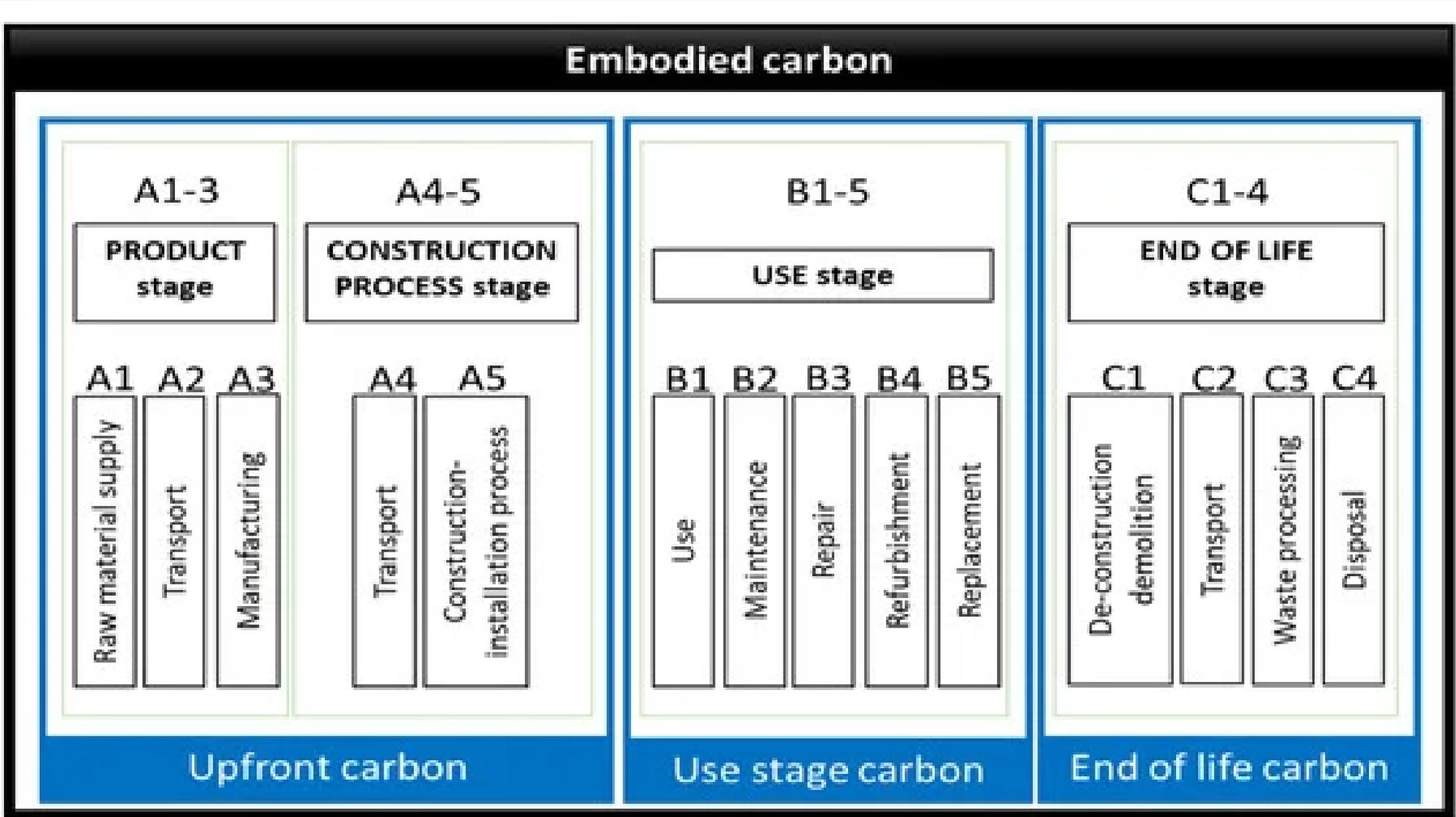


EMBODIED CARBON IN CONSTRUCTION MATERIALS

Curt Turgeon | Office of Materials and Road Research

- EPD -Environmental Product Declaration: documentation of the environmental impacts of a product based upon an approved PCR. An EPD can be a national/regional average or a plant and mix specific value.
- PCR – Product Category Rule: defines the functional unit (ton, cubic yard, ..) and the parameters required to be included when calculating the EPD values.
- LCA – Life Cycle Assessment: Calculated embodied carbon within the considered life cycle stages. An EPD is an LCA for life cycle stages A1-A3.

ISO Defined Life Cycle Stages



- ISO Standards in Europe
- 2012 FHWA Sustainable Pavements TWG
- 2015 National Ready-Mix Association Publishes PCR
 - Response to LEED system
- 2018 National Asphalt Pavement Association Publishes PCR
- 2018 California Legislation requiring EPDs
- July 2021 Colorado Legislation requiring EPDs
 - Requires EPDs on July 2022
 - Requires Maximum Limits by 2024
- 2022 FHWA Climate Challenge
- 2023 Minnesota Legislation,
 - Dept Admin EPD recommendations by January 2026
 - MnDOT EPD recommendations by January 2028
- **September 2024 Low Carbon Transportation Materials Grant Announcement (October?)**

- Inflation Reduction Act – FHWA Low Carbon Transportation Materials Grant
 - \$1.2 Billion available in noncompetitive grants to State DOTs.
 - MnDOT requested \$40 million, likely receive approximately \$30M
 - All expenditures must be linked to EPDs
 - Award later in September (October ?)
 - Obligating funds within 2 years with expenditure by 2031.

Potential Activities

- Program to Create and Collect EPDs
 - Likely predetermined price through Change Order
- Pilot Projects using Lower GHG materials (added costs are eligible)
- Enhanced Quality Control and Quality Assurance –
 - Implementation of new tests and protocols
 - Not developing new tests
- Training
- Database management
 - Interconnect with Material Data Management Systems
 - Interconnect with AASHTOware
- Establish Benchmarks and potentially incentive specifications.



Anticipated Actions

- Asphalt Industry

- Increase RAP percentage
 - Mill deeper, thinner overlay, 3D mill
 - Additional testing
 - Relax current volumetric specs
- Plant Operation
 - Insulate drum, silo and tanks – house
 - Warm mix additives
 - Biogas fuels ?
 - Cover stockpiles – limit moisture

- Concrete Industry

- Optimize gradations = less paste
- Decrease klinker cement
 - Portland lime cement 15% - done
 - Fly Ash
 - Slag
 - Crazy Chemistry

- 2023 Mn Legislature - Environmental Sustainable Procurement Task Force
 - Dept of ADMIN is lead, MnDOT is co Chair,
 - Ready Mix concrete for structures recommendations in 2026
 - MnDOT recommendations for asphalt, concrete and steel to Legislature January 2028
 - EPD implementation is the basis for this Legislation.

Benchmarking

- Benchmarks can be set using available data. What is the outcome?
- Benchmarks should not limit number of bidders
- Preference should be provided to lower embodied carbon no matter the Benchmark.
- Low Bid system assumes the Contract will provide the minimum and nothing more. They will meet the Benchmark, but not go lower without incentive
- Benchmarks should be used in conjunction with other common Contract Administration procedures such as A+B+C bidding or preferably, incentives/disincentives based upon what was actually furnished and installed.

- Generate and collect EPDs
 - Ideally, done outside standard MnDOT Contracting
 - More data sooner
 - Less paperwork
- Implement off the shelf technology
 - Asphalt Mix
 - Higher RAP Percentages
 - Warm Mix
 - Concrete Mix
 - Optimize gradation / reduce paste
 - Cement Replacement

**REDUCING THE DURABILITY OF THE
PRODUCTS WE BUY IMMEDIATELY
INCREASES THE EMBODIED CARBON OF
THE FINISHED PRODUCT**

QUESTIONS?