



FHWA Sustainable Pavements Program: The Movement Toward More Sustainable Pavement Systems

CDOT Internal EPD Workshop
June 8, 2022

Note: Unless otherwise indicated, all images in the presentation are from FHWA



U.S. Department
of Transportation

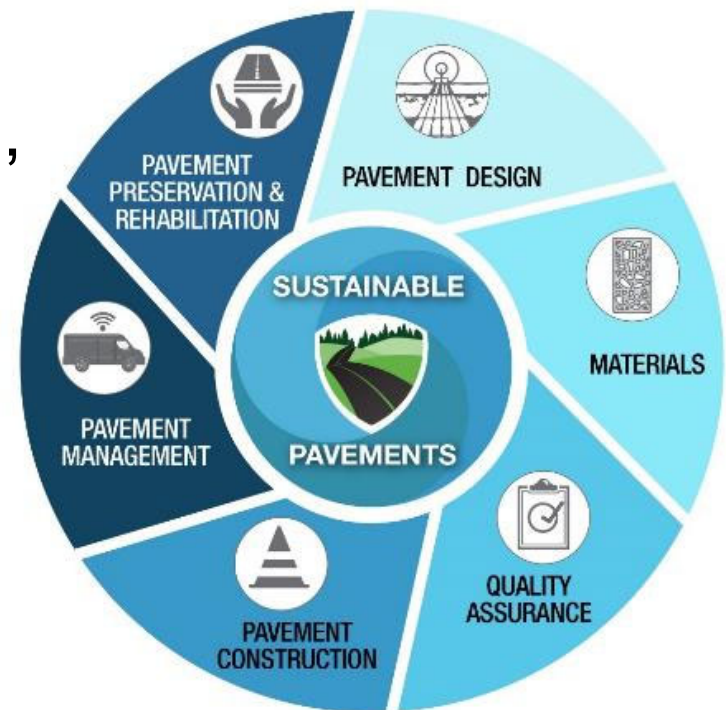
**Federal Highway
Administration**

Disclaimer

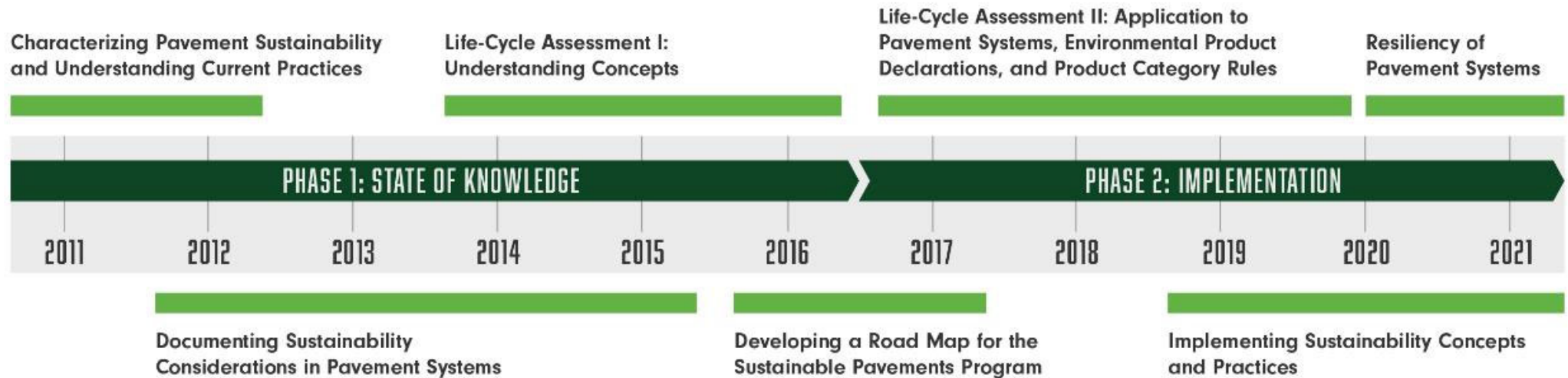
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Program Goal

- Advance the knowledge and practice of designing, constructing, and maintaining more sustainable pavements through:
 - Stakeholder engagement
 - Education
 - Development of guidance and tools



10 Years of Activity



Description: Sustainable Pavements

1. Achieve the engineering goals.
2. Preserve and (ideally) restore surrounding ecosystems.
3. Use financial, human, and environmental resources wisely.
4. Meet basic human needs such as health, safety, equity, employment, comfort, and happiness.

<https://www.fhwa.dot.gov/pavement/sustainability/hif15002/hif15002.pdf>

Balance of the Triple Bottom Line

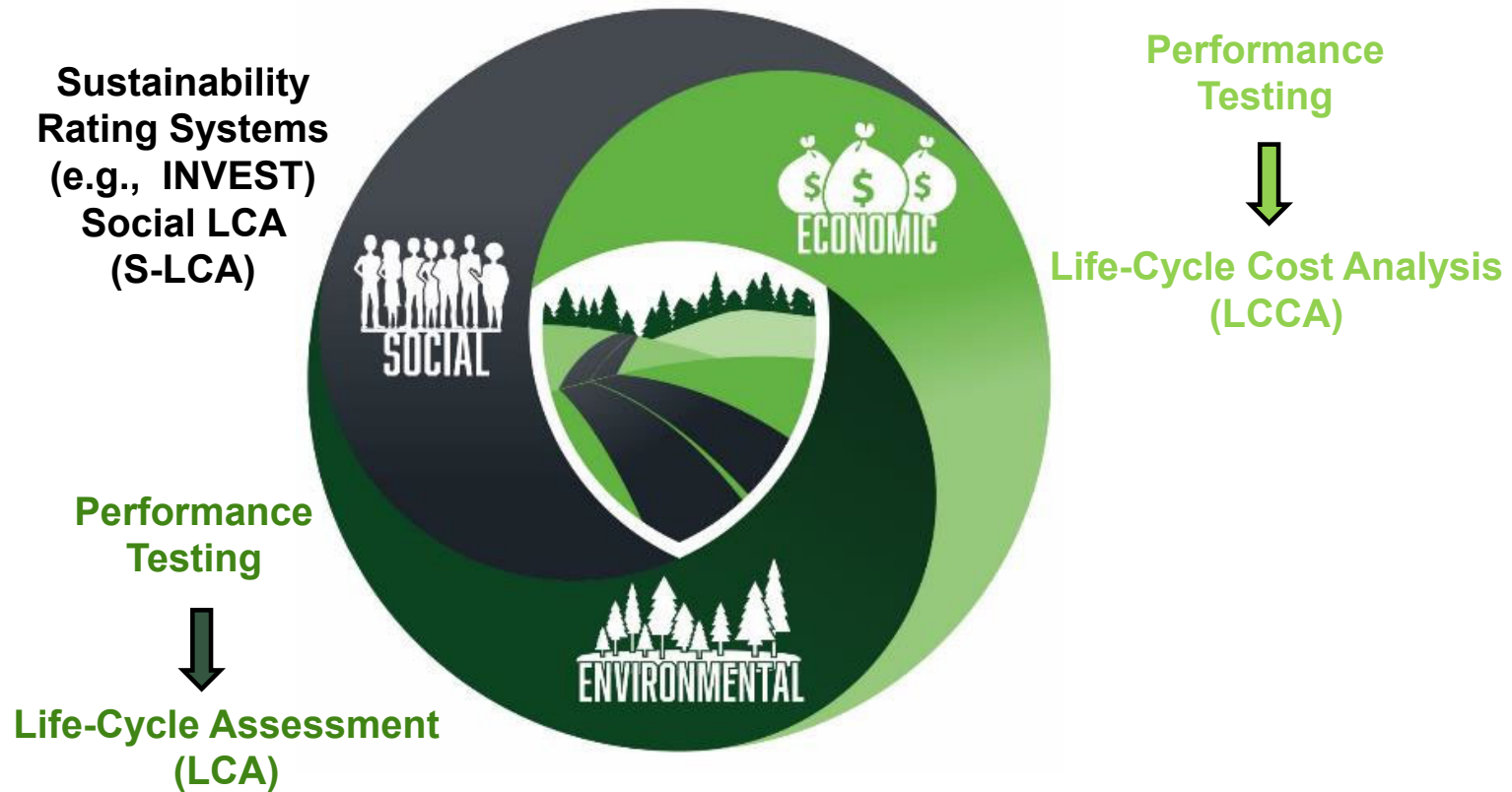




Image Source: FHWA/APTech

Green Public Purchasing Initiatives



Information collected from state legislative websites.

-  States that legislated green public purchasing
-  States that have considered green public purchasing legislation in past 2 years

Executive Order on Federal Sustainability

EO 14057- Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability



Goal 5: Net-zero emissions from Federal procurement, including a Buy Clean policy to promote use of construction materials with lower embodied emissions



The Buy Clean Task Force provides recommendations on policies and procedures to expand consideration of embodied emissions and pollutants of construction materials in Federal procurement and federally funded projects.

Source: <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/12/08/executive-order-on-catalyzing-clean-energy-industries-and-jobs-through-federal-sustainability/>

GSA – lower embodied carbon materials

- On March 30, 2022, GSA published their first-ever Concrete and Asphalt Specifications requesting EPDs at installation.
- This was done in collaboration with FHWA SPP.
- Their waiver process require the use of tools such as the **FHWA LCA Pave Tool** to estimate GWP.

Low Embodied Carbon Concrete Standards for all GSA Projects
March 2022 version

- The [prime contractor] shall provide a product-specific cradle-to-gate Type III environmental product declaration (EPD) for each concrete mix design specified in the contract and used at the project, using NSF International's [product category rule for concrete](#). Please send EPD(s) with each concrete mix batch design (including type [e.g. standard or lightweight mix] and volume) to embodiedcarbon@gsa.gov, and upload the submittals into GSA's project management information system.
- The [prime contractor] shall provide **low embodied carbon concrete** that meets the global warming potential (GWP) limits of the table below, for concrete of the mix type and strength class.

| Specified compressive strength (fc in PSI) | Maximum Global Warming Potential Limits for GSA Low Embodied Carbon Concrete (kilograms of carbon dioxide equivalent per cubic meter - CO ₂ e kg/m ³) | | |
|--|--|---------------------|-------------|
| | Standard Mix | High Early Strength | Lightweight |
| up to 2499 | 242 | 326 | 462 |
| 2500-3499 | 306 | 413 | 482 |
| 3500-4499 | 346 | 466 | 501 |
| 4500-5499 | 385 | 519 | 540 |
| 5500-6499 | 404 | 546 | N/A |
| 6500 and up | 414 | 544 | N/A |

These numbers reflect a 20% reduction from GWP (CO₂e) limits in proposed code language: "Lifecycle GHG Impacts in Building Codes" by the New Buildings Institute, January 2022.

- These requirements apply to all GSA projects that use at least ten (10) cubic yards of concrete.
- If it is not feasible to meet GSA's EPD requirement or GWP limits, the [prime contractor] shall ask the GSA project manager to request a [P100 waiver](#).
 - The [prime contractor] shall outline and provide evidence of the specific circumstances that make compliance infeasible. For example, the only concrete suppliers within the maximum transport range for the mix design:
 - are small businesses that have not yet invested in EPDs; or
 - do not yet offer mixes that meet GSA's GWP limits, e.g. because lower-carbon materials are unavailable, or do not meet specific client-driven performance requirements.
 - Any requests for waivers from the GWP limits must include the strategies, if any, that will be used to reduce GWP to the extent feasible. Such strategies include, but are not limited to, the use of alternative cements, supplementary cementitious materials, or alternative aggregates.
 - For each concrete mix for which GSA has granted a waiver from the EPD requirement, the [prime contractor] shall send a GWP estimate generated with a tool such as [ZGF's LCA Tool](#), [Athena IE](#), or the Federal Highway Administration's [LCA Pave Tool](#) to embodiedcarbon@gsa.gov.
 - GSA will respond to each complete P100 waiver request with a decision or a request for more detail within ten (10) business days. A complete waiver request is deemed granted if no response is provided within that time.

Source: [GSA Concrete Spec.](#)

Environmentally Preferable Asphalt Standards for all GSA Projects
Revised March 29, 2022

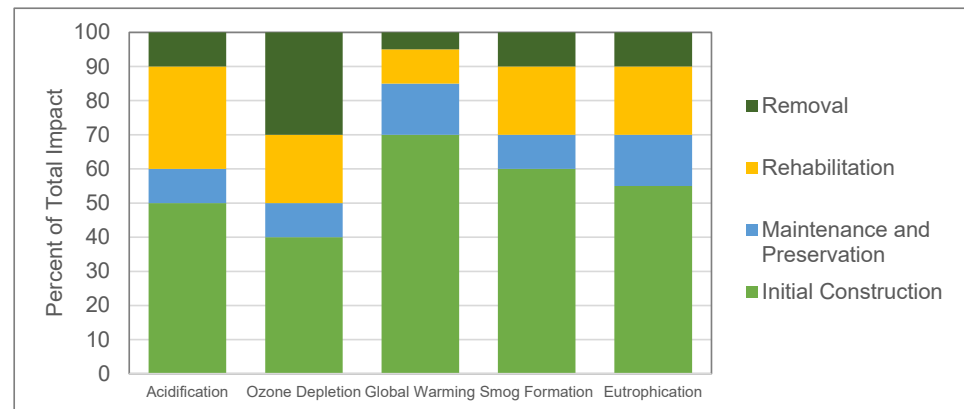
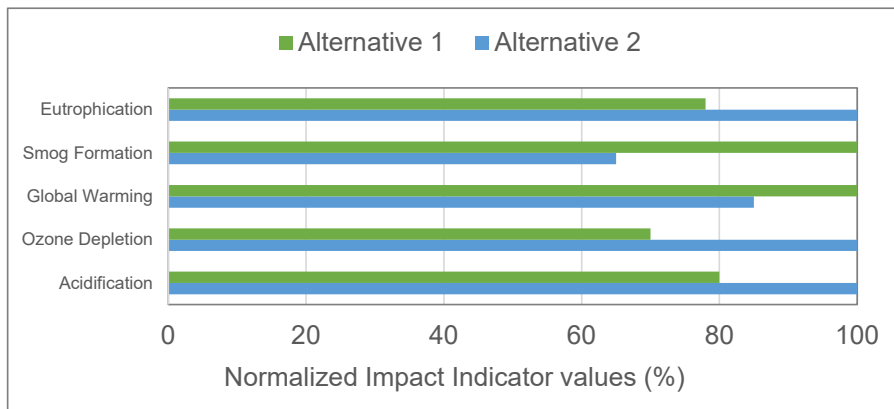
- The [prime contractor] shall provide a product-specific cradle-to-gate Type III environmental product declaration (EPD) for each asphalt mix specified in the design and used at the project, using version 2 of the National Asphalt Paving Association's [product category rule](#) for asphalt mixtures. Please send EPD(s) to embodiedcarbon@gsa.gov, and upload EPD(s) into GSA's project management information system.
- The [prime contractor] shall provide **environmentally preferable asphalt**, which is defined in this context as material manufactured or installed using at least two (2) of the following techniques. Please send each asphalt mix batch design (including type, volume, and a description of the proposed techniques) to embodiedcarbon@gsa.gov, and upload the submittals into GSA's project management information system.
 - Greater than 20% recycled asphalt pavement (RAP) content (specify percentage, and whether in-place or central plant recycling is used);
 - Warm mix technology (reduced onsite mix temperature);
 - Non-pavement recycled content (e.g. roof shingles, rubber, or plastic);
 - Bio-based or other alternative binders;
 - Improved energy/ carbon efficiency of manufacturing plants or equipment (e.g. using natural gas or electric for heating materials); or
 - Other environmentally preferable features or techniques (please specify).
- These requirements apply to all GSA projects that use at least ten (10) cubic yards of asphalt.
- If it is not feasible to meet GSA's EPD requirement or to implement at least two of the listed environmentally preferable features or techniques, the [prime contractor] shall ask the GSA project manager to request a [P100 waiver](#).
 - The [prime contractor] shall outline and provide evidence of the specific circumstances that make compliance infeasible. For example, the only asphalt suppliers within the maximum transport range for the mix design:
 - are small businesses that have not yet invested in EPDs; or
 - do not yet offer mixes that use at least two environmentally preferable features or techniques while meeting specific client-driven performance requirements.
 - For each asphalt mix for which GSA has granted a waiver from the EPD requirement, the [prime contractor] shall send a GWP estimate generated with a tool such as [Athena Pavement LCA](#) or the Federal Highway Administration's [LCA Pave Tool](#) to embodiedcarbon@gsa.gov.
 - GSA will respond to each complete P100 waiver request with a decision or a request for more detail within ten (10) business days. A complete waiver request is deemed granted if no response is provided within that time.

Source: [GSA Asphalt Spec.](#)

LCA Benchmarking Tool



- Created with stakeholder input
- Use the identified background datasets
- Incorporate material EPDs



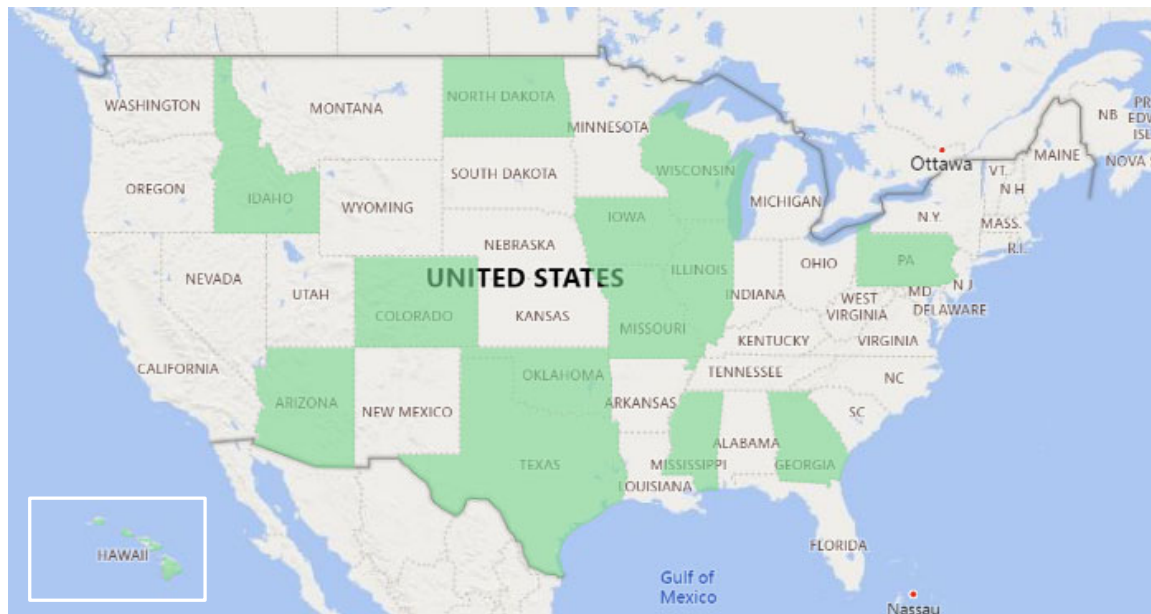
Available at: <https://www.fhwa.dot.gov/pavement/lcatool/>

National Buy Clean


- No Federal Mandate, yet
- PCRs not harmonized, yet (FHWA closely working on this, and ACLCA PCR Guidance Toolkit is coming soon!)
- State DOTs needs in-house/consultant expertise to do QA to ensure EPDs (provided) are meeting PCRs requirement on specifications:
 - PCRs national repository, yet
 - EPDs national repository, yet (verifying validity)

Deployment: Pooled Fund for Demonstration Projects

- <https://www.pooledfund.org/Details/Study/705>
- Provides \$250,000 +100 hours of technical assistance



LEGEND

 Pooled fund partners

Information collected from the pooled fund [web page](#).

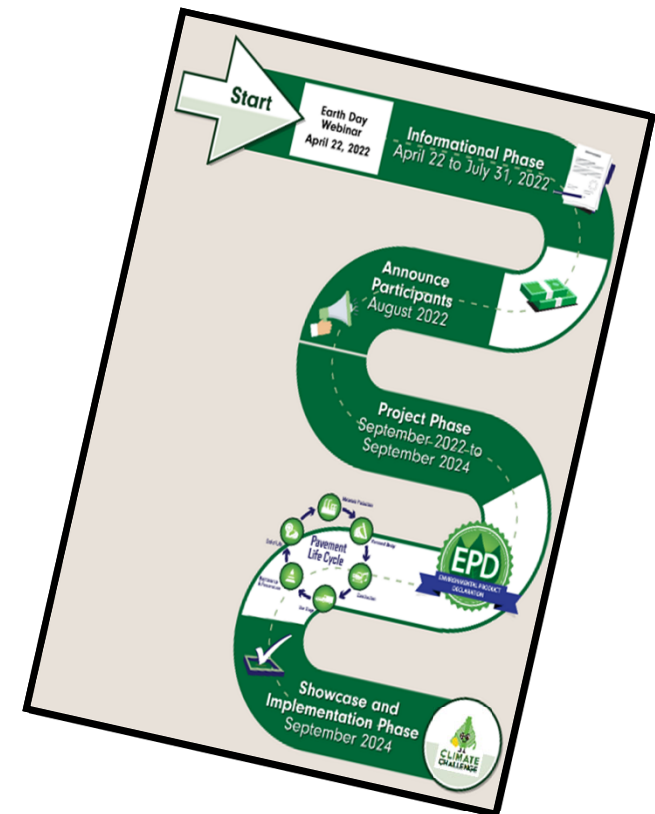


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Climate Challenge; Quantifying the Emissions of Sustainable Pavements

- Quantify GHG emissions of pavements through the implementation of LCA and EPDs
- Challenge participants with eligible proposals will be selected on a rolling basis until funding is no longer available
- **Up to \$500k** will be available per DOT (funding may require a match contribution by the DOT)
- For the latest information, visit the website: <https://highways.dot.gov/climatechallenge>



Resources

<http://www.fhwa.dot.gov/pavement/sustainability>



Education

[Pavement LCA Framework](#)

[Webinars](#)

[Tech briefs, studies](#)

[Technical articles](#)



Research

[LCA fit in transportation decision-making](#)

[EPDs in Green Public Procurement](#)

[LCA of recycled plastics in pavements](#)

[LCA of ground tire rubber in pavements](#)



Deployment

[LCAPave Tools](#)

[Pilot projects with State DOTs](#)

[Mobile Pavement Technologies Centers](#)

[Informing pre-engineering with ICE Tool](#)

For More Information

- FHWA Sustainable Pavements Website
 - www.fhwa.dot.gov/pavement/sustainability
- Contacts:
 - LaToya Johnson (Latoya.Johnson@dot.gov)
 - Migdalia Carrion (Migdalia.Carrion@dot.gov)
 - Brian Dobling (Brian.Dobling@dot.gov)

Q&A



Image source: [Pixabay open-source image](#)

<http://www.fhwa.dot.gov/pavement/sustainability>