embodied carbon materials**
  - **Establish a process to identify, verify, and use materials with lower levels of embodied greenhouse gas emissions**
- Funding announcement later this year
- Funds Obligation Deadline: September 30, 2026

Low Carbon Transportation Materials (IRA § 60116)

- **Sec. 60116 – $100 million** to EPA to develop a program to identify and label construction materials/products that have substantially lower embodied carbon, in coordination with the General Services Administration (GSA) and the Department of Transportation Federal Highway Administration (DOT-FHWA)
- Funds Obligation Deadline: September 30, 2026

Low Carbon Transportation Materials (IRA § 60112)

- **Sec. 60112 – $250 million** to EPA to develop a program to support enhanced standardization, measurement, reporting and verification of embodied carbon of construction materials/products (grants, technical assistance, etc.)
- Funds Obligation Deadline: September 30, 2031

Resources

- FHWA SPP dedicated website to EPDs: https://www.fhwa.dot.gov/pavement/sustainability/epds/

- IRA Low-Carbon Transportation Materials website: https://www.fhwa.dot.gov/lowcarbon/

Illinois Department of Transportation Sustainability Efforts

Kelly Morse
Illinois DOT
Chief Chemist

01 Climate Challenge

ICT Project R27-248

Climate Challenge

Field Demonstration of Dolomite Quarry By-products (QB) Used in Local Road Construction in Illinois

Project Goals:
(1) Environmental impact assessment along with performance assessment of pavement sections constructed with dolomitic and limestone quarry by-products.

(2) Construct full-scale test sections with dolomitic QB to demonstrate sustainable and effective use of excess dolomitic QB sources in local road construction in Illinois.

Both unsurfaced (seal coated) and thin hot mix asphalt (surfaced pavements will be constructed as local roads to include (lightly cement-treated dolomitic QB regular dense graded dolomite base course layers, and a limestone control section.

Illinois Department of Transportation

Climate Challenge

Field Demonstration of Dolomite Quarry By-products (QB) Used in Local Road Construction in Illinois

Project Scope:
(1) This demonstration project will provide field data to IDOT related to long-term pavement performance and pavement life expectancy.

(2) Conduct a comparative Life Cycle Assessment study using FHWA's LCA Pave Tool of the three constructed test sections using field construction and aggregate data from the project and the State of Illinois, utilizing the life cycle inventories from the FHWA LCA Commons Database and dolomite aggregate source from Environmental Product Declarations from quarries.

(3) A Life Cycle Cost Analysis of the QB applications will also be evaluated.

The IL roadmap to our current Climate Challenge project:

ICT R27-81 – Field Performance Evaluations of Illinois Aggregates for Subgrade Replacement and Subbase – Phase II

ICT R27-125 – Sustainable Aggregates Production: Green Applications for Aggregate By-Products

ICT R27-168 – Field Performance Evaluation of Sustainable Aggregate By-Product Applications

ICT R27-SP38 – Durability Aspects of Stabilized Quarry By-Product Pavement Base and Subbase Applications

Current Climate Challenge-Related Project
ICT R27-248

Investigation of Dolomite Aggregate Long-Term Cementation & its Potential Advantage for Building Roads

TRP Chairs: Tim Peters and Andrew Stolba

Project Investigators: Erol Tutumluer and Nishant Garg

ICT R27-248

Investigation of Dolomite Aggregate Long-Term Cementation & its Potential Advantage for Building Roads

Project Objectives

- Study effects of chemical, mineralogical, and physical properties of dolomitic fines on the long-term performance of unbound and stabilized aggregate materials
- Conduct a comprehensive geological survey and review of aggregate quarry maps to characterize dolomite aggregate compositions in Illinois
- Short- and long-term performance monitoring of UCS samples with and without conditioning to trigger precipitation-dissolution delayed reaction

ICT R27-248

Investigation of Dolomite Aggregate Long-Term Cementation & its Potential Advantage for Building Roads

Project Tasks:

1. Identify sources and collect dolomite aggregate
2. Perform characterization tests for physical, chemical, and mineralogical properties.
3. Laboratory testing for unconfined compressive strength under soaking and freeze-thaw environments.

Quarry By-products (QB)

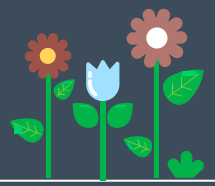
CA06

ICT R27-248

Investigation of Dolomite Aggregate Long-Term Cementation & its Potential Advantage for Building Roads

Project Tasks:

4. Additional characterization tests and interpretation of test results
    a. Chemical Effects from Freeze Thaw
    b. Physical Effects from Freeze Thaw
    c. Microstructure Characterization
    d. Physical Effects – Microscopy Images
5. Final Report and Implementation



Climate Challenge Next Steps

Field Projects:

Currently seeking projects to implement the use of QB. Please reach out to Andrew Stolba and Tim Peters to provide potential projects.

The field projects will be vital to completing the “Climate Challenge” objectives. The projects will be monitored beyond the completion of the “Climate Challenge”.

The IL Training Plan:
Climate Challenge:

FHWA CLIMATE CHALLENGE

FHWA Climate Challenge
Quantifying Emissions of
Sustainable Pavements

Illinois Department of Transportation

Draft Training Plan

	Training 1	Training 2
Training Goal	Have a basic level of understanding to answer basic questions on the topic and identify people and resources that can answer more advance questions.	Understand options for integrating GWP into the decision making and procurement processes. Develop an initial Strategic Plan for possible implementation.
Topics of Interest	Basics of Sustainable Pavements, EPDs, LCAs and Buy Clean Policies. Case study - aggregates	How to integrate Sustainability using LCA and EPD into the IDOT business practice.
Key Additional Information	Answering why we are doing this, what it all means, and what others are doing, what FHWA is organizing in support of these efforts.	A brainstorm session to discuss integration of sustainable practices into IDOT project delivery process, with a focus on the appropriate uses of LCA and EPD.
Attendees - Internal	Yes – broad group Planners, Project Managers, Designers, Bid and Estimate Engineers, Construction Managers, etc. Key personnel Research panel: Illinois Aggregates Association, District DOT personnel, Environmental EDC-7 Implementation team	Yes – more focused group. IDOT Climate Challenge Team, Bureau of Construction (building); Planning division. Key personnel EDC-7 Implementation team
Attendees - External	University	No
Level of Expertise	Beginners	Beginners to Mid-Level
Training Time	4 –6 hours	4 – 6 hours
Training Format	In-person ***Presentation with Q&A, interactive discussion.***	In-person ***Interactive/brainstorm activities***
When	***Looking for options***	***Looking for options***

	Training 1	Training 2
		Could this be combined in the same day as Training 1?
Location address	IDOT would like to host the training at their auditorium in the Hanley Building, 2300 S. Dirksen Parkway, Springfield, IL.	IDOT would like to host the training at their auditorium in the Hanley Building, 2300 S. Dirksen Parkway, Springfield, IL.
Location facility (type of room, number of seats internet, projector, …)	***Please provide information***	***Please provide information***
Facility contact person, phone and email	***Please provide information***	***Please provide information***

In-person training for Illinois Climate Challenge/EDC-7/EPDs
January 17th and 18th
1½ days – 2 sessions

Look for more information soon!

02 EPDs

EDC-7, EPD initiative in IL

1st Steps:

IL Baseline Report:

Baseline Questions (Due April 21, 2023):	
1) April 2023 Baseline: What stage of implementation is the State currently at? Review the Implementation Stage Definitions on page 1 and select the appropriate stage for your state.	(Choice – Pick One) ☐ Not Implemented ☒ Development Stage ☐ Demonstration Stage ☐ Assessment Stage ☐ Institutionalized
2) Current Status: Provide the current state of practice to support the above selection. Please note State DOT, local agency, and transportation partners status.	*We are interested in EPDs in IL. Some of our industry partners are developing EPDs and we are interested in learning more about how to use them to make decisions on a project level.*
3) May 2025 Goal: What is the State goal in two years? Review the Implementation Stage Definitions on page 1 and select from appropriate stage.	(Choice – Pick One) ☐ Not Implemented ☐ Development Stage ☒ Demonstration Stage ☐ Assessment Stage ☐ Institutionalized
4) Implementation Plan Activities: Provide the proposed activities the State and their partners intends to perform to attain their goal.	*(open discussion – summarize activities)* *There is a table provided below to aid in answering this item.*
5) Assistance Needed: What assistance can the Innovation Deployment Team provide to help the State and their partners reach its goal within two years?	☐ Training (e.g., NHI course or self-directed modules) ☒ Technical Support on specific projects/issues ☒ Guidance Documents (Suggest specific needs below) ☒ Webinars on specific topics (Suggest specific topics below) ☐ Workshops or Peer Exchanges ☒ Case Studies (e.g., Successful deployments from other states) ☐ **NO Assistance Anticipated from FHWA in Deployment** ☐ **Our State is willing to assist others** ☐ Other _____
6) FHWA Division Contact for Innovation:	Dennis Bachman

EDC-7 EPDs:

IL Baseline Report: Implementation Plan

- Target completion dates will likely be modified to allow more time for training and education.

Innovation Implementation Team Members		
State DOT: Kelly Morse (co-lead)	Doug Dirks, Ben Sperry, Tim Peters, Elizabeth Irvin	
FHWA: Dennis Bachman (co-lead)	David Adedokun	
Illinois Center for Transportation (ICT): Imad Al-Qadi	Illinois Tollway: Bryan Wagner	

State Innovation Goal (Benefit Goal): In other words, after 2 years "What would success look like for your state?" (i.e. X innovation will save X time, money, or lives.) These benefits are what elected officials and the traveling public can relate to and help to support the level of resources invested in the deployment of innovations under EDC. What are the measurable targets to assess your progress?

State will be reviewing EPDs and using the information provided to make project-level decisions on materials used in construction and maintenance.

Obstacles: What is perceived as hindering the State in meeting the implementation goal?

Availability of EPDs from our industry partners. Not all industries are prepared and or knowledgeable in how to develop EPDs. Resources are available but not well known or utilized currently.

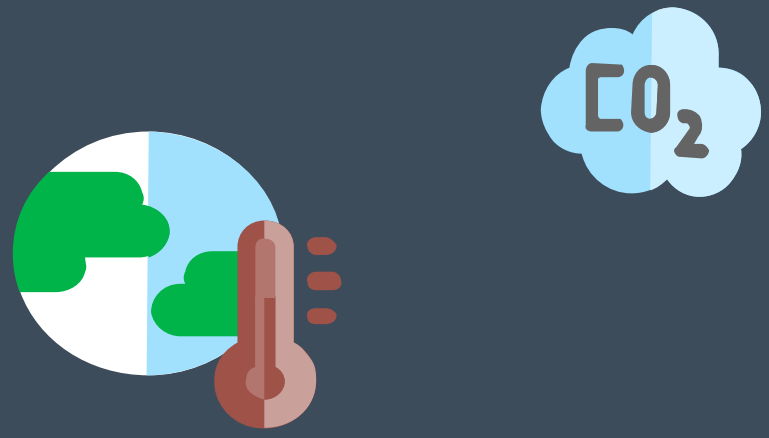
Implementation Plan Activities

Activity No.	Description of Activity	Target Completion Date
1.	Literature review of EPD development and use by other Agencies currently.	July 2023
2.	Collect and review EPDs on a limited subset of products supplied to IL	August 2023
3.	Draft a Pilot Project(s) plan to incorporate EPDs in decision making on material selection and use at the project level	December 2023
4.	Track the Pilot Project and document decisions and outcomes.	May 2024
5.	Make decisions on future use of EPDs and describe pros and cons of use.	Summer 2024
6.	Develop specifications, revise policies and update material approval/qualification procedures to include EPDs.	Fall/Winter 2024

EDC-7 EPDs:

IL Progress Report:

- 1- Year Progress Report
- 2-Year Final Report
  - Work will continue in IL



Progress Report Questions:	
1) If there has been NO CHANGE on this innovation during this reporting period and the previous Report is still accurate, select "No Change from last Progress Report" and you do not need to complete Questions 2-5.	(Choice) ☐ No Change from last Progress Report ☐ Changes indicated in Progress Report Below
2) What is the State's current stage of innovation implementation? Review your past progress report responses and the Implementation Stage Definitions on page 1.	(Choice) ☐ Not Implemented ☐ Development Stage ☐ Demonstration Stage ☐ Assessment Stage ☐ Institutionalized
3) Describe the State's accomplishments for this reporting period (State DOT, local agency, and transportation partners accomplishments). -- If advanced to the next implementation stage, consider the prompt questions in the chart and explain the advancements made to support your selection. -- Please include benefits as part of your explanation (i.e. time/cost savings, delay/crash reductions, etc.)	*(open discussion)*
4) Describe any implementation challenges or lessons learned. Also, indicate if and how your state and transportation partners can assist others in their implementation of this innovation.	*(open discussion)*
5) Describe any additional assistance needed by your state or partners.	*(open discussion)*

EPDs

Current Progress:

- Implementation Team meetings
- Industry Provided Training
- Brainstorming Ideas
  - How to collect EPDs?
  - When to collect EPDs?
  - Incentives to Industry?
- Pursue Funding Opportunities

Thank you!

Do you have any questions?

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