



What the Heck is an EPD? (And Should You Care?)

Presented by:

Thomas Van Dam, Ph.D., P.E.

NCE

CPAM

March 14, 2019



Acknowledgements

- Dr. John Harvey, UC-Davis
- Jacquelyn Wong, Caltrans EPD
Implementation Project Manager

The Answer to the Question

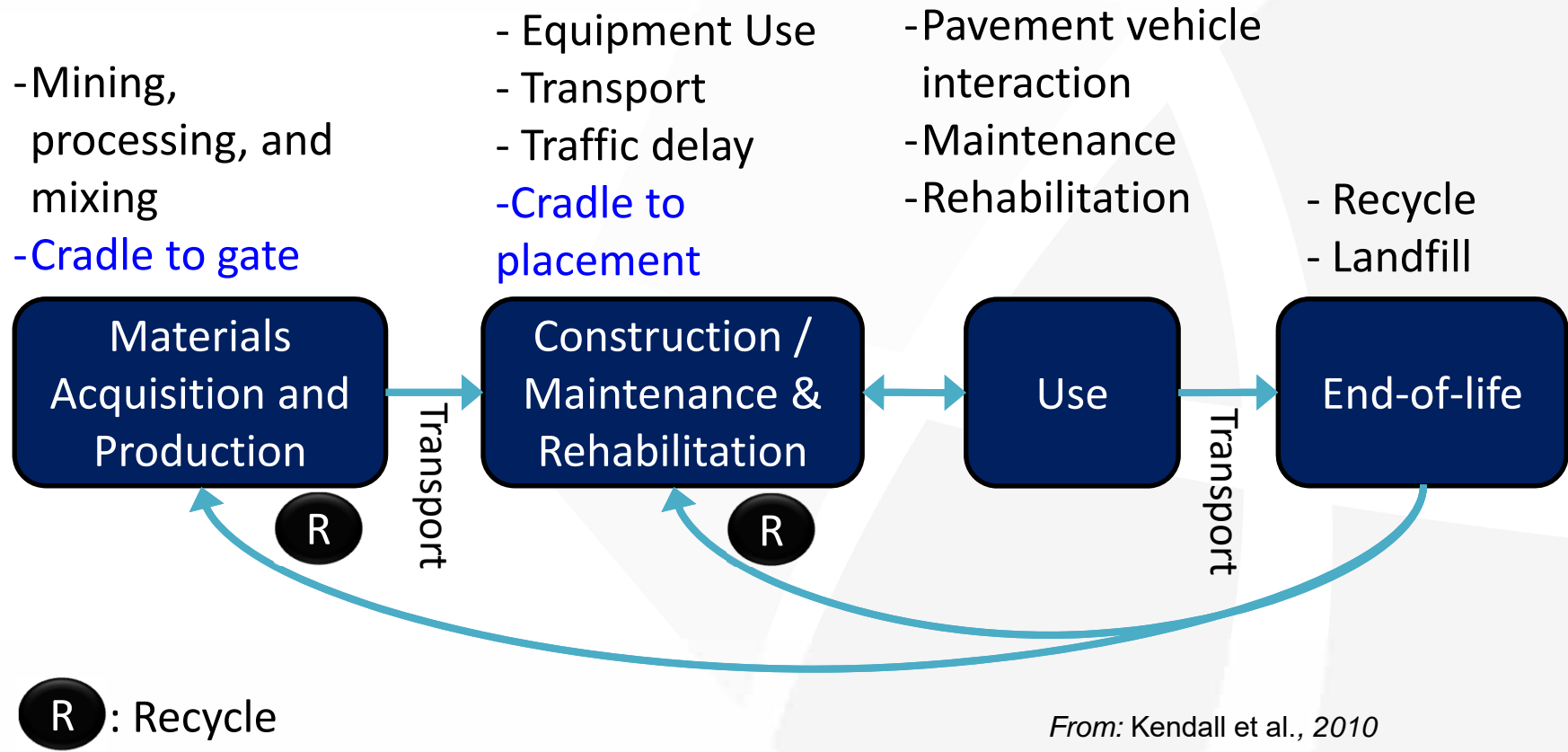
- An EPD is an environmental product declaration
 - The bigger question is, “Should you care?”
- So let’s talk about what an EPD is and how they can be effectively used to improve what we do.

Pavement Life Cycle Assessment

- An approach, using a standardized and rigorously enforced process, to quantitatively assess impact over multiple environmental impact categories
 - From cradle to gate, cradle to placement, or cradle to grave
- Becoming implementable for pavements
 - Environmental Product Declarations (EPDs) are a first step

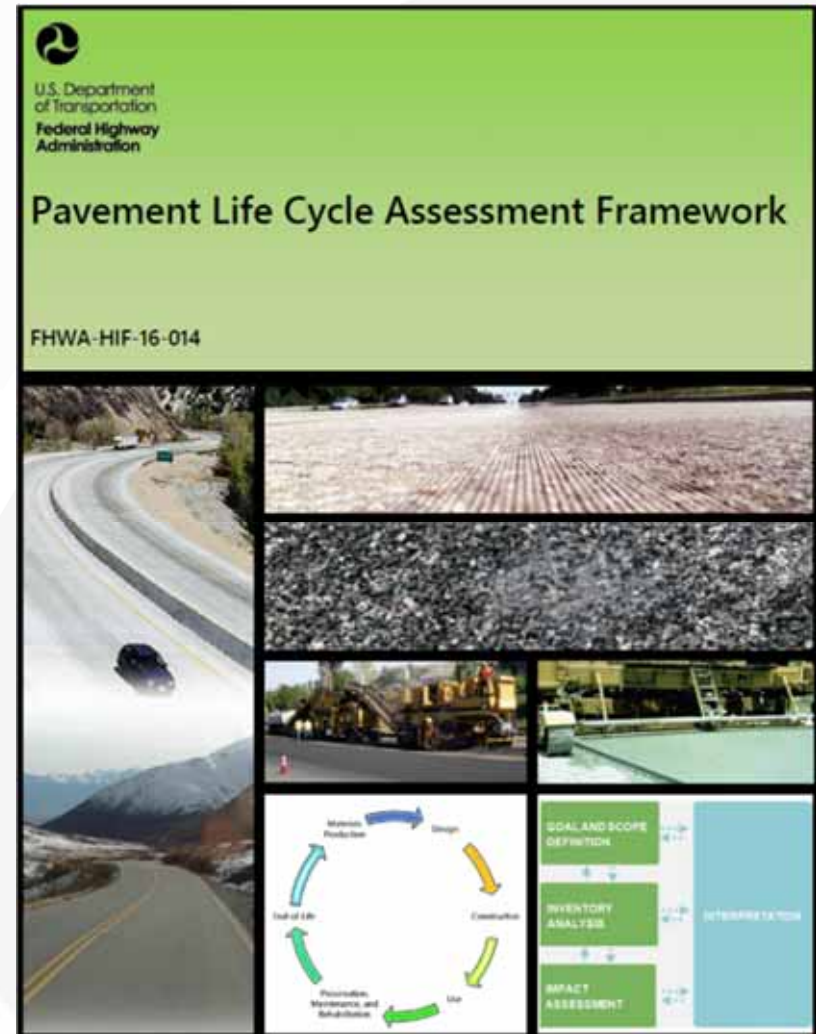


Pavement Life Cycle Assessment



ISO Standards and FHWA Pavement LCA Framework Document

- International Standards Organization (ISO) standards for LCA are generic for all materials
- FHWA guidance specific to pavements published in 2016





Illustrative Case Study

- Peña Boulevard is the four-lane divided highway providing access to Denver International Airport
- Required reconstruction to replace ASR-affected concrete pavement
- A number of innovative strategies were used to reduce cost and environmental impact



Illustrative Case Study

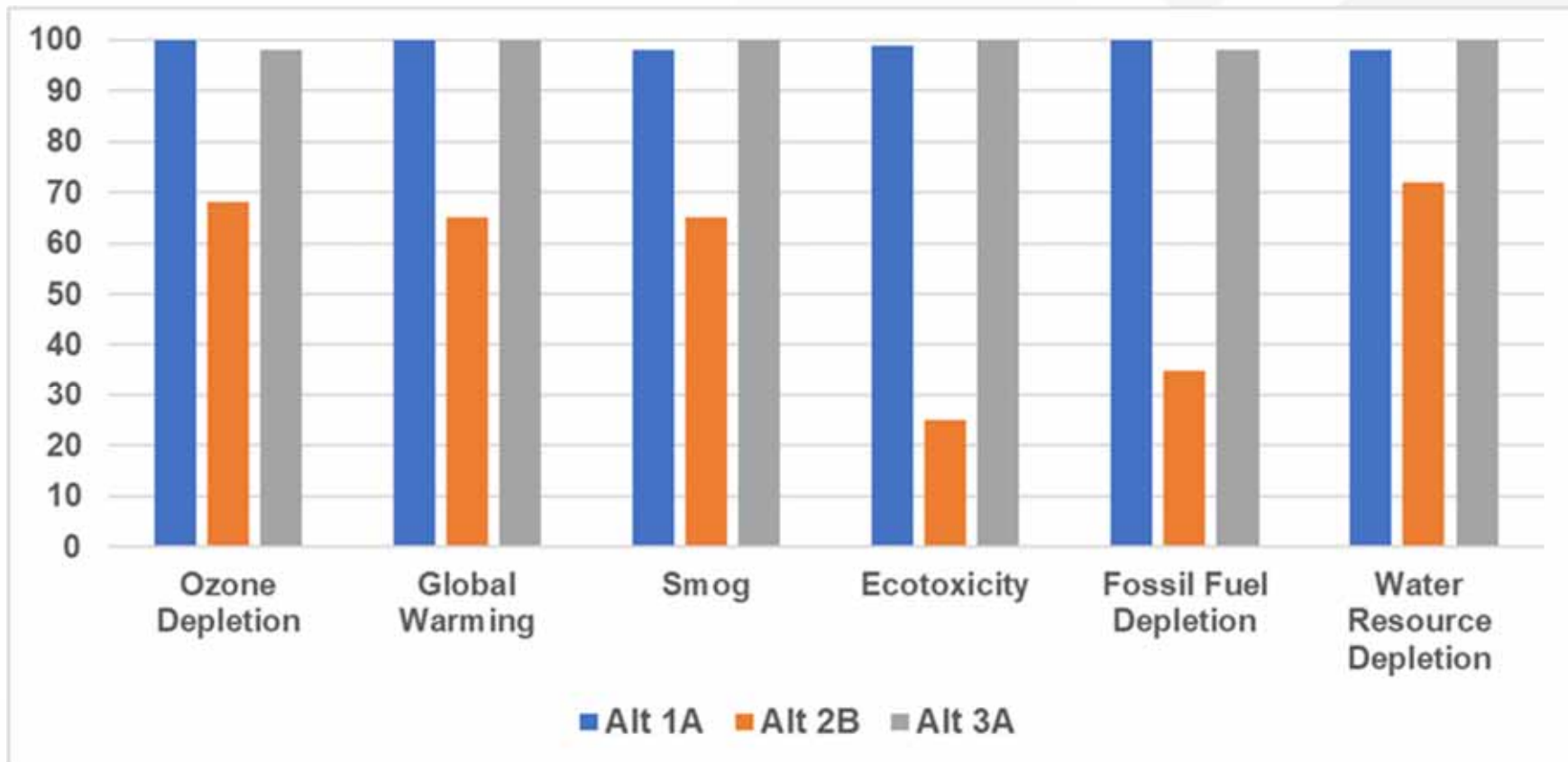
- Innovative strategies included:
 - In-place recycling of existing JPCP through rubblization
 - Optimized aggregate grading with reduced cementitious content
 - The use of a Type II cement with fly ash
- An LCA was used to assess reduced environmental impact



Scenarios Evaluated

Alternative	Existing Pavement	Base	New Pavement
1A. Remove & Replace	Remove existing pavement and 12 inches (305 mm) of lime-treated subgrade	Reapply broken up existing pavement, 4 inches (102 mm) of RCA, geotextile, 12 inches (305 mm) of RCA	11-inch (279-mm) JPCP (CDOT Class P mix)
2B. Rubblized	Rubblized and compacted	2-inch (51-mm) RCA (from other stockpiles)	11-inch (279-mm) JPCP (Optimized mix)
3A. Reconstruct	Remove existing pavement and 12 inches (305 mm) of lime-treated subgrade, recondition and compact 18 inch (457 mm) of subgrade	Geotextile, 12-inch (305- mm) virgin aggregate	11-inch (279-mm) JPCP (CDOT Class P mix)

LCA Results



Role of EPDs: What and Why?

- Standards used by producers to define performance of products
 - Result of a stakeholder process for measurement and reporting
 - EPDs are published by producers
- An LCA is used to declare the environmental impacts on product labels (Type III declarations = EPDs)
- EPDs are a preferred method for communication
 - Provide high level of confidence to customers and other stakeholders
 - Follow a standardized and transparent scientific process

Caltrans is Interested in Collecting EPDs

- Data collection for benchmarking
- Policy and legislation
 - Executive Order B-30-15
 - California Transportation Plan 2040
 - Strategic Management Plan Goal 3 – Sustainability, Livability, Economy (2015-2020)
 - Director's Policy: 30 – Climate Change and 33 – Sustainability
 - CA Assembly Bills 32 (GHG Reduction), 296 (Urban Heat Island), 262/1817 (Buy Clean CA), and CA Senate Bill SB-1



Development of EPDs

Adapted from N. Santero
by John Harvey

PCR: the framework

Product Category Rule (PCR)

“Set of specific rules, requirements, and guidelines for developing Type III environmental product declarations for one or more product categories” (ISO 14025)

LCA: the analysis

Life Cycle Assessment (LCA)

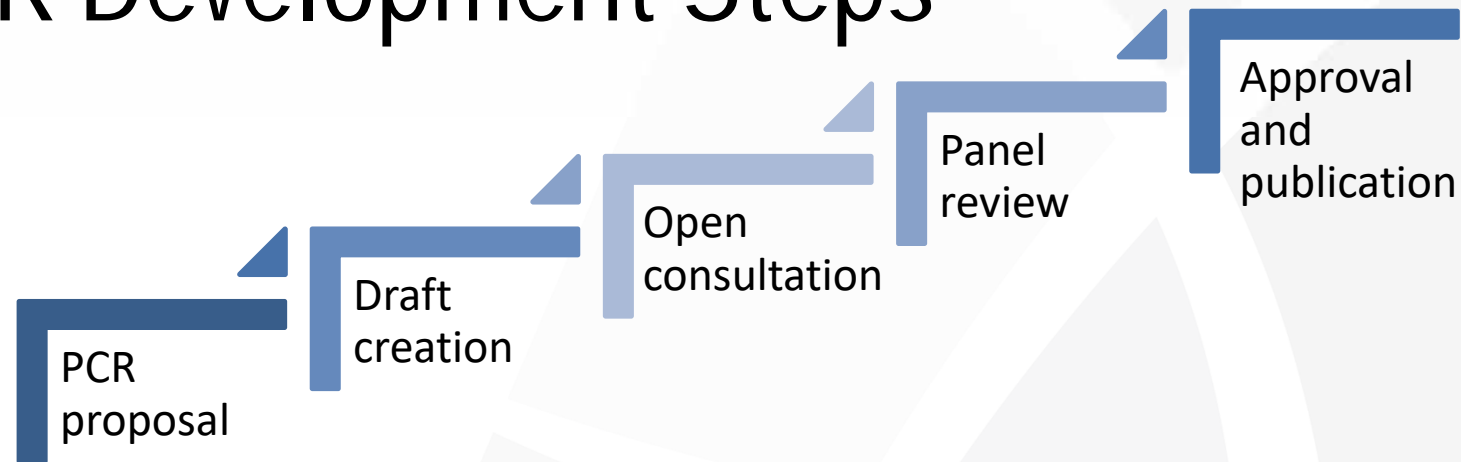
“Compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle” (ISO 14040)

EPD: the declaration

Environmental Product Declaration (EPD)

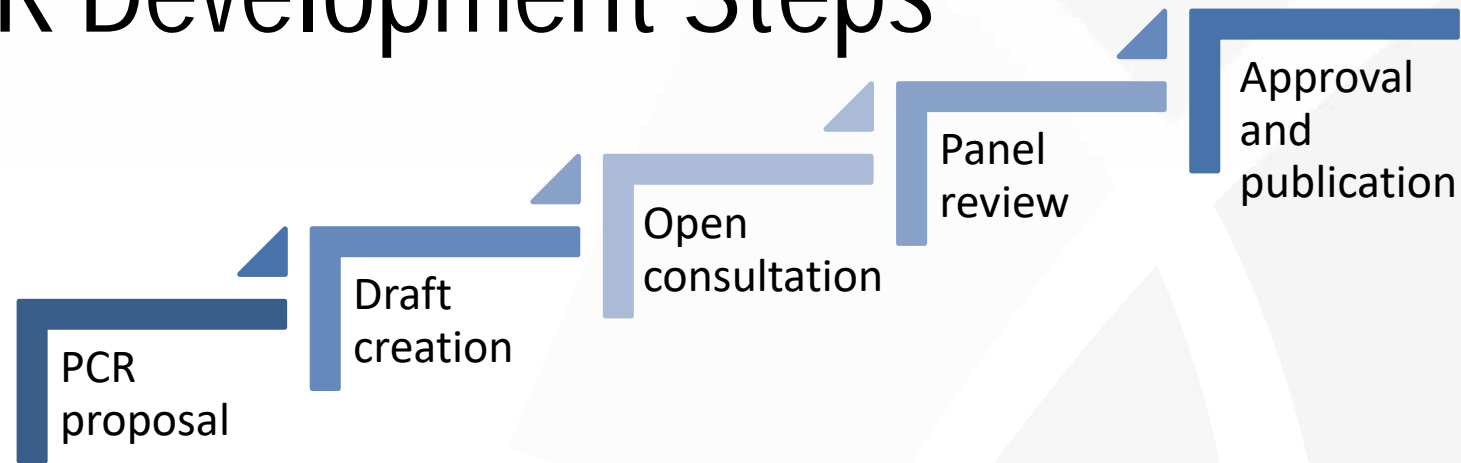
“Providing quantified environmental data using predetermined parameters and, where relevant, additional environmental information” (ISO 14025) as defined in a PCR which is based on LCA

PCR Development Steps



- Stakeholder engagement
 - Manufacturers within the industry
 - Other industry associations, including competing industries
 - LCA practitioners (e.g., LCA consultants)
 - Government agencies (e.g., FHWA, state DOTs)
 - NGOs
- Subject to critical review, relative to ISO and other standards of importance to customers

PCR Development Steps



- Facilitated by a program operator
 - Hosts the PCR
 - Verifies EPDs
 - Registers EPDs
- Each industry sets up, operates, or chooses operator for its own PCR/EPD
- Currently some differences in US between PCRs: conflicts in rules
- In Europe generally reviewed by government coordinating committees, peer pressure used to resolve conflicts in PCR rules

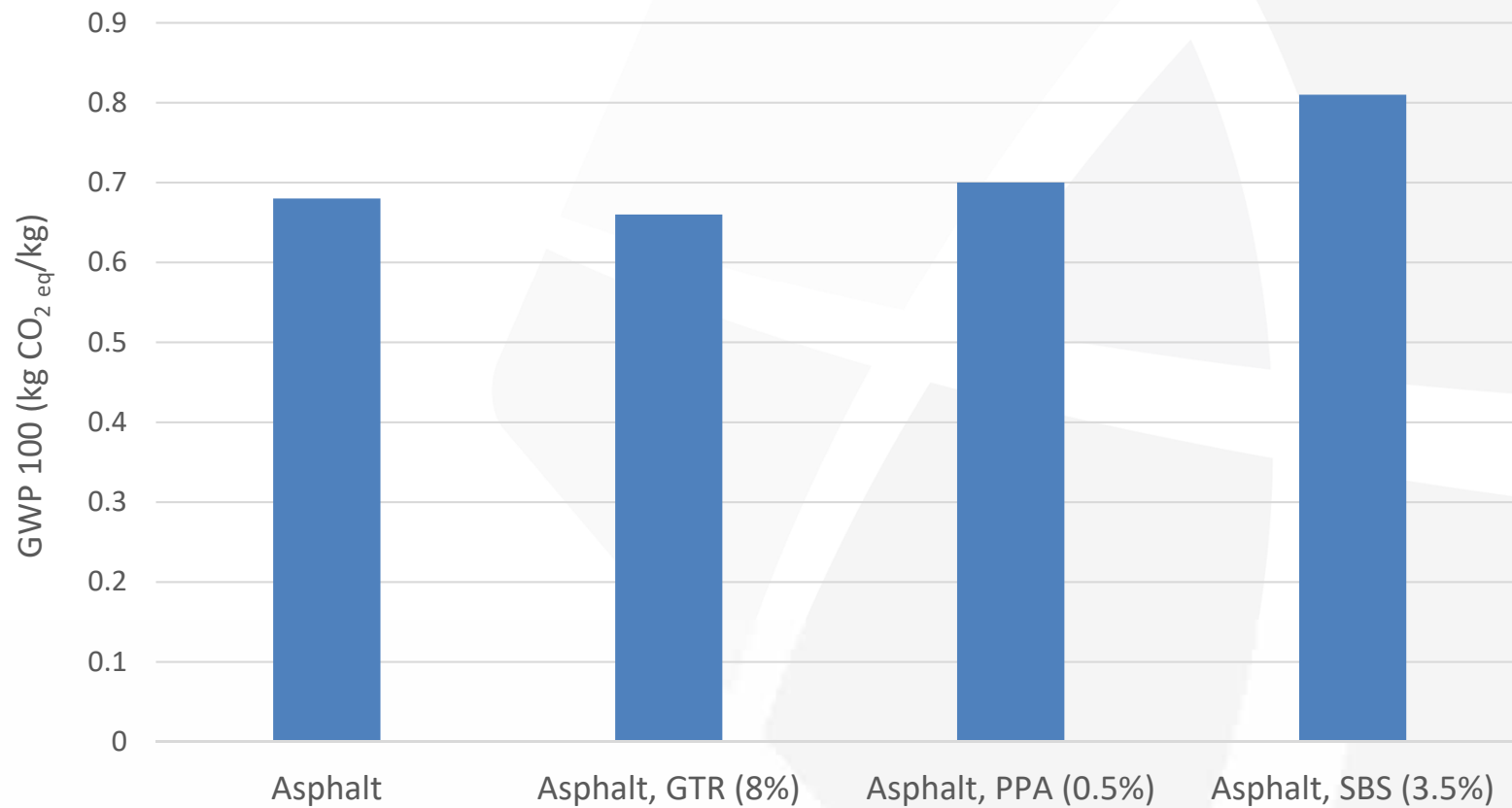


LCA Used to Create the EPD

- An LCA must be developed that falls within the product category of the PCR
- The LCA must follow the instructions in the pertinent PCR
- An industry group will often conduct an initial national industry-average or regional-average LCA that uses typical values from across the country or region
- An independent third party performs a critical review and verification of the LCA and EPD against the PCR, after which the Program Operator issues the EPD

Example: Asphalt Institute EPD

U.S. National Average for Asphalt Binder







The LCA for the EPD

- Initial industry-average LCA assembles all of the information needed to produce EPDs and makes data available to individual producers to use for their initial EPDs
 - Individual companies produce EPDs for their company or plant-specific products by adjusting the mix design for the specific product and making other changes needed to make it relevant to the specific product (e.g. specific or regionalized data vs national)
- EPDs can only be produced for those stages of the life for which the EPD developer has information
 - Most often cradle to gate

Example: Specific Concrete EPD

Summary of Environmental Product Declaration		Environmental Impacts 			
Central Concrete		Impact name	Unit	Impact per m3	Impact per cyd
Mix	340PG9Q1	Total primary energy consumption	MJ	2,491	1,906
San Jose Service Area		Concrete water use (batch)	m3	6.66E-2	5.10E-2
EF V2 Gen Use P4000 3" Line 50% SCM		Concrete water use (wash)	m3	8.56E-3	6.55E-3
Performance Metrics 		Global warming potential	kg CO2-eq	271	207
		Ozone depletion	kg CFC-11-eq	5.40E-6	4.14E-6
		Acidification	kg SO2-eq	2.26	1.73
		Eutrophication	kg N-eq	1.31E-1	1.00E-1
		Photochemical ozone creation	kg O3-eq	46.6	35.7
28-day compressive strength	4,000 psi				
Slump	4.0 in				

A sample EPD for a concrete mix design by Central Concrete Supply Co.

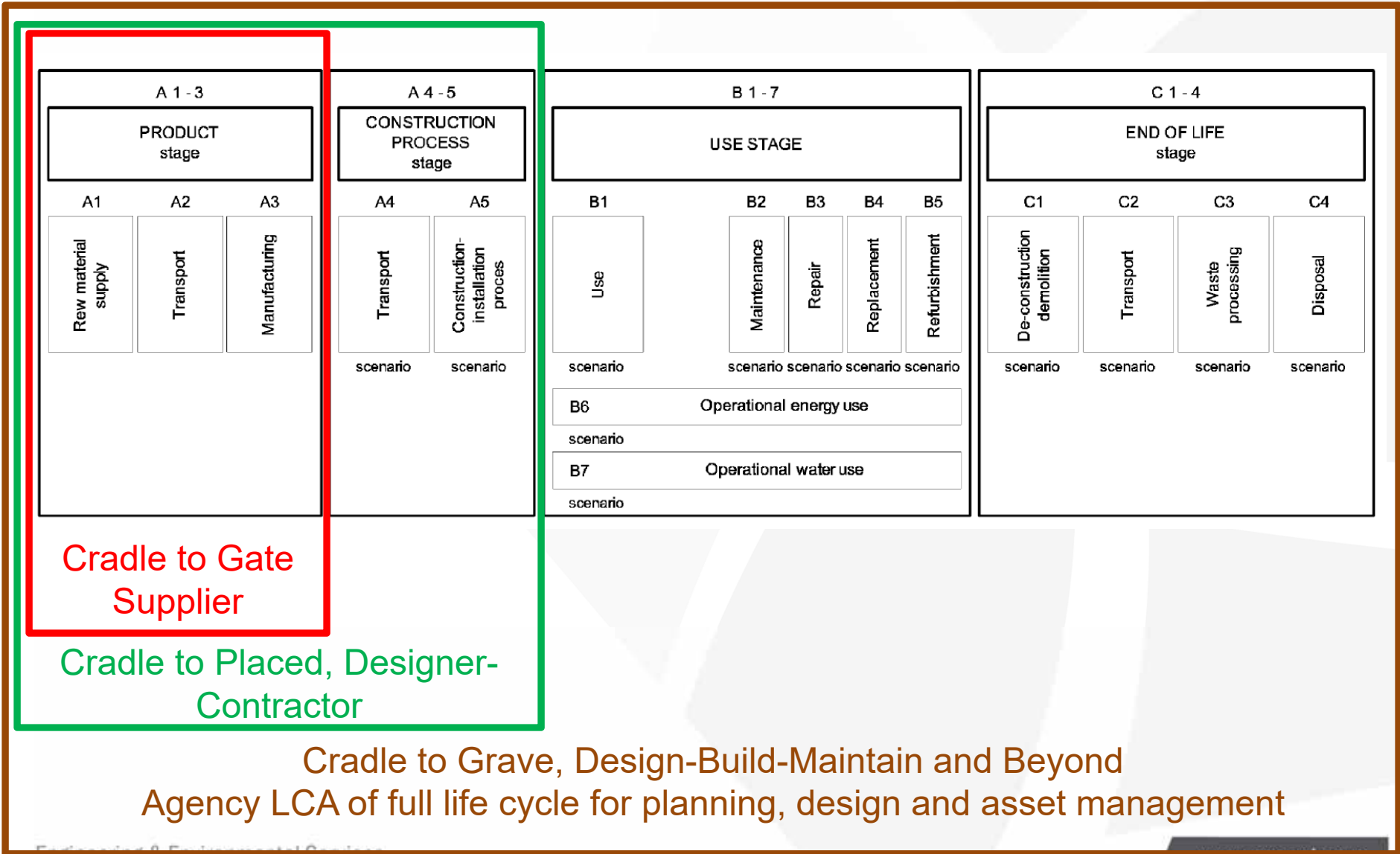
Credit: Central Concrete Supply

<https://www.fhwa.dot.gov/pavement/sustainability/articles/environmental.cfm>



Types of LCAs/EPDs EN 15804

Adapted from John Harvey





What's Next for Caltrans?

- Carbon steel rebar, flat glass, mineral wool board insulation, and structural steel
 - Jan 1, 2019 to Dec 31, 2019 – Request EPDs
 - After Jan 1, 2020 – Require EPDs
- Concrete, asphalt, and aggregate
 - EPD requested on voluntary basis
 - Five pilot projects currently in the works with more in the pipeline

www.dot.ca.gov/mets/ab-262

Things to Think About

- Can EPDs/LCA support better decision-making?
 - Significantly reduces “greenwashing”
 - Drive innovation
 - Use in selection process?
- How does an agency objectively incentivize sustainable practices?
- How do we move EPDs/LCAs from “cradle to gate” to “cradle to grave”?

Devil is in the Details

- What happens if producers do not want to play the game?
- What happens if supply changes in the course of a project?
- How are mobile concrete plants assessed?
- Other concerns?



For More Information

- Keep an eye on the FHWA's Sustainable Pavements Program
 - <https://www.fhwa.dot.gov/pavement/sustainability/>
 - Or Google "FHWA Sustainable Pavements"



Thomas Van Dam, Ph.D., P.E.
tvandam@ncenet.com



NCE

Engineering and Environmental Services

Collaboration. Commitment. Confidence.SM