

Climate Compliance vs Action 2023: An Update on "Buy Clean," Emissions, LCAs, EPDs, and Funding

NYC Clean Construction – Executive Order 22
NYS Sustainability & Decarbonization Program
– Executive Order 23

CURRENT LANDSCAPE

❑ FEDERAL: General Service Administration

"GSA is *evaluating and reimagining our climate footprint across the full life cycle of federal buildings* -- not only the impacts of their daily operations but also the products used in construction and modernizations."

❑ NYS & NYC Executive Orders & Local Laws

- ❑ Leading by Example

- ❑ Leveraging existing frameworks & solutions

- ❑ Known Gaps in existing frameworks and solutions

Climate Compliance vs Action 2023: An Update on "Buy Clean," Emissions, LCAs, EPDs, and Funding

“According to Architecture 2030, embodied carbon **will account for 74% of the emissions from new construction over the next decade.**

Greenhouse gas emissions and energy use ***will continue to rise unless concerted effort is made to reduce the carbon footprint of building construction.***

CLEAN CONSTRUCTION – EXECUTIVE ORDER 23

- ❑ committed to carbon neutrality by 2050 and the goals set forth in the Paris Agreement

- ❑ construction is responsible for 23% of global greenhouse gas emissions

CLEAN CONSTRUCTION – EXECUTIVE ORDER 23

- ❑ the **embodied carbon** from cement manufacturing is responsible for an estimated 8% of global greenhouse gas emissions
- ❑ the **embodied carbon** from iron and steel production accounts for approximately 7% of global greenhouse gas emissions
- ❑ "Embodied carbon" means the *greenhouse gas emissions arising from the manufacturing, transportation, installation, maintenance, and disposal of building materials.*

CLEAN CONSTRUCTION – EXECUTIVE ORDER 23

- ❑ the City of New York commits to *reducing greenhouse gas emissions associated with the embodied carbon* of **building materials** and **construction equipment** through city agency leadership as set forth in this Order

- ❑ the City of New York has the opportunity to *lead the market development* and **uptake of low-embodied carbon** and **clean construction strategies** through the incorporation of these principles **into our publicly-funded project**

CLEAN CONSTRUCTION – EXECUTIVE ORDER 23

- ❑ "Capital project agencies" means the NYC department of
 - ❑ design and construction,
 - ❑ citywide administrative services,
 - ❑ environmental protection,
 - ❑ transportation, and
 - ❑ parks and recreation

CLEAN CONSTRUCTION – EXECUTIVE ORDER 23

- ❑ "**Substantial reconstruction**" has the same meaning as such term is defined in subdivision a of section 224.1 of the charter of the city of New York
- ❑ "**Substantial work on the building envelope**" means the replacement or alteration of 50 percent or more of the building envelope's total glazing area, or 50 percent or more of the building envelope's total area of opaque components.

This includes recladding, work on the interior side of exterior walls, including, but not limited to the removal of interior wallboard or plaster, and roof replacements.

CLEAN CONSTRUCTION – EXECUTIVE ORDER 23

- "Life cycle assessment report" means a **report that complies** with one of the following green building standard credits, **or equivalent**, consistent with the standard pursued by the project:
 - **LEED v4 Materials and Resources Credit** -*Building Life Cycle Impact Reduction: Option 4. Whole-Building Life-Cycle Assessment;*
 - **Envision v3 Credit CRI .1** - *Reduce Net Embodied Carbon, and/or LD3.3 -Conduct Life Cycle Economic Evaluation;* or
 - **NYC Green Schools Guide 2019 credit M3 .1 A** - *Life-Cycle Impact Reduction, Whole Building LCA.*

DECARBONIZATION – NYS EXECUTIVE ORDER 22

- ❑ "Starting **January 1, 2023**, Affected Entities (about 75 State Agencies & Authorities) ***shall seek to reduce the embodied carbon in all new construction or construction projects consisting of adaptive reuse or significant renovations that cost greater than 50% of the cost of new construction***, submitted for permitting by Affected Entities, by taking the following actions:
 - ❑ **Design teams** shall calculate the ***total embodied carbon that will result from the project***, including shipping, transportation, and construction equipment requirements.
 - ❑ **Bidders** shall be required to ***submit environmental product declarations when available***, that include the amount of embodied carbon in given building materials.

SCOPE OF EPDs

- ❑ **Cradle-to-Gate:** Includes the impacts calculated from initial material production (e.g., oil exploration and extraction, mining of rock) up to the gate of the manufacturing site (EN 15804 modules A1-A3 in table 2) (EN 2012).

*This type of EPD is most applicable in **design-bid-build (DBB) projects.***

- ❑ **Cradle-to-Site:** Includes the impacts of cradle-to-gate plus the transportation to the paving site, and the construction operation of paving (EN 15804 modules A1-A5 in table 2) (EN 2012).

*This type of EPD is most applicable in **design-build (DB) projects.***

SCOPE OF EPDs

- ❑ **Cradle-to-Grave:** Includes the impacts of cradle-to-site, plus the use stage processes (e.g., vehicle operation, stormwater, noise) and maintenance and rehabilitation just before the first reconstruction (EN 15804 modules A1-A5, B1-B7, and C1-C4 in table 2) (EN 2012).

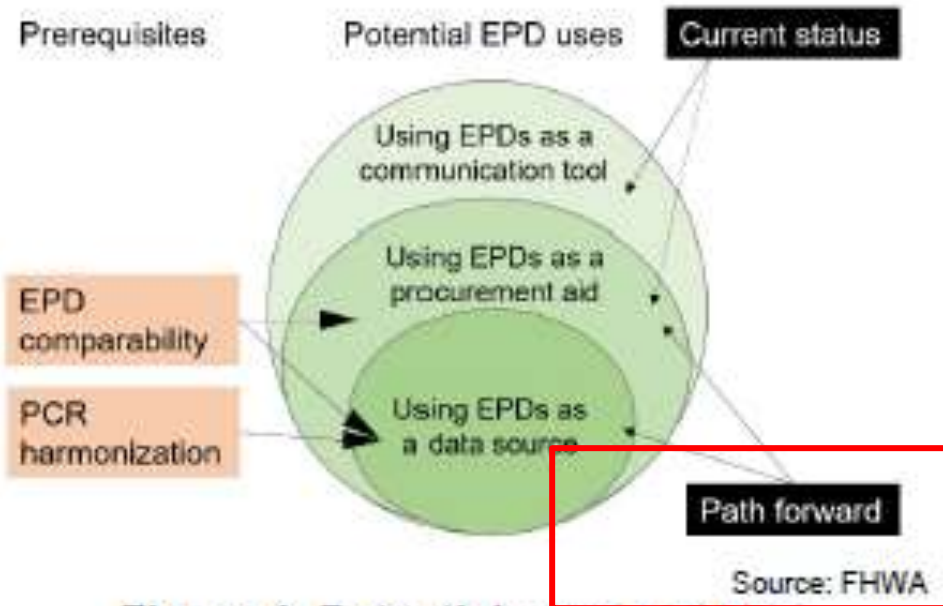
This type of EPD is most applicable in design-build-maintain (DBM) projects.



Source: FHWA

Figure 3. EPD types based on specificity.

Note: PFS EPD = product- and facility-specific EPD.



Source: FHWA

Figure 4: Potential uses of EPDs.

| Program/Guide | 2015 LEED v4 | 2018 Envision | 2018 NYC SCA |
|--|--|---|--|
| Product Category Rules (PCR) / Life-Cycle Assessment (LCA) / Environmental Product Declarations (EPDs) | LEED BD+C: New Construction v4 Materials and Resources Credit - Building Life Cycle Impact Reduction: Option 4. Whole-Building Life-Cycle Assessment | Envision v3 Credit CR1.1 - Reduce Net Embodied Carbon, and/or LD3.3 - Conduct Life Cycle Economic Evaluation | NYC Green Schools Guide 2019 credit M3.1A – Life-Cycle Impact Reduction, Whole Building LCA. |
| Intent | Intent: reduce environmental effects during initial project decision-making by reusing existing building resources OR demonstrating a reduction in materials use through life-cycle assessment. Encourage strategized material decision making for reduced environmental impacts, health hazards, and waste-materials that can be reused in the future. | CR1.1- Reduce the impacts of material extraction, refinement/manufacture, and transport over the project life—Reduce Net Embodied Carbon LD3.3- Utilize economic analyses to identify the full economic implications and the broader social and environmental benefits of the project through LCCAs | Optimize the environmental performance of building products and materials for schools. |
| Embodied Carbon | LEED v4.1 Recent updates to the rating system reward life-cycle analysis in the form of whole-building life cycle assessment and EPD; material ingredient reporting and optimization; responsible sourcing of raw materials; and waste reduction and management (by reducing construction and demolition waste disposed of in landfills and incineration facilities by recovering, reusing and recycling materials) – all in which incentivize real reductions in embodied carbon | CR1.1- (A) identify and determine which materials are primary contributors to net embodied carbon, (B) calculate embodied carbon (extraction, production, transportation, repair over life of materials), (C) project team demonstrates at least 5-50% reduction in total embodied carbon of materials | Overall the guide entails requirements that identify specific actions that fit into the larger context of lifecycle approach to embodied impact reduction" - Does not directly set requirements for embodied carbon |
| LCA | Reward demonstrations of reduced environmental effects by the reduction of materials use through LCA | CR1.1 (B) calculate embodied carbon as it relates to the replacement, repair, or refurbishment of materials over the life of the project—requires total calculations that offer insight into the durability of materials LD3.3- (A) life-cycle cost analysis (B) Life-cycle Cost alternatives analysis - | For new construction projects.. - Requires an LCA of school's structure and building enclosure that demonstrates 10% reduction compared to baseline |
| Challenges | Supply chains globally- disrupted manufacturing-shortage of products with high demand Designing for flexibility of space with changing cultures of how public spaces are to be used (e.g office spaces and hybrid schedules) Waste disruptions- recycling centers closed, or social distancing practices reduce productivity, new contamination procedures in response to the pandemic | CR1.1 availability of data on the carbon intensity of materials is often limited, some projects have hundreds or thousands of products, choosing local vs. outsourced materials to reduce embodied carbon from transportation might compromise durability- need to compare net embodied carbon | Often limited availability of data on the carbon intensity of materials |

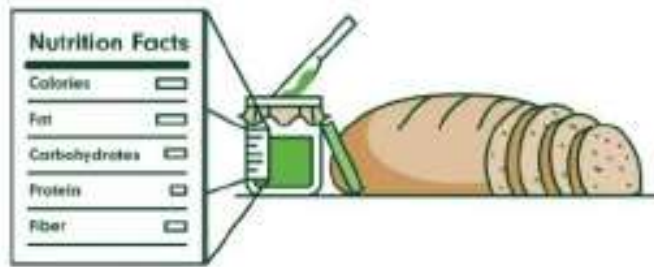
NYC SCHOOL of CONSTRUCTION AUTHORITY: LCA IMPACT REDUCTION – WHOLE BUILDING CONSTRUCTION MATERIALS

Evaluating Unique Building Assemblies

- ❑ The NYC School OF Construction Authority (SCA) **prototype LCA model evaluated SCA Standard building envelope and structural assemblies using the Athena Impact Estimator for Buildings.**
- ❑ **Athena Impact Estimator** provides LCA profiles for **many common building assemblies and systems based on regionally specific**, ISO 14044-compliant engineering and manufacturing data. The prototype school analysis was developed using Athena.
- ❑ The SCA LCA Impact Assessment Guidelines was also developed with Athena. The assessment must follow TRACI Method developed by U.S. EPA.
 - ❑ The scope of the analysis must be a **cradle-to-grave assessment**, which includes environmental impacts associated with all the life-cycle stages for the building structure and enclosure: resource extraction or harvest, building product manufacture, on-site construction, product maintenance and replacement (where warranted), and ***deconstruction or demolition and disposal over an assumed service life of at least 60 years.***
 - ❑ Operational energy use is excluded from the LCA to avoid double-counting reductions with E3.1.



Figure 1. Construction materials stacked on project site. Materials that are energy intensive, labor intensive, or make up a large portion of the building envelope have the highest life-cycle impacts.



Similar to nutrition labels for food products, EPDs communicate critical environmental information on pavement materials to the customer.



Source: FHWA

Figure 1. EPD concepts.

- Industry stakeholders.
- Related industries.
- LCA practitioners.
- Subject matter experts, often from academia.
- Government agencies.
- Non-governmental organizations.
- Customers.