SENATE COMMITTEE ON ENVIRONMENTAL QUALITY
Senator Allen, Chair
2021 - 2022 Regular

Bill No:	SB 1297		
Author:	Cortese		
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Urgency:	No	**Fiscal:**	Yes
Consultant:	Eric Walters		

SUBJECT: Low-embodied carbon building materials: carbon sequestration

DIGEST: This bill requires the California Energy Resources Conservation and Development Commission (CEC), as part of the 2023 integrated energy policy report (IEPR), to include considerations of embodied carbon and carbon sequestration in buildings, as specified. This bill also requires the California Air Resources Board (ARB) to develop an accounting protocol to quantify embodied carbon and carbon sequestration in building materials. This bill also incorporates projects using these materials into an existing registry of carbon sequestration projects, where appropriate, directs public agencies to prefer the use of California-made and low-embodied carbon materials (where feasible and as specified), and directs the Governor's Office of Planning and Research (OPR) to evaluate the use of these materials to qualify as an acceptable mitigation measure under the California Environmental Quality Act (CEQA).

ANALYSIS:

Existing law:

1) Establishes the California Energy Resources Conservation and Development Commission (CEC) within the California Natural Resources Agency (CNRA), as the state's primary energy policy and planning agency. (Public Resources Code (PRC) §25200 et seq.)

2) Requires, under SB 1389 (Bowen, Chapter 568, Statutes of 2002), CEC to prepare a biennial integrated energy policy report (IEPR), which contains an integrated assessment of major energy trends and issues facing California's electricity, natural gas, and transportation fuel sectors, as well as policy recommendations to conserve resources, protect the environment, ensure reliable, secure, and diverse energy supplies, enhance the state's economy, and protect public health and safety. (PRC §25302)

3) Establishes the Air Resources Board (ARB) as the air pollution control agency in California and requires ARB, among other things, to control emissions from

a wide array of mobile sources and coordinate, encourage, and review the efforts of all levels of government as they affect greenhouse gas (GHG) emissions. (Health and Safety Code (HSC) §39500 et seq.)

4) Requires, under the Buy Clean California Act (BCCA) the Department of General Services (DGS), in consultation with ARB, to establish and publish the maximum acceptable Global Warming Potential (GWP) limit for four eligible materials: structural steel, concrete reinforcing steel, flat glass, and mineral wool board insulation. Further states that when used in public works projects, these eligible materials must have a GWP that does not exceed the limit set by DGS. (Public Contract Code §3500-3505)

5) Requires, under the California Environmental Quality Act (CEQA) public lead agencies to impose feasible mitigation measures as part of the approval of a "project" in order to substantially lessen or avoid the significant adverse effects of the project on the physical environment. (PRC § 21000 et seq.)

6) Defines, under California Code of Regulations, Title 14 ("CEQA Guidelines") §15370, "mitigation" as:
   a) Avoiding the impact altogether,
   b) Minimizing the impact by limiting its degree or magnitude,
   c) Rectifying the impact by repairing, rehabilitating, or restoring the impacted environmental resource,
   d) Reducing or eliminating the impact over time, through actions that preserve or maintain the resource, and
   e) Compensating for the impact by replacing or providing substitute resources or environmental conditions, including through permanent protection of such resources in the form of conservation easements.

7) Requires, under SB 596 (Becker, Chapter 246, Statutes of 2021), ARB, by July 1, 2023, to develop a comprehensive strategy for the state's cement sector to achieve net-zero GHG emissions no later than December 31, 2045.

8) Requires, under SB 27 (Skinner, Chapter 237, Statutes of 2021), CNRA to, among other duties, create the California Carbon Sequestration and Climate Resilience Project Registry, in order to maintain a list of eligible but unfunded projects, which then may be funded by public or private entities in order to mitigate California's GHG emissions and improve climate resilience.

This bill:

1) Requires CEC to include, as part of the 2023 IEPR, a plan to advance low-carbon materials and methods in building and construction projects, as specified, and that, in part, includes:
   a) An evaluation of embodied carbon in building materials currently used in buildings and in infrastructure in the state;
   b) An evaluation of the estimated potential for reducing embodied carbon and maximizing carbon sequestration in building materials;
   c) Barriers to minimizing embodied carbon and maximizing carbon sequestration in building materials, and opportunities and recommendations to overcome these barriers;
   d) Consideration of the potential to reduce embodied carbon and maximize carbon sequestration in a wide array of commonly used building materials, including, but not limited to, cement, concrete, aggregate, lumber, cross-laminated timber, steel, and other materials identified by the agency; and
   e) Consideration of how policies to advance low-carbon materials and methods in buildings and construction projects can create and maintain jobs for California workers.

2) Directs CEC to, in preparing the above plan, to consult with the California Environmental Protection Agency, ARB, the Department of Transportation (CalTrans), the Office of Planning and Research (OPR), CNRA, the California Building Standards Commission (BSC), the Department of Housing and Community Development (HCD), any other relevant state agency, and representatives of a labor organization representing affected workers.

3) Requires ARB to develop an accounting protocol to quantify embodied carbon and carbon sequestration in building materials.

4) Requires CNRA to incorporate, as appropriate, projects using low-embodied carbon building materials or carbon sequestration in building materials into the registry created by Senator Skinner's SB 27 (Chapter 237, Statutes of 2021).

5) Instructs public agencies to, when feasible and cost effective, prefer the use of building materials with low-embodied carbon.

6) Instructs public agencies to, when feasible and cost effective, prefer the use of the above materials that are produced in California.

7) Directs OPR to evaluate the circumstances under which the use of low-embodied carbon building materials could be an acceptable mitigation measure under CEQA.

8) Makes findings and declarations, and states that it is the intent of the Legislature to take a leadership role in reducing embodied carbon, thereby maximizing carbon sequestration in the built environment and advancing climate restoration objectives, and that it is further the intent that those policies be adopted with consideration of creating and maintaining good jobs in California.

Background

1) *Net zero GHG emissions and sequestering carbon*. Achieving net zero GHG emissions – a state where GHG emissions either reach zero or are entirely offset by equivalent atmospheric GHG removal – is essential in all scenarios that would keep Earth's average temperature within 1.5 °C of its historical average. Net zero GHG emissions is also often used interchangeably with "carbon neutrality," however net-zero GHG emissions implies the inclusion of GHGs other than those that contain carbon, such as nitrous oxide, as defined by AB 32 (Nunez, Chapter 488, Statutes of 2006). The sooner net zero GHG emissions is reached globally, the less warming will be experienced.

   When we say carbon is "sequestered" we mean that is has been converted from gaseous CO2 in the atmosphere to a solid (or liquid) form. Although conversations around carbon capture and storage (CCS) typically involve sequestering the carbon in geologic formations or other natural sinks, those are not the only place solid carbon can be kept.

   Building materials, depending on how they are manufactured, can be considered as a site of carbon sequestration. Consider wood. The carbon that comprises wood (roughly 50% of the weight) came from CO2 the tree absorbed from the air. For CO2 removal to be considered permanent, California policies typically consider a 100-year time horizon. Thus, if atmospheric CO2 could—reliably and accountably—be made solid in building materials for at least a century, it stands to reason that that those could potentially be accounted for as a negative emission. Given California's stated goal of net zero GHG emissions by 2045, there is a need for GHG emissions to be entirely balanced by atmospheric GHG removal.

2) *Embodied carbon*. The term "embodied carbon" refers to the GHG emissions arising from the manufacturing, transportation, installation, maintenance, and disposal of building materials. The majority of a building's total embodied carbon is released upfront at the beginning of a building's life. Unlike with operational carbon, there is no chance to decrease embodied carbon with updates in efficiency after the building is constructed.

In California, according to the latest GHG Emission Inventory from ARB, residential and commercial buildings account for 10.5% of the state's total GHG emissions. However, residential and commercial buildings are responsible for roughly 25% of California's GHG emissions when accounting for fossil fuels consumed onsite and electricity demand. It is unclear what the exact breakdown is between embodied and operating emissions, but due to California's mild climate, increasing renewable electricity supply, and relatively efficient building stock, our state's operational emissions may be a smaller percentage of total building energy use, compared to the embodied carbon in new construction.

In order to determine the emissions associated with building materials, the entire life cycle of those products must be considered. Life cycle analysis (LCA) is a method of quantifying the environmental impacts associated with a given product. In LCA, researchers create an inventory of resources used and pollutants generated in product production and use. LCAs can vary depending on the assumptions made and the extent of the life cycle considered. Notably, for LCAs of building materials, assessments are usually either cradle-to-gate or cradle-to-grave. Cradle-to-gate LCAs consider the emissions associated from extraction up until arrival at the project site, while cradle-to-grave continue further to consider any emissions associated with the product's use within the project and building and, ultimately, its end of life.

3) *Buy Clean California Act.* A first in the nation and widely emulated, the Buy Clean California Act (BCCA) is an innovative program establishing limits on embodied carbon emissions and construction materials procured by the state for public construction projects. The law requires the California Department of General Services (DGS) to publish, by January 1, 2022, acceptable maximum Global Warming Potential (GWP) limits for the following eligible materials: structural steel, concrete reinforcing steel (rebar), flat glass, and mineral wool board insulation. In order to determine and compare the GWPs of different products and materials, DGS relies on Environmental Product Declarations (EPDs).

   An EPD tells the life cycle story of a product in a single, comprehensive report. The EPD provides information about a product's impact upon the environment, such as global warming potential, smog creation, ozone depletion and water pollution. With an EPD, manufacturers report comparable, objective, and third-party verified data that helps purchasers better understand a product's sustainable qualities and environmental repercussions so they can make more informed product selections. EPDs are typically cradle-to-gate analyses, which

makes sense since they are used partly to determine which products to acquire for a given project.

4) *Integrated Energy Policy Report (IEPR)*. The IEPR provides a cohesive approach to identifying and solving the state's pressing energy needs and issues. The report, which is crafted in collaboration with a range of stakeholders, develops and implements energy plans and policies. Senate Bill 1389 (SB 1389, Bowen and Sher, Chapter 568, Statutes of 2002) required the CEC to conduct assessments and forecasts of all aspects of energy industry supply, production, transportation, delivery and distribution, demand, and prices. The CEC is then required to use these assessments and forecasts to develop energy policies that conserve resources, protect the environment, ensure energy reliability, enhance the state's economy, and protect public health and safety. The CEC adopts an IEPR every two years and an update every other year.

   The latest IEPR from 2021, within its volume on building decarbonization, had a section on embodied carbon. Most relevant to SB 1297, there was even a subsection on embodied carbon in building materials. It reported that in new building projects, on average, up to 50 percent of total GHG emissions, considered over a 30-year building life, are from the embodied carbon associated with the initial construction, and nearly 70 percent of that is from just six materials — concrete and steel (by far the most significant), flat glass, insulation, masonry, and wood products. There are, however, significant variations in estimations of the contribution of embodied carbon to the lifetime emissions from a building that warrant further analysis and contextualization for California.

   Ultimately, the IEPR concluded that, "…there is enormous potential for innovation and use of low-carbon products in the built environment. Further research and development are needed, as well as collaboration with other jurisdictions, to develop best practices for reducing embodied carbon in buildings. Also, city planners, designers, and architects could benefit from greater clarity around low-carbon label claims and material-neutral embodied carbon standards."

5) *Climate restoration*. The concept of "climate restoration" is used to mean a return to pre-industrial atmospheric CO2 concentrations. Before the Industrial Revolution started in the mid-1700s, the global average amount of carbon dioxide in the atmosphere was about 280 parts per million (ppm). Today, that level is at approximately 418 ppm. Given the mass of the atmosphere (estimated to be 5.137×10^{18} kg), each 1 ppm of CO2 is equal to 2.13 billion

tons of carbon. Thus, that 138 ppm increase in the concentration of CO2 in the atmosphere since pre-industrial levels represents the addition of over 293 billion tons of CO2. For comparison, California's GHG emissions in 2019 totaled 418.2 million tons of CO2 – 0.14% of that weight.

The term "climate restoration" has not generally been part of the discussions this committee (or Legislature) have had around GHG emission reduction goals. There is one instance of "climate restoration" appearing in California statute: the Community Economic Resilience Fund Program established pursuant to the Senate Committee on Budget and Fiscal Review's SB 162 (Chapter 259, Statutes of 2021). In that program, the inter-agency leadership team (comprised of the Labor and Workforce Development Agency, OPR, and Governor's Office of Business and Economic Development), was made responsible for developing economic recovery and transition plans to support the state in recovering from the COVID-19 pandemic and transitioning to a carbon-neutral economy. The plans are required to prioritize the creation of high-quality jobs and equitable access to them, and emphasize where possible the development of sustainable and resilient industries, such as renewable energy, energy efficiency, carbon removal, zero-emission vehicles, advanced manufacturing, agriculture and forestry, and climate restoration and resilience.

Atmospheric CO2 levels are at the highest they have ever been in recorded history and continue to climb. Policy discussions around the end goal of emission mitigation and CO2 removal (i.e. how much carbon do we ultimately plan to remove?) are noteworthy, but do not change the vital necessity of first stopping the increase of emissions. In order to stave off the worst impacts of climate change, all efforts must be taken to minimize the peak concentration of atmospheric CO2.

Comments

1) *Purpose of Bill.* According to the author, "SB 1297 will advance California's climate neutrality and carbon restoration objectives, both of which require achieving and maintaining net-negative emissions as soon as possible, by leveraging a tremendous, but largely unexplored, opportunity to sequester carbon in our built environment. This bill will support a complete evaluation of this opportunity across a diversity of building materials and take steps to support the use of building materials with low embodied carbon and high carbon sequestration. Doing so will support high-quality jobs in California across an array of industries and advance a number of additional economic, climate, and related priorities."

2) *Permanence and baselines.* There is no doubt that carbon derived from atmospheric CO2 can end up in building materials. However, in determining accounting for carbon sequestered in buildings and potentially including that in the state's progress towards our GHG goals, it is important to make the right comparisons.

   As stated above, (1) permanence of GHG removal in California typically requires 100 years of reliable storage in a solid state, and (2) the EPDs used to determine BCCA compliance typically utilize a cradle-to-gate LCA. In order to appropriately account for the full life cycle emissions of building materials, it will be essential to consider a full cradle-to-grave LCA, and to evaluate what—if any—certainty can be had about the fate of those materials over a 100-year time horizon.

   Moreover, the use of building materials containing carbon derived from the atmosphere is not new. Simply put, people have used wood to make buildings for a long time. While there are promising new technologies to capture more carbon through mineralization or other technologies, ultimately the question of an appropriate baseline for comparison may be relevant. For instance, if carbon stored in building materials is deemed to count as a negative emission for the purposes of achieving the state's SB 32 or other goals, it must be recognized that in 1990 (the year the SB 32 goal is set relative to) there was carbon being sequestered in wood used for buildings too.

   Going forward, the author should work with ARB to ensure the protocol developed pursuant to this bill provides adequate accounting of real changes made to building material acquisition decisions, and is not just quantifying GHG reductions for behaviors that were happening already.

3) *Is the IEPR the right home?* Recent amendments made to SB 1297 relocated the bulk of bill's requirements from CNRA to the IEPR, as prepared by the CEC. Given that the latest IEPR released did include significant consideration and discussion of embodied carbon, this seems like a reasonable change. Going forward, the author should continue to engage stakeholders and state agencies to ensure the requirements of the bill align with existing efforts and purviews.

4) *Preference for in-state production.* Section 8 of Article I of the United States Constitution grants the United States Congress the power to regulate interstate commerce. The obverse proposition—that states may not usurp Congress's express power to regulate interstate commerce—is known as the "Dormant Commerce Clause." The Dormant Commerce Clause serves as a bar to regulations that discriminate against interstate commerce, i.e., by favoring in-

state businesses or excluding out-of-state businesses.

Notably, there is a "market participant exception" to the Commerce Clause. The market participant exception establishes an exception to the Commerce Clause's scrutiny for the state when the state functions not as a regulator of the market, but rather as a market participant. The impact of this exception is felt in cases where the state itself produced goods for commerce or where it has engaged in a program of subsidies or other economic incentives to aid in-state businesses.

Given that the direction provided in SB 1297 is for public agencies specifically to "prefer the use of building materials with low-embodied carbon that are produced in California" when feasible and cost effective, it is likely that the market participant exception applies. *Ultimately, this is beyond the scope of this committee's jurisdiction to adjudicate, but going forward the author should take care to ensure the California-made preferences in SB 1297 are—and remain—constitutional.*

5) *CEQA mitigation.* As part of SB 1297, OPR would be required to evaluate the circumstances in which the use of low-embodied carbon building materials or carbon sequestration in building materials qualifies as an acceptable mitigation measure pursuant to CEQA.

Under CEQA, lead agencies are required to impose feasible mitigation measures as part of the approval of a project in order to substantially lessen or avoid the significant adverse effects of the project on the physical environment. As stated above, sequestering carbon in building materials and using low-embodied carbon materials do make sense as ways to reduce the GHG emissions associated with a project. However, beyond the scope of GHG emissions, the impacts of these materials is less clear.

In the interest of clarity and ensuring the applications to CEQA align with the author's intent, the committee should consider amending this provision to refer to mitigation "of GHG emissions" specifically.

DOUBLE REFERRAL:

If this measure is approved by the Senate Environmental Quality Committee, the do pass motion must include the action to re-refer the bill to the Senate Natural Resources and Water Committee.

Related/Prior Legislation

SB 905 (Skinner, 2020), among other things, tasks ARB with a number of responsibilities surrounding geologic carbon sequestration demonstration projects. SB 905 is currently before this committee.

SB 596 (Becker, Chapter 246, Statutes of 2021) requires ARB to, by July 1, 2023, to develop a comprehensive strategy for the state's cement sector to achieve net-zero GHG emissions no later than December 31, 2045.

AB 1365 (Bonta, 2021) would have established a schedule to incorporate concrete into the State's Buy Clean program and leverage California's purchasing power to advance low carbon technologies and best practices across the supply chain. AB 1365 died when then-Assemblymember Bonta left the Legislature.

SOURCE: Blue Planet
Foundation for Climate Restoration

SUPPORT:

350 Humboldt: Grass Roots Climate Action
350 Sacramento
350 Silicon Valley
Acterra
Bay Area Youth Lobbying Initiative
Climate Reality Project, San Fernando Valley
Foundation for Climate Restoration
Harker Green Team
Los Altos High School Green Team
Menlo Spark
The Climate Reality Project: Silicon Valley
Uucpa Green Sanctuary Committee
Weideman Group
YMCA of San Francisco
1 individual

OPPOSITION:
Building Owners and Managers Association of California
California Apartment Association

California Building Industry Association (CBIA)
California Business Properties Association
Commercial Real Estate Development Association, Naiop of California

ARGUMENTS IN SUPPORT: According to one of the sponsors of this bill, the Foundation for Climate Restoration, "Construction materials used in buildings and roads are responsible for a significant amount of total global CO2 emissions: 11%. This large percentage can come as a shock, but the good news is that the problem can be efficiently addressed.

"Through relatively recent innovations, it is now possible to store CO2 in the built environment, including roads and buildings. Many companies around the world are now innovating in this space, including Blue Planet Systems, based in Los Gatos, California. Low-carbon and carbon-negative building materials provide value-added opportunities to store carbon and enormous potential to support California's priorities. Minimizing embodied carbon and maximizing carbon sequestration in the built environment represents an outstanding opportunity for California to take a leadership role in advancing climate restoration."

ARGUMENTS IN OPPOSITION: According to a coalition of opposed stakeholders, "SB 1297 would require newly constructed buildings to use building products that minimize embodied carbon and maximize carbon sequestration. While we believe this is a laudable goal and are optimistic that we can work together to satisfy our concerns, in its current form we must unfortunately oppose SB 1297 unless it is amended…

"We believe that SB 1297 should find ways to incentivize rather than mandate these materials in order to gradually roll out these new materials and achieve California's climate goals. Additionally, we caution that the bill not be used to freeze competition between material manufacturers which would drive up costs for the materials. Since advocates for lower embodied carbon claim that these new products do not increases costs, this should be feasible to accomplish."

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