

Planned Strategically, Federal Buy Clean Investment Can Increase Its Impact Exponentially

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To support the federal government’s ambitious climate goals, the Biden administration is making unprecedented investments to decarbonize the economy while promoting equity. The carbon-intensive construction industry is a prime focus area for these funds, raising the urgent question of how the federal government—as well as [the 12 state governments it is partnering with](#), plus municipalities, cities, and counties that have set equally ambitious goals—should utilize their relatively limited resources. The Biden administration has dedicated several hundred billion dollars in climate funds in the [Infrastructure Investment and Jobs Act](#) (IIJA) and the [Inflation Reduction Act](#) (IRA), but this is a drop in the ocean compared to the [\\$131 trillion in investments needed to combat climate change globally](#). If the U.S. economy rapidly and strategically decarbonizes, [it could gain \\$3 trillion over the next 50 years](#), according to Deloitte. How can the public sector use procurement to match or exceed private-sector ambition so that both can jointly lay the groundwork to transform current carbon-intensive practices in the construction industry?

Consider the [Federal Buy Clean Initiative](#) as an example. A recently published [RMI report](#) estimated that the administration’s Buy Clean procurement policy for federal buildings will reduce greenhouse gas (GHG) emissions by 12 to 15 million tons of CO₂ equivalent by 2050, assuming the policy is effectively implemented using a combination of short-term and long-term decarbonization strategies. Up to 15 million tons sounds impressive (it is the amount of CO₂ emitted [annually by Maine](#)), but in 2019, [embodied emissions from manufacturing and construction in the United States totaled 439 million metric tons](#)—that is 29 times larger than the total GHG reduction potential from federal buildings over a 30-year period.

The IRA provides \$4.5 billion [to the Environmental Protection Agency \(EPA\), the General Services Administration \(GSA\), and the Department of Transportation \(DOT\) to identify and procure climate-friendly construction materials that will be used in IIJA and other federally funded construction projects](#). But if the GSA and DOT focus too narrowly on only federal buildings, they will drastically limit their impact on the overall American construction market, which is 100 times larger than the federal market in terms of spending.

Strategic Public Procurement by States, GSA, and DOT Is a Huge Opportunity to Help Decarbonize the Construction Industry.

By considering a number of factors, the government can spend this money in a strategic way that will drive the market toward lower-embodied-carbon construction materials—ultimately reducing the GHG emissions estimated in the RMI report by a hundredfold or more. **The critical questions that federal program implementers need to consider are as follows:**

1. Which low-carbon building products and construction technologies are commercially viable but have been hindered by slow market adoption? What are the major market deployment barriers that public procurement can help remove?
2. In which markets (i.e., geographic locations, products, suppliers) can public procurement cover the price premium on low-carbon materials in the near term and help bring down costs over time by catalyzing market demand? When spending taxpayer dollars, decision makers should prioritize markets in which demand can be stimulated, cultivated, and sustained to ensure a business pipeline long after public funds are depleted.
3. How can public projects at scale help cultivate widespread, robust market acceptance of new materials, products, and technologies by demonstrating their performance, prompting necessary changes in building codes and standards, and in building or retraining the workforce?
4. What other federal or private-sector investments can be leveraged to strengthen the supply of low-carbon products while public procurement is creating market pull (i.e., the GSA and Federal Highway Administration both received over \$2 billion to implement the Federal Buy Clean Initiative, but enough materials need to be available if they are to spend that money as intended)? For example, \$73 billion has been allocated to upgrade power infrastructure to facilitate the expansion of renewable energy; \$7 billion has been allocated to establish 6 to 10 regional clean hydrogen hubs across America; \$2.5 billion has been allocated to develop six carbon capture facilities. All these investments could provide additional support to decarbonize iron and steel, cement, and aluminum production, which account for 7%, 6%, and 2% of carbon emissions in the United States, respectively.

Using these four questions, we use concrete as an example to illustrate the strategic thinking required to maximize the decarbonization and market-transformation potential of public procurement.

Question One: “Where is the market and how big is the demand?” With concrete, we need to know where it is used in the construction industry and where major construction activities will likely occur in the near future. The primary uses of concrete include buildings (architectural structures, foundations, pavements, driveways), roadways and bridges, and

other civil engineering projects (dams, marine construction). Due to the lack of national building construction data, we use construction spending by state as a proxy for the potential market demand for concrete. We looked at the non-residential construction spending of private, state, and local entities across the United States by state in 2021 using census data. The top three highest spending states are Texas (\$91 billion), California (\$67 billion), and New York (\$52 billion). There are other large pockets of high construction spending around the Great Lakes and Eastern seaboard of the United States (see figure 1).

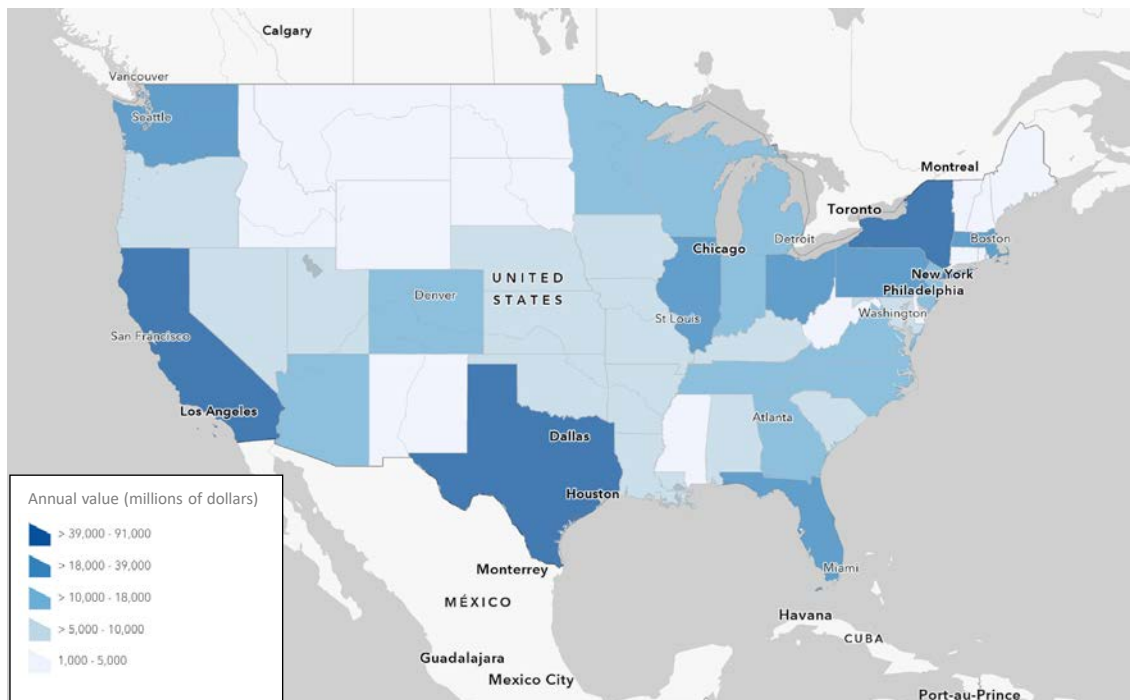


Figure 1. Non-residential construction spending. Source: www.census.gov/construction/c30/c30index.html.

Question Two: "What is the local workforce capacity, and how ready is the local market to embrace new materials, technologies, and practices?" A strong interest and adequate capacity (e.g., knowledge, experience, etc.) from local businesses, communities, and the workforce (including developers, architectural and engineering firms, construction companies, and contractors) are essential to drive the adoption of low-carbon construction materials. We use certified green buildings as a metric to assess the readiness of the local design and construction market. Although green building certificates represent a wider spectrum of sustainable buildings than just low-embodied-carbon buildings, a higher number of existing green buildings indicates a higher desire and an existing knowledge base for embracing low-carbon construction. Using United States Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) projects database, we looked at LEED-certified new buildings (Building Design and Construction projects) as of February 2023. The top three states with the highest number of green buildings were Arizona (1,263 certified buildings), Colorado (803), and California (476). Although data are currently limited, we also

reviewed the recently updated LEED 4.1 rating system because it includes various credits (especially in the Materials and Resources category) that help capture low-embodied-carbon materials procurement and product disclosure. Using the LEED 4.1 system, while Arizona (751) and Colorado (234) remain the leading states, Texas (435), Ohio (258), and New Mexico (207) also rise to the top. Overall, the areas with high densities of LEED-certified projects are predominately in the Southwest, West, Great Lakes Region, and Northeast of the United States (see figure 2).

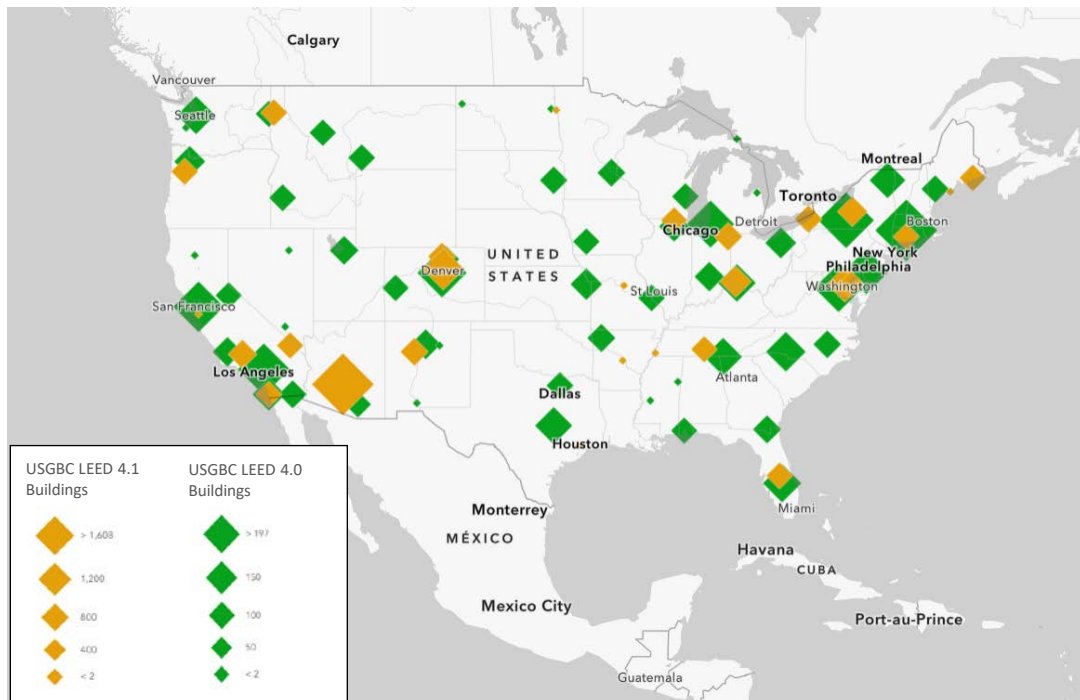


Figure 2. Locations of LEED 4.0 and 4.1 certified buildings. Source: USGBC Projects Database (as of March 2023).

Question Three: "How ready is the policy environment to support business growth and uptake of low-carbon materials/concrete?" State and local policies play a significant role in shaping the regional economy, as well as the labor and construction markets. States with Buy Clean policies and/or more ambitious climate goals will likely look for ways to stimulate and incentivize low-carbon technologies, processes, and practices, including leveraging federal funding and project opportunities to advance their climate agendas. Fourteen states across the United States are engaged in Buy Clean in some capacity: [five have passed Buy Clean legislation or similar provisions \(CA, CO, OR, NY, NJ\)](#); five may follow suit (WA, MN, VA, IL, MD); 12 have joined the newly established [Federal-State Buy Clean Partnership](#) to promote public procurement of low-carbon materials and develop the market (CA, CO, HI, IL, ME, MD, MA, MI, NJ, NY, OR, WA). [Six counties, cities, or municipalities](#) have also developed Buy Clean-types of policies, legislation, executive orders, or provisions in building codes (Portland, OR; New York City, NY; San Francisco, CA; Cook County, IL; Marin County, CA; Denver, CO). Moreover, 22 states, the District of Columbia, and Puerto Rico have broader

clean energy and emission reduction ambitions, taking the form of 100% carbon-free electricity or clean energy, 100% renewable energy electricity, net-zero emissions, and/or carbon-neutrality targets or goals in the electricity sector. Decarbonizing the power sector will help decarbonize the industrial sector. Overall, states with energy-sector-related, economy-wide, and Buy Clean types of policies will likely be better positioned to advance lower-carbon materials and products (see figure 3).

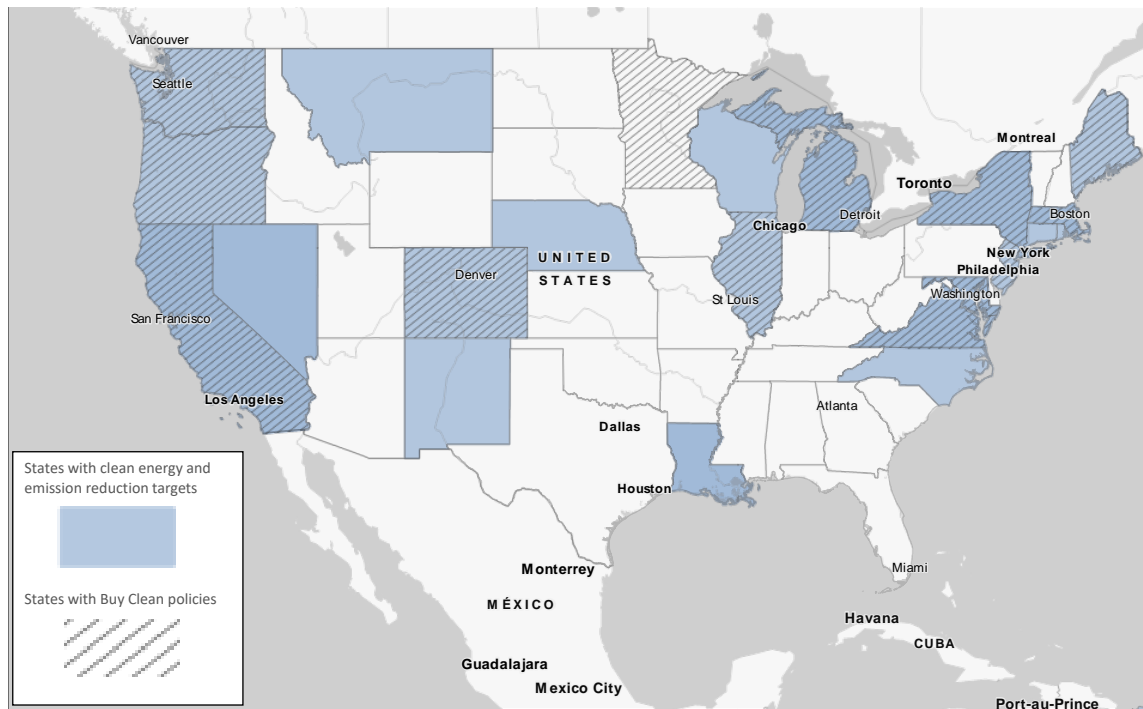


Figure 3. States with supporting Buy Clean and clean energy policies. Hawaii and Puerto Rico are not shown on the map but are included in the data. Source: Carbon Leadership Forum and additional online resources.

Question Four: "What is the regional availability of low-carbon concrete and cement? Reliable supply is another key to success. Locally sourced materials not only reduce energy and carbon emissions from transportation but also reduce product costs and contribute to the local economy. Texas, California, Florida, Pennsylvania, and Missouri are the states with the most cement plants, based on an [industry market analysis conducted by the IBISWorld](#). Texas, California, Missouri, Florida, and Michigan are the states with the [highest emissions from cement manufacturers](#). One of the largest cement manufacturers (Holcim) has a large presence in both Missouri and Michigan, which explains the relatively high emissions in those regions. Outside the top five states, cement manufacturers are generally evenly distributed across the rest of the country. The top five states with the most concrete establishments include: Texas (613), Florida (402), California (391), North Carolina (280), and Illinois (250). Other large pockets are along the Eastern seaboard and the Great Lakes region. The presence of concrete contractors generally correlates well with concrete manufacturing

plants in states. States with more concrete establishments tend to have more concrete contractors, indicating potential demand for low-carbon concrete (see figure 4).

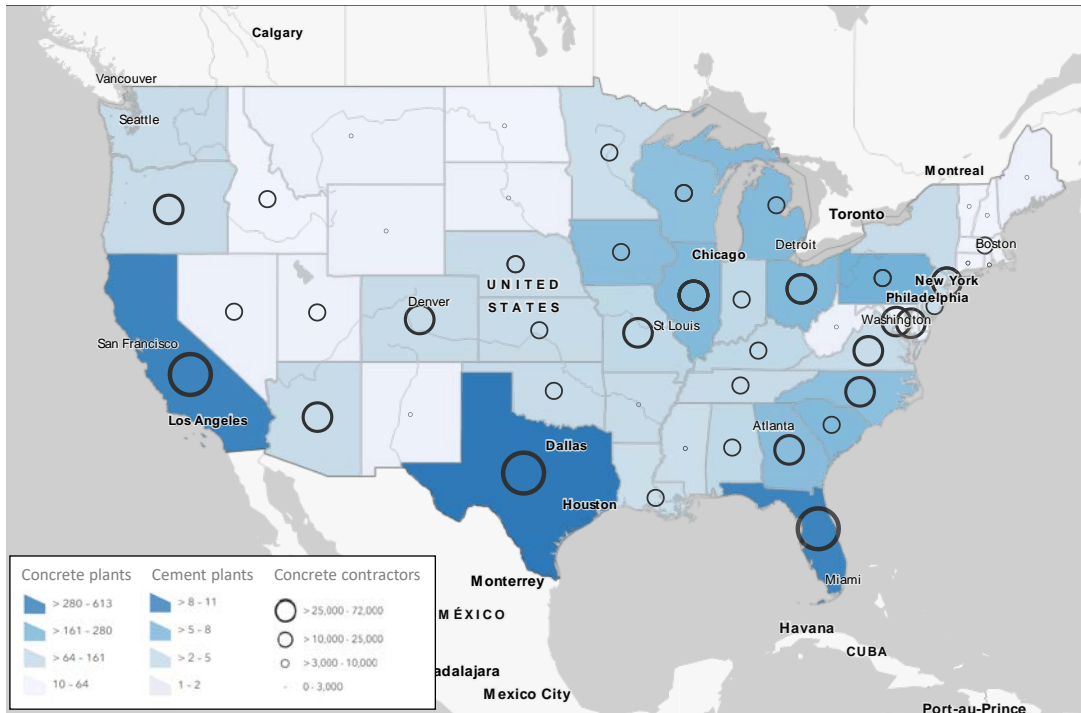


Figure 4. Distribution of concrete plants, cement plants, and contractors. Source: IBIS World Data.

How States Can Grow the Market for Low-Carbon Concrete and Cement

Using the four questions above, we have identified states and regions that potentially demonstrate strong market demand (construction spending), solid knowledge infrastructure (green buildings), a supportive policy environment (Buy Clean, economy-wide, energy sector), and strong and steady local material supplies (concrete manufacturers and contractors). Figure 5 illustrates the highest market demand density, with all four factors collated on one heat map. The top 10 states that indicate large opportunities for investments include California, New York, Texas, Colorado, Michigan, Illinois, Ohio, Florida, North Carolina, and Washington.

States with the largest opportunity to scale up low-carbon construction materials based on comparison of construction activities, workforce infrastructure, supportive policy environment, and manufacturing capacity.

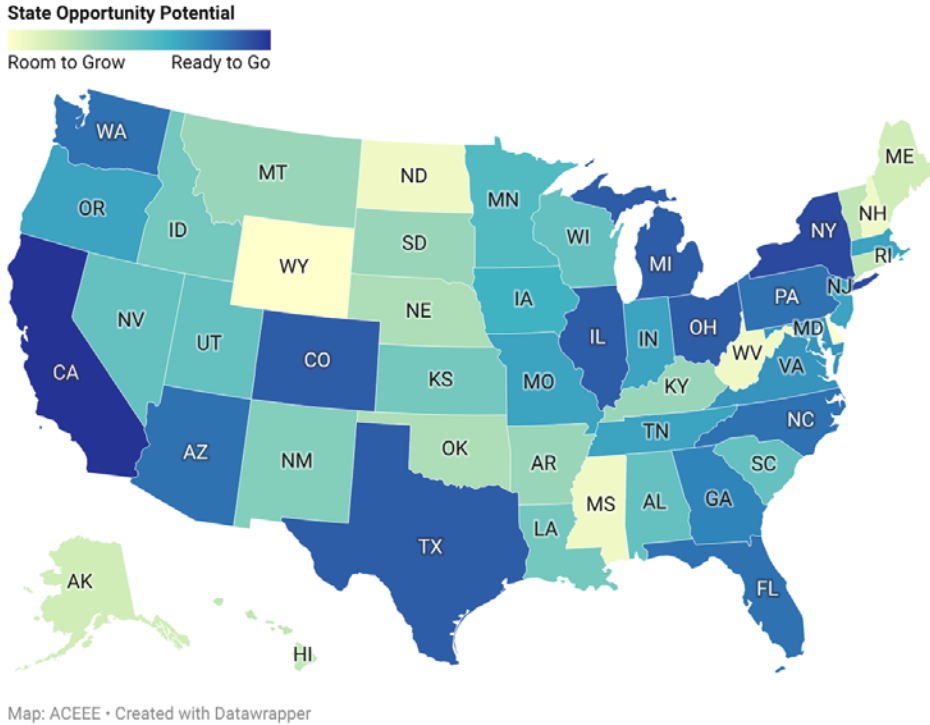


Figure 5. States’ potential for scaling up low-carbon concrete

TARGETING HOTSPOTS FOR PUBLIC PROCUREMENT

Next, we examined the locations of GSA-owned buildings to identify project locations that may have a higher potential to influence local construction practices and accelerate market transformation through public procurement. Texas has the highest number of federally owned buildings, followed by Washington DC, Maryland, and California. Other regional pockets include the Southwest, Midwest, and Northeast (see figure 6).

We then examined GSA low-embodied-carbon projects recently funded through the IRA including Land Ports of Entry projects, port paving projects, and other general renovations or construction of federally owned buildings. Based on the limited available published information, the strategies behind these investments are unclear. How these projects may affect the local construction market is unknown.

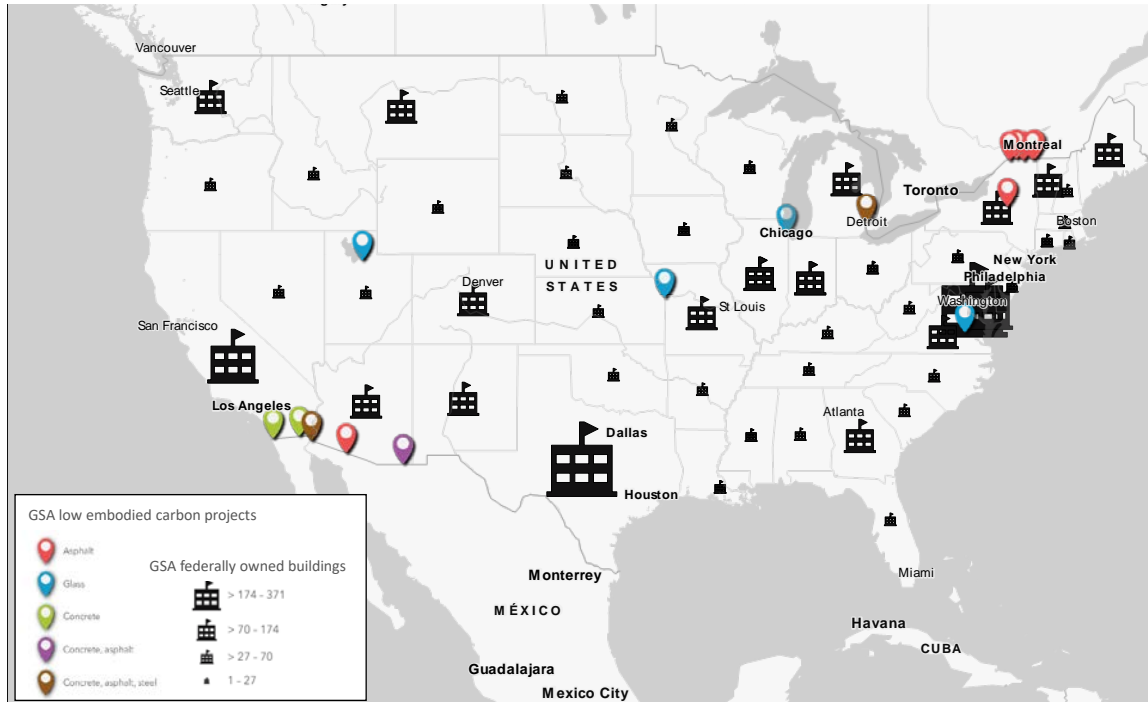


Figure 6. Locations of federally owned buildings and GSA low-embodied-carbon projects

A Call to Action for States, GSA, and DOT

To have long-lasting impact, pursue the right projects in the right locations.

Finding strategic locations to pursue low-embodied-carbon projects is just the first step. Federal agencies should reach out to local companies (designers, developers, contractors, and manufacturers) and state and local governments to get them involved in early stages, share strategies and lessons learned, and develop relationships with allies and partners.

Changing a complex market that relies on multiple actors is challenging. The marketplace for construction materials sits at the intersection of building design, the construction industry, and materials manufacturing; it involves an interconnected supply chain that provides the information needed to select products and then deliver these products to the construction site. For a market transformation effort to be successful, all these value chain participants need to be engaged, and their needs and concerns must be addressed. It is also important for all market actors to have clear and consistent information upon which they can act.

Our [interviews with manufacturers](#) revealed that they have not been adequately engaged in the development process of Buy Clean policies; they expressed concerns about policymakers' expectations of the industrial sector and uncertainty about achieving compliance with forthcoming requirements and regulations. We also found that companies in the industrial and buildings sectors are not competing on a level playing field. Typically,

only elite or large firms, savvy building owners, or flagship construction projects tend to consider embodied carbon issues. Additionally, building products, design, and construction firms tend to have very thin margins and may not be able to answer the call for improvements purely on a voluntary basis. Unless participation in Buy Clean is required, only self-selecting companies (typically the largest and least risk-averse) will choose this route. Federal projects can help lower these barriers by paying a premium price to launch a market for low-carbon construction products and design services, soften the learning curve, and build market confidence.

In addition to giving manufacturers a seat at the table and reaching out to smaller players in the construction industry, Buy Clean collaborations should go beyond the buildings industry. [Roughly 60% of highways in the United States are made of concrete](#). Federal, state, and local governments [spend \\$45 billion to purchase materials for publicly funded highways](#). Thus, state departments of transportation—collectively one of the largest concrete consumers in the United States—can significantly influence market dynamics, and states need to recognize this potential. We will publish a separate analysis on low-carbon material strategies for departments of transportation.

Market transformation to reduce embodied carbon requires an active, leadership role from government agencies and support from industry. It is important to engage all market players to shift incentives, encouraging all actors to transition to a new, preferred state. When manufacturers are engaged rather than simply given rules to follow, they will help drive the market toward greater adoption of low-carbon building materials. A transformed market will ultimately benefit companies by opening new lines of business and making them resilient to the business and economic shocks that will come with the global transition to a low-carbon economy.

Additional resource: *We have created an openly accessible interactive online map through ArcGIS that includes the various factors discussed throughout this brief. Each factor is shown as a layer on one map and can be toggled on and off at the user's discretion. The map's description includes recommendations for toggling on certain layer combinations as an additional way to underline some of the narrative trends and points we have mentioned in this brief. Link to interactive ArcGIS Map:*

aceee.maps.arcgis.com/apps/instance/interactivelegend/index.html?appid=a1169ca16bc74ac1bc55f7744fe9136e&locale=en-US