



Opportunities for Reducing Embodied Carbon in the Building Sector

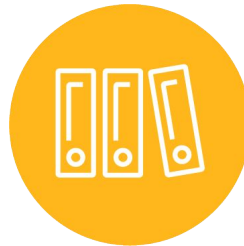
Meghan Lewis

Senior Research, Carbon Leadership Forum



Research

- Data assessment
- Data methodology
- Policy
- Strategies



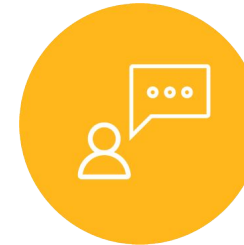
Resources

- Newsletters
- Toolkits
- Curricula
- References



Network

- Local hubs
- Focus groups
- Online community
- NGO roundtable
- Members



Initiatives

- SE 2050 Challenge
- EC3 Tool
- Events
- Etc.



Sponsors

- Organizations
- Foundations
- Individuals

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What is **Upfront Embodied** Carbon?



Embodied Carbon

Manufacture, transport and installation of construction materials

Operational Carbon

Building Energy Consumption

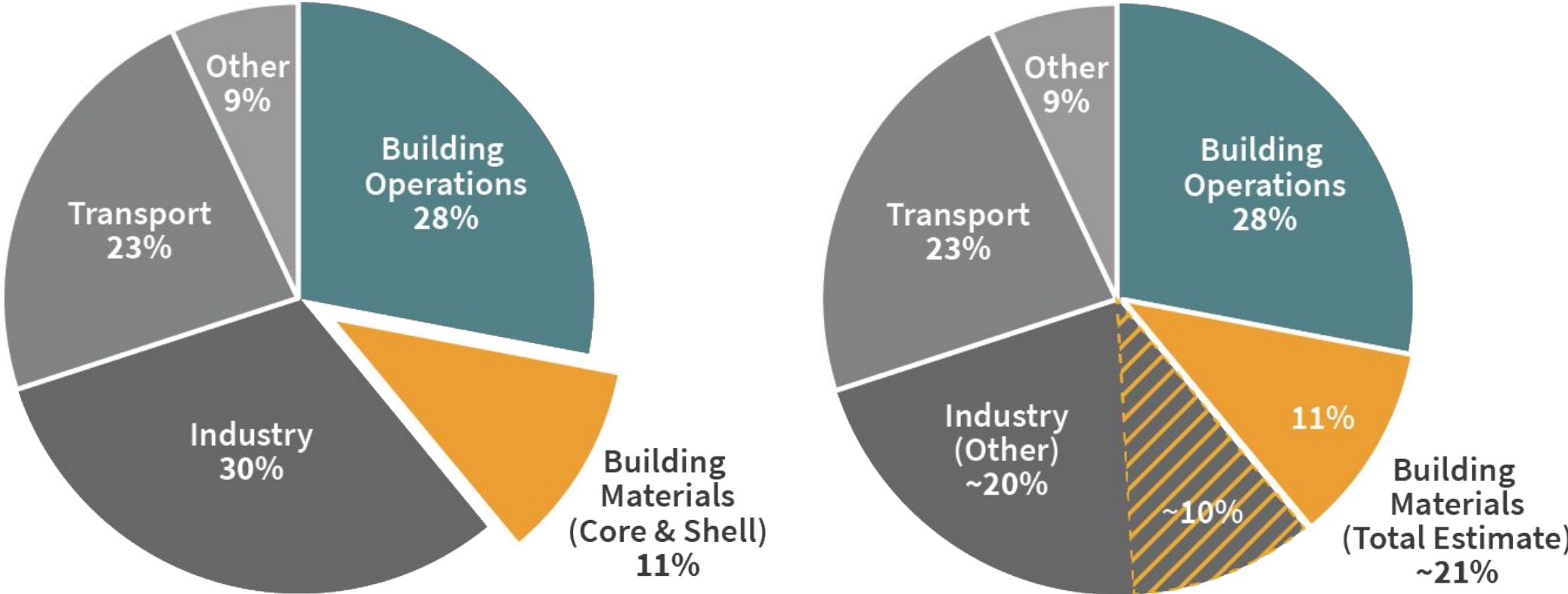
Image: S. Smedley Skanska

Total Carbon = Embodied Carbon + Operational Carbon

$$TC = EC + OC$$

Embodied Carbon is Significant

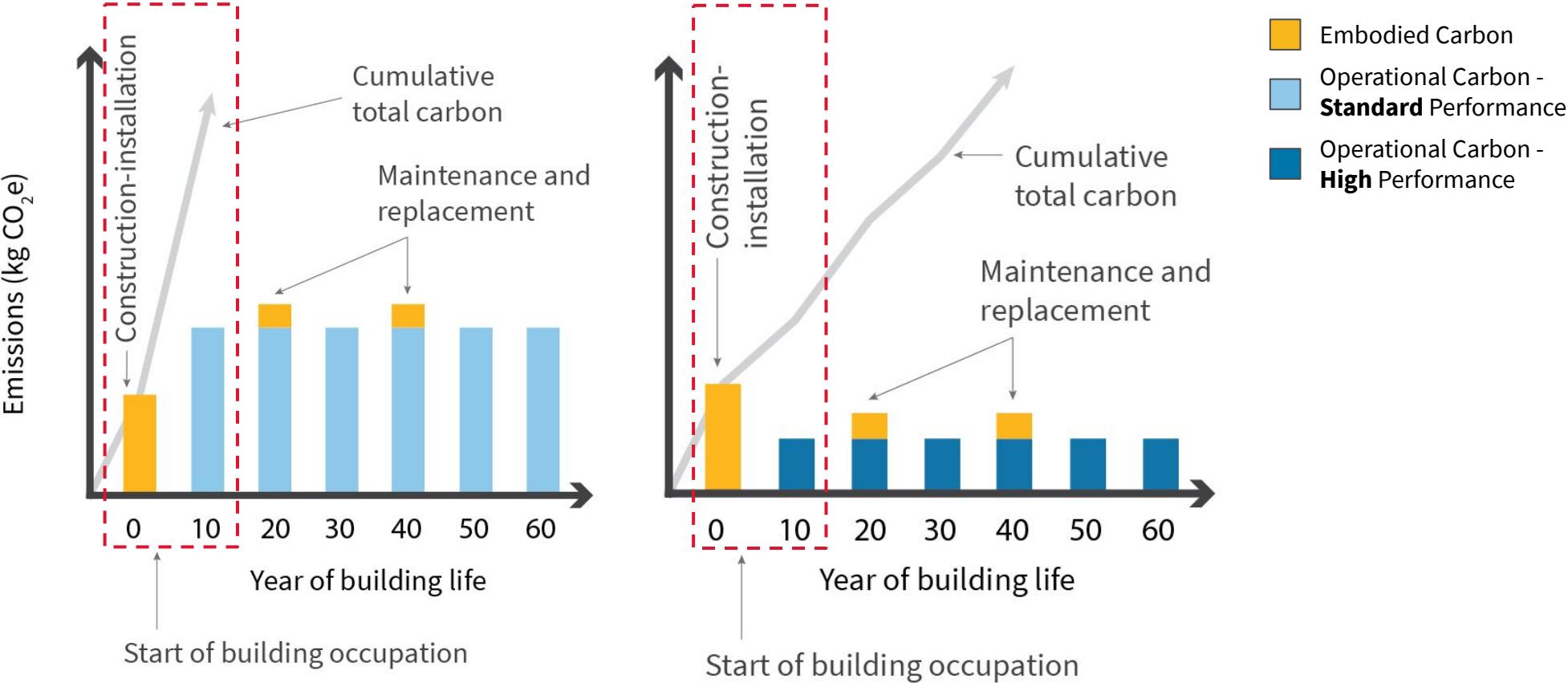
Global CO₂ Emissions by Sector



Adapted from 2018 2030, Inc. / Architecture 2030. Data Sources: UNEP Global Status Reporting 2017; EIA International energy Outlook 2017

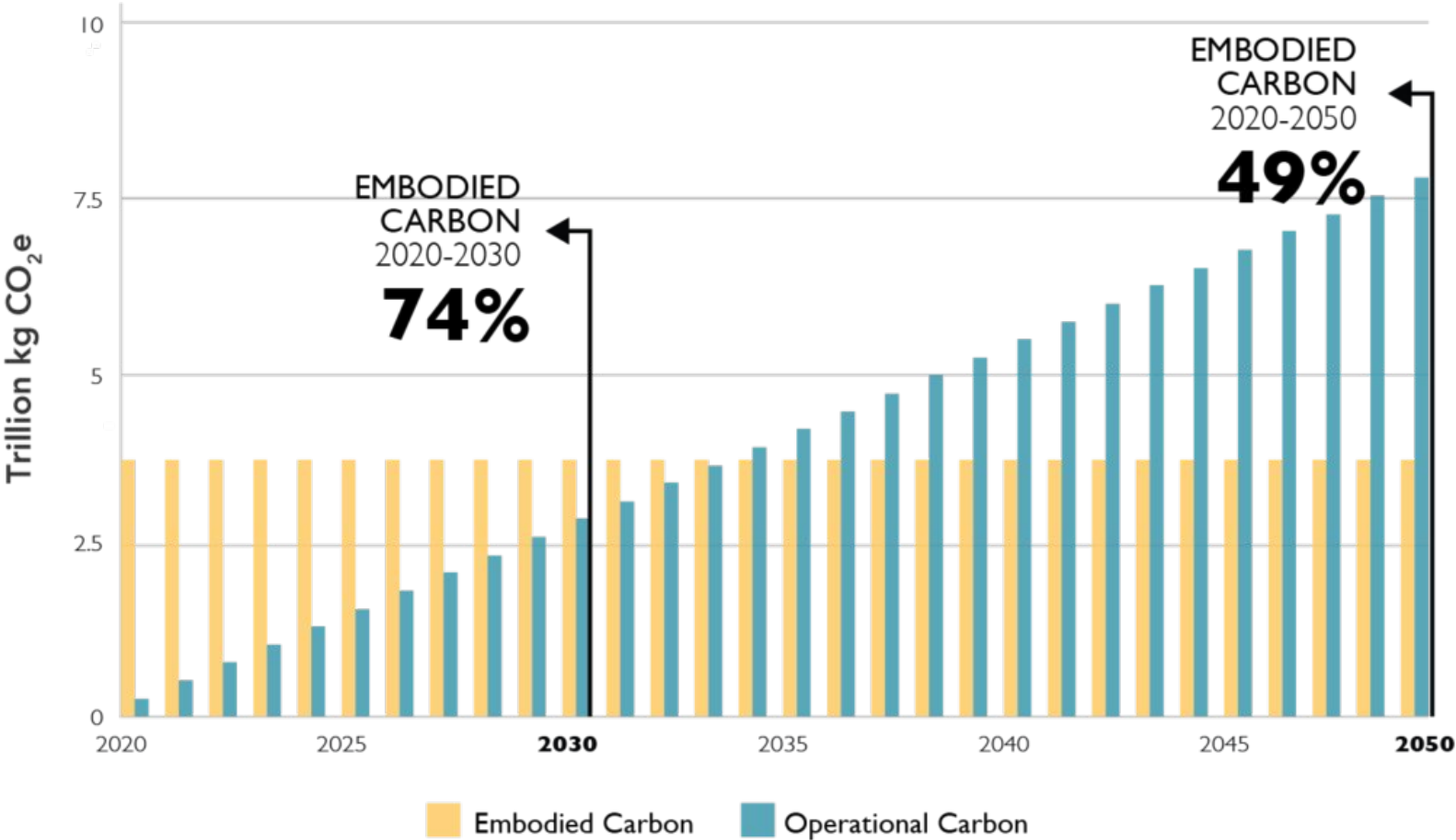
Embodied Carbon is Urgent

Single Building Carbon Emissions Estimate, 2020-2080



Embodied Carbon is Urgent

Total Global Carbon Emissions of New Construction, 2020-2050

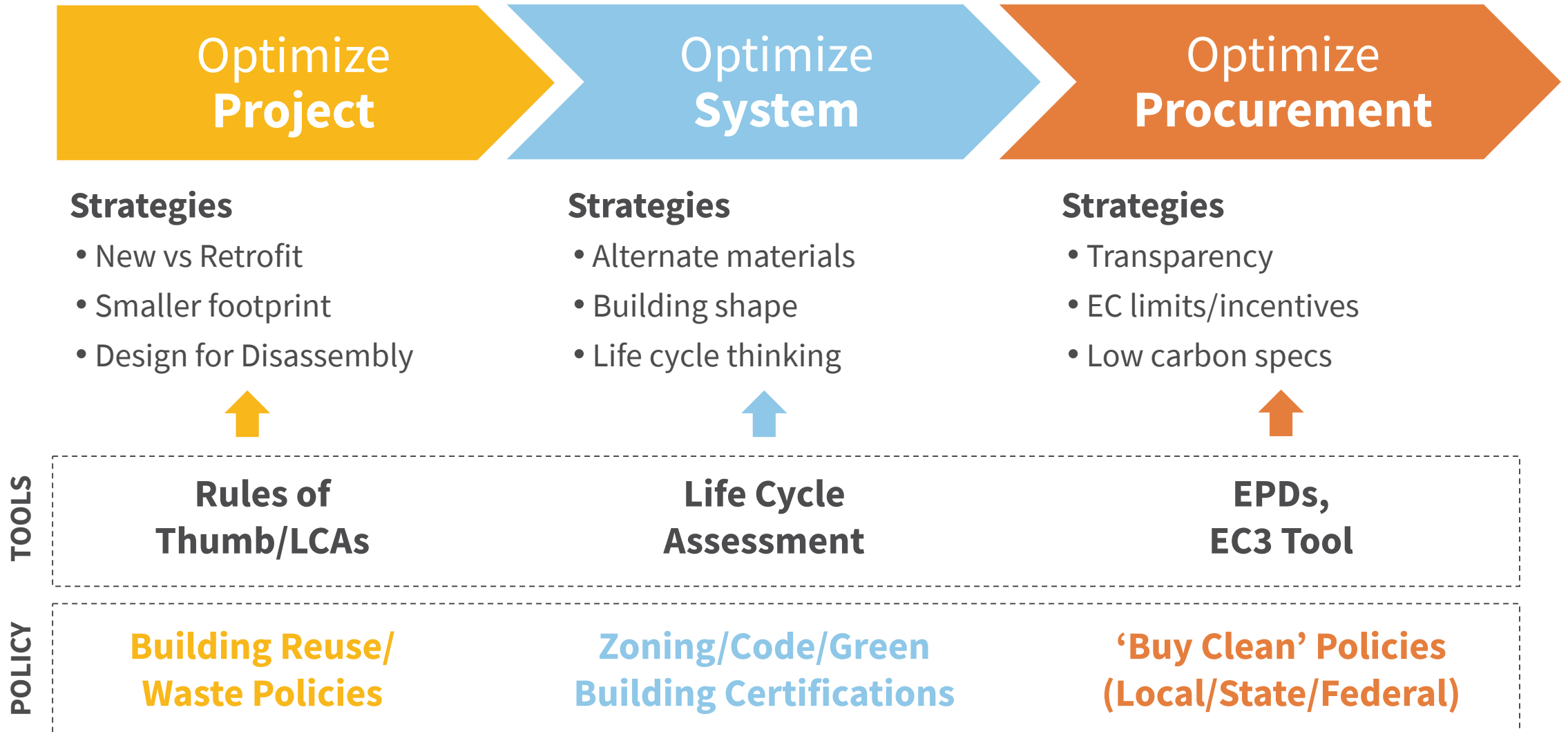


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Data Sources: UN Environment Global Status Report 2017; EIA International Energy Outlook 2017



What Can We Do About It?

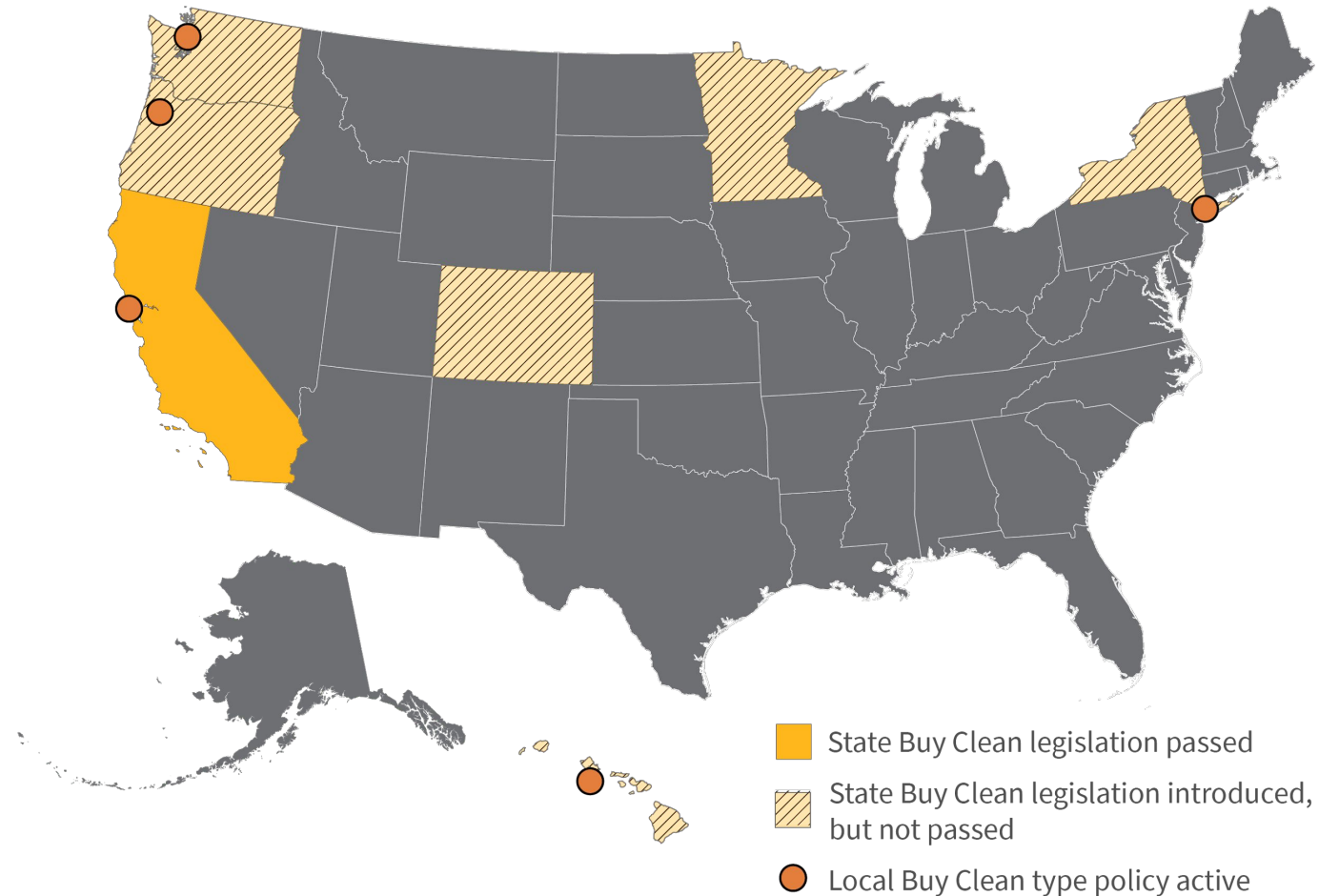
Embodied Carbon Reduction Strategies



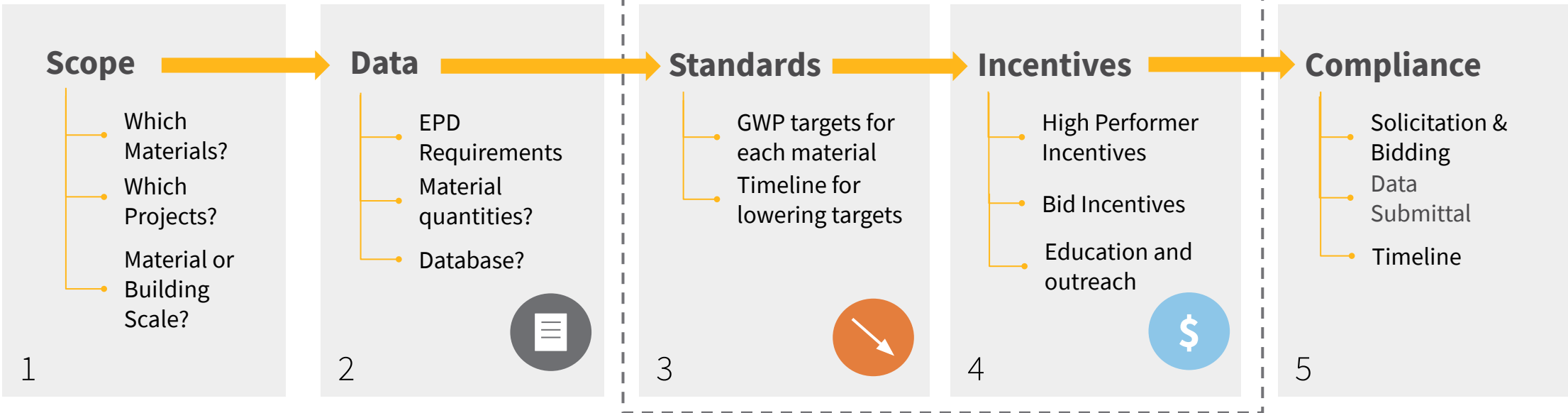
Embodied Carbon Policy Opportunities

- Create a **market demand for low carbon products** through procurement policy
- Encourage **standardization** of embodied carbon **data collection and reporting**
- **Extend education and action** on embodied carbon beyond industry or regional leaders
- Encourage investment into R&D and technology upgrades
- Set embodied carbon targets in regional and local **climate action plans**

Growing Buy Clean Legislation (status as of Oct 2019)



Embodied Carbon Policy Framework



Depends on the goal / context

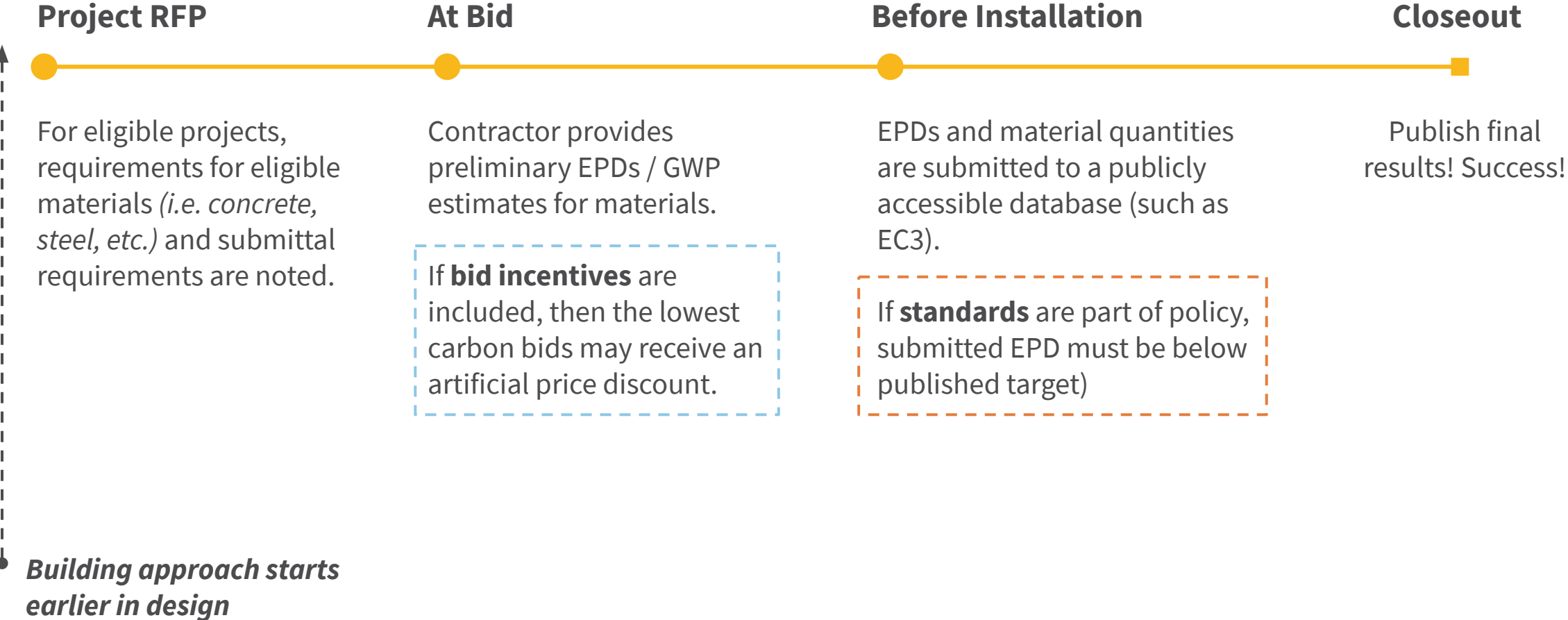
Focus on high impact materials

Great to start with just disclosure

Projects can compete on cost AND carbon

Consider phased implementation

Hypothetical Project Timeline Procurement (Material) Approach



Case Study King County

King County is pilot partner of the EC3 tool incubated by, and has included the following language in their upcoming 2020 Sustainable Climate Action Plan.



Strategy GHG 4.15. King County capital portfolios will be managed to maximize GHG emissions reductions in operational and embodied emissions.

GHG 4.15.1 King County capital portfolios will be managed to maximize GHG emissions reductions in operational and embodied emissions. They will use the following strategies:

- Use the Embodied Carbon in Construction Calculator (EC3) tool to identify low embodied emissions materials that meet construction specifications, and to inform decisions in materials selections in accordance with King County's Sustainable Purchasing Guide.

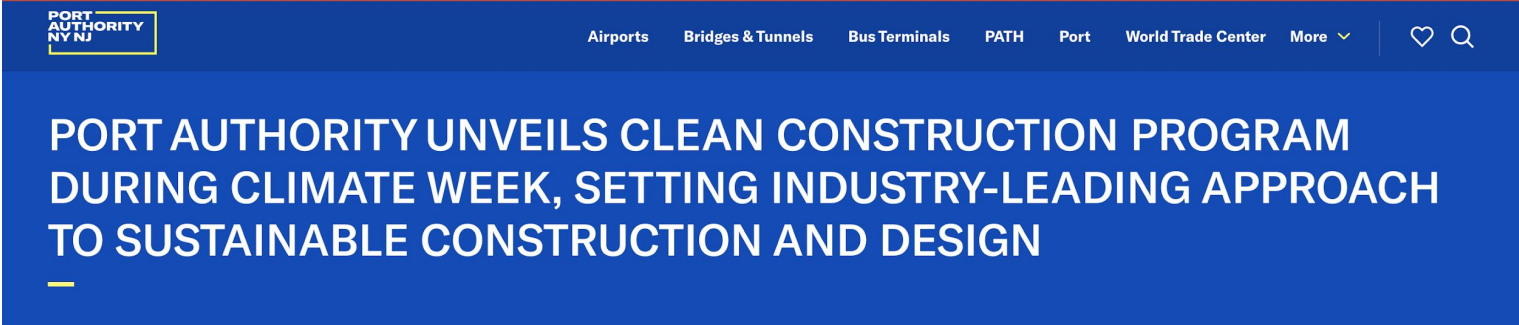
Strategy GHG 5.8. Require contractors and consultants to use recycled, low carbon, and other sustainable products and services whenever practicable.

GHG 5.8.1 Specifying low-embodied carbon building materials in King County capital projects. The mining, manufacturing and transportation of building materials result in significant GHG emissions. To reduce these “embodied” emissions, King County will develop requirements and specifications for the use of low emission alternatives for concrete, asphalt, wood, and steel by County project managers and designers in bid solicitations.

By 2022, the County shall create standard specifications for concrete and begin requesting environmental product declarations (EPDs) for this material in construction bids. By 2023, it will require the use of EPDs for concrete and, by 2024, require a maximum global warming potential (GWP) for concrete products, which it will enforce for all construction projects starting in 2025. The Embodied Carbon in Construction Calculator (EC3) tool will be used to help choose the lowest embodied carbon materials per project that meets the specification. Based on lessons learned, the County will expand these specifications to other high embodied emissions materials including asphalt, wood, and steel.

Case Study Port Authority of New York and New Jersey

Port Authority of New York and New Jersey launched their Clean Construction Program during Climate Week (September) 2020



Including:

- **Specification for low carbon concrete:** reduces the required cement content in certain concrete mixes by 25%, significantly reducing its carbon intensity and allowing for lower-carbon alternatives
- **Pilot projects to develop low carbon concrete and materials**
- **Requirement for Environmental Product Declaration:** enables systematic collection of environmental data directly from construction contractors to help inform more environmentally focused material selection

Case Study State of California Buy Clean Act



State of California is currently implementing Buy Clean CA policy for four material categories (rebar, structural steel, flat glass, insulation). The lead agency is CA DGS. The EC3 tool already integrates a 'Buy Clean California Compliant' filter to identify compliant EPDs for use.



The screenshot displays the EC3 software interface. On the left, a navigation menu lists material categories like Concrete, Masonry, Aluminium, Steel, Wood, etc. The main search area is titled "SEARCH BY PROPERTIES: 03 21 00 REINFORCEMENT BARS". It includes sections for "DESIGN INTENT" (with filters for Yield Tensile Strength, Ultimate Tensile Strength, Recycled Content, Post-Consumer Recycled Content, and EC3 / 1 lbs), "GEOGRAPHIC", and "ADVANCED". A "Compliance" filter is set to "Buy Clean California 2020". At the bottom, it shows "Samples: 8" and summary statistics: Achievable: 0.339 kgCO2e, Average: 0.501 kgCO2e ± 39.6%, Conservative: 0.646 kgCO2e. An inset window titled "COMPARE BY MANUFACTURER" shows a bar chart of embodied carbon per 1 lb for various manufacturers. An orange arrow points from the "Samples: 8" box to the chart.

Manufacturer	Number of EPDs	Embodied Carbon (kgCO2e per 1 lb)
Search-Results	8 EPDs	0.646
CMC	3 EPDs	0.339
Cascade-Steel-Rolling-Mills	2 EPDs	0.223
ArcelorMittal	1 EPD	1.02
Nucor	1 EPD	~0.25
Gerdau-Long-Steel-North	1 EPD	~0.45

City Policy Framework Resources by CNCA & C40






CITY POLICY FRAMEWORK FOR
DRAMATICALLY
REDUCING EMBODIED
CARBON


52 detailed policies to reduce embodied carbon

embodiedcarbonpolicies.com




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IN COOPERATION WITH



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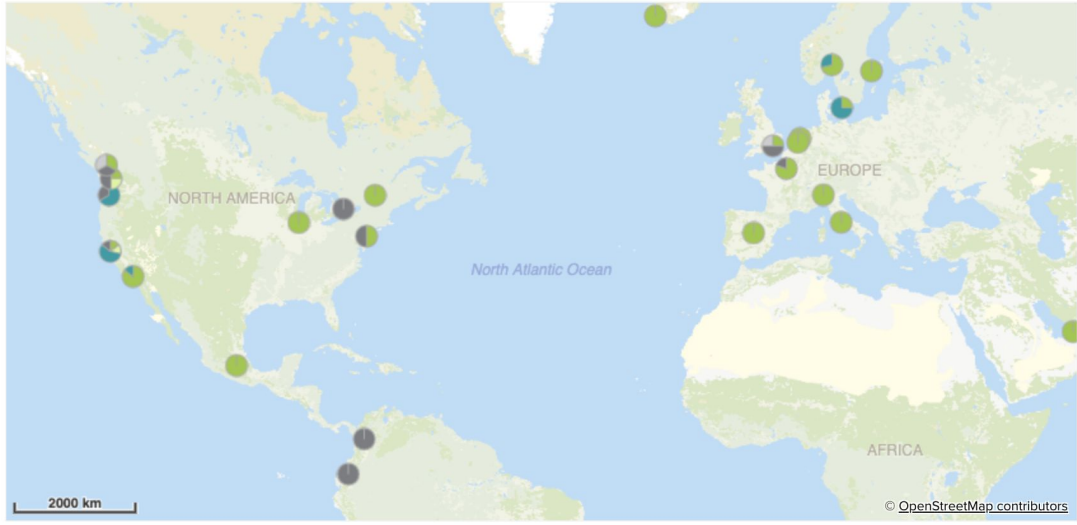
KNOWLEDGE

Clean Construction Policy Explorer (C40 Knowledge Hub)

Filter by:

Select a city or a region to see its current policies and actions. Select a policy type, or the type of asset it is applicable to for getting the scope of the activities undertaken.

Clean construction policy map



© OpenStreetMap contributors

For more information on the cities' policies or actions, see the table below.

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~12 Regional Hubs, 12 + under development!

Educational Resource Library under development!