

2025 Summit Proceedings

Bio-Based Materials Collective



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New Frameworks

About the Summit

The Bio-Based Materials Collective gathered in Burlington, Vermont for the 2025 Summit with a shared mission: To accelerate the scaling of plant-based materials regionally and build energy around this growing movement across North America.

Over two days, more than 80 participants from across the built environment ecosystem came together—architects, engineers, builders, consultants, academics, farmers, manufacturers, foresters, government officials, researchers, investors, and students. The diversity of voices and perspectives underscored the holistic and collaborative nature of this work.

Field to Form Tour

On our first day, 48 participants boarded a school bus for a full-day tour of Chittenden County's bio-based materials landscape—from field to form. The tour showcased real-world examples of regional material cultivation, processing, and buildings. Participants engaged directly with farmers, manufacturers, and builders who are trailblazing these practices in Vermont.

Aurora Farm/Nitty Gritty Grain Company Charlotte, Vermont

Our first visit was to an organic farm that supplies New Frameworks with straw bales for their panels. A 7th generation, white settler family farm, they grow several organic grains for products like cornmeal, pancake mix, and wheat flours, all sold at local groceries and markets. Straw is one of their byproducts, and co-owner David Kenyon's background in architecture led them to support innovative construction initiatives like structural, straw-insulated panels (S-SIPs). David shared insights and challenges in scaling production of building grade straw (which needs to be free of leafy weeds), including equipment capacities, planting densities and weeding techniques, and timing harvests in an increasingly unpredictable climate).



Clifford Lumber Hinesburg, Vermont

Clifford Lumber is a small-scale, 3rd generation sawmill operation focused mainly on species such as pine and hemlock used for interior paneling, siding, fencing, and more. Most of the logs arriving at the mill come from land owners' needs to comply with VT's current use regulations by harvesting trees to maintain a preferable tax rate. The mill has a small gas kiln, an upgrade from their previous wood-fired one, and gets electricity from federally and state subsidized solar. They face challenges from regional closures of biomass plants, which provide off take for low value byproducts streams, as well as labor shortages and competition for workers from better-paying construction jobs is also a challenge.



The New Frameworks Casita Árbol 1200 @ Full Moon Farm Hinesburg, Vermont

The Casita line from New Frameworks is the company's attempt to provide "missing-middle", economically-accessible high performance, biobased, healthy homes to address the housing crisis. The homes are net carbon-storing/carbon drawdown, all-electric, and utilize local and regional wood products from Clifford and Curtis Lumber, as well as lime plaster walls, Marmoleum and wood flooring & trim, and natural oils and polywhey wood finishes. The Árbol model is a 1200sf 3 BR, 2 Ba design built with S-SIPs (straw structural insulated panels) installed as a pre-designed, panelized home on a helical pile foundation. The general contracted price for the standalone home on farm property (new construction, not an ADU) is around \$356/SF for the home, excluding site work and utilities. According to the BEAM estimator from Builders for Climate Action, the Árbol draws down and stores -3084 kg/CO2e.



Bread and Butter Farm Shelburne, Vermont

Bread and Butter Farm in Vermont is trailblazing a model of integrated farm-based community development combining high performance worker housing, stacked business and non-profit enterprises, and regenerative agriculture. Housing has been built with New Frameworks' S-SIPs and they seek to build more. The farm has successfully navigated an often challenging and complex grant and policy space to secure \$1m from Vermont's Missing Middle Income Homeownership Development Program. Enterprises on their over 600 acres include retail farm goods, a café, and education programs, and are expanding. Their business model is complex and would be difficult to replicate without inherited land and deep relational dedication from these specific individuals; yet also an inspiration to growing aligned and innovative enterprise ecosystems.



New Frameworks Essex Junction, Vermont

19 year old design/builder - multi-racial, queer, trans, and women-owned worker cooperative New Frameworks toured us around their facility where they produce straw structural insulated panels (S-SIPs) and high performance, bio based pre-designed kit homes. The company operates with language justice principles and the tour was given and Q&A conducted in both Spanish and English by worker owners. They also discussed their Seed Program and burgeoning Seed Collaborative, a training program to create decentralized, networked straw panel manufacturers across the country and beyond.



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The New Frameworks Casita Terra 600 Burlington, Vermont

A 600SF Casita in the New Frameworks line of pre-designed, panelized high performance homes, this Terra 600 is installed as an ADU in the city of Burlington behind a single family home. Made with straw structural insulated panels (S-SIPs) from organic straw from Aurora Farms/Nitty Gritty Grain Company, this infill housing unit is a 1 BR, 1 Ba lofted design with local and healthy materials used throughout, adds a much-needed liveable unit to the densifying city, and draws down and stores 2660 kgCO₂e.



Lightning Talks

The second day brought 85 attendees to Main Street Landing in Burlington for a day of learning, exchange, and co-creation. The day opened with a warm invocation, land acknowledgement and reflection from Ace. He recapped the start of the BBMC at our Founding Summit in November 2023, offered insights from the tour (aka "Meeting Our Bioregional Plant, Animal and Mineral Relatives and the Things We Create Together") and set the tone of being embodied and grounded in place for the day's collaborative work.

In the morning, we heard from a range of local and national organizations on the latest developments across critical domains: finance, governance, data, education, and culture. These presentations helped ground our collective understanding of the enabling mechanisms that it will take to create lasting change in how buildings are made and materials are sourced.

Jen Green, Burlington Electric Department, presented on Burlington's Net Zero Energy roadmap and the initiatives that support it. Jen also reminded us that Burlington was the first city in the US to power its electricity grid entirely from renewables; something they did and continue to do affordably.

Jacob Deva Racusin, Builders for Climate Action, & Michelle Lambert, Carbon Leadership Forum, presented on embodied carbon policy at the city, state and federal level including where it intersects with bio-based materials, sharing an abundance of resources.

Tim Yandow, Efficiency Vermont, presented on the rebates for using low embodied carbon insulation in the Vermont Residential Building Energy Standard, that New Frameworks and other Vermont builders, homeowners and developers are taking advantage of; placing bio based materials squarely in the context of Vermont's residential energy landscape.

Liz Johndrow, Earthen Endeavors, presented her version of workforce development in regards to nontoxic mineral finishes for bio based buildings: site-based clay and lime plaster workshop trainings for particularly women, non binary, and trans folks throughout the Northeast.

Z Grabowski, Alliance for the Mystic River Watershed, presented on the importance of supporting cultural change, buildings as catalysts for larger systems change, and the emergent movement of bioregional regenerative finance.

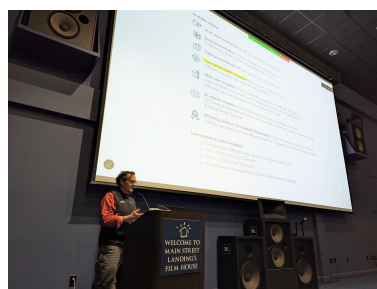
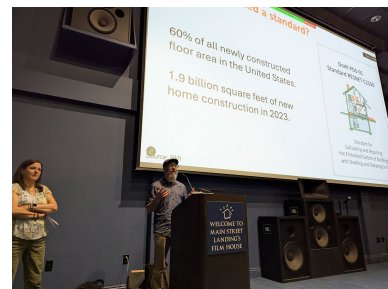
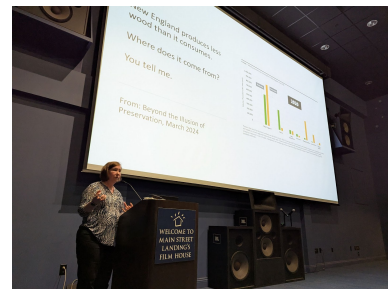
Christine McGowan, Vermont Sustainable Jobs Fund, presented on the "OG" of bio based materials - wood - tracing its history through the Northern Forest to the current day, including our generations arms length relationship with working forests and the challenges and opportunities that creates for the regional and local wood industry.

Jon Fenton, Eroteme, chronicled the pivot of the Hillside Center for Sustainable Living in Newburyport, MA - from conventional concrete construction in phase 1 to what is now the largest hempcrete project in North America by phase 4.

Kent Hicks & Munkaila Musah, University of Massachusetts, presented on the design build courses, and technical bio-based material research being practiced at the school, including with straw and hemp hurd.

Jacob Deva Racusin representing the work of Chris Magwood, RMI, presented the findings from Building with Biomass: A New American Harvest report.

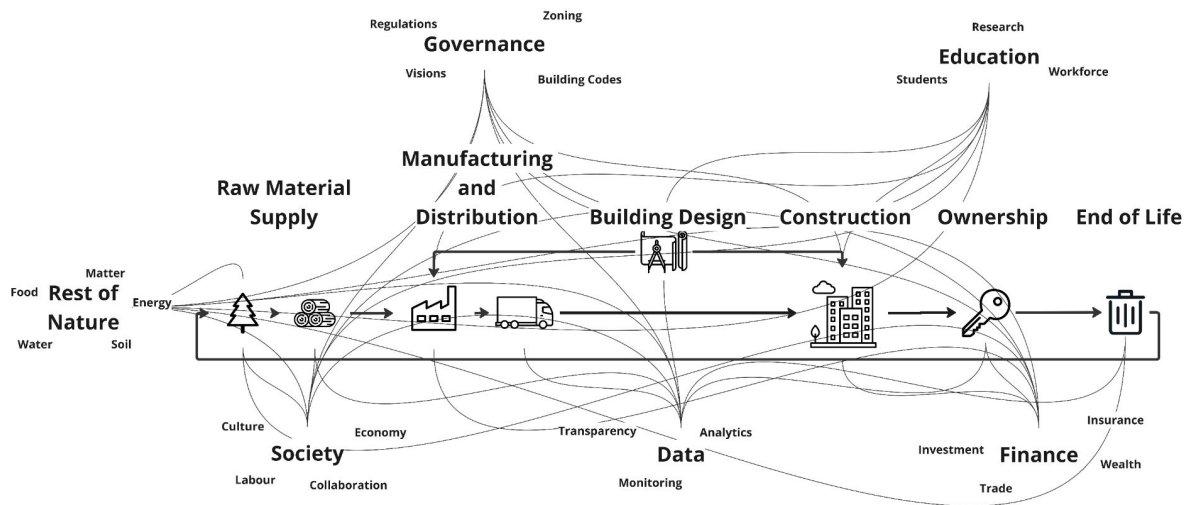
Greg Bossie, Rare Forms, & Ace McArleton, New Frameworks - both members of the burgeoning Seed Collaborative - presented the approach of the Seed Collaborative in training manufacturers how to make structural straw panels and in doing so, offering a provocation that the way to scale biogenic buildings materials is through collaboration and reciprocity.



The second day kicked off with ten lightning talks from experts in a diverse range of topics.

Insight to Action

In the afternoon, attendees self-organized into four working groups based on their expertise and interest: Source Materials, Manufacturers, Design & Construction, and Owners & Developers. The goal of this exercise was to create an approach for local BBMC groups to analyze opportunities and strategies for scaling bio-based materials and create a plan to do so in their bioregion. The sessions surfaced ideas for collaboration, identified leverage points, and began mapping actionable next steps towards our shared vision.



* This is a non-exhaustive map

The workshop discussions have been distilled into the following topics. A full list of solutions from the workshop groups can be found in Appendix A.

Collaboration

All solutions recognized collaboration as essential—whether through sharing knowledge and resources, building cross-sector relationships, or identifying partnership opportunities. Collaboration was also identified as a key lever for driving the cultural change needed to transform the broader system.

Governance

Regional and local governments can play a central role in accelerating the adoption of bio-based materials through supportive policies and increased public sector demand. Government departments should be engaged to understand their existing visions, strategic plans, and implementation tools—both regulatory and incentive-based. These documents can be reviewed to identify alignment with BBMC's goals. Where alignment exists, proposals can be developed to integrate explicit support for bio-based materials.

Education

Education is foundational to building cultural acceptance, workforce readiness, and professional capacity. Learning takes place in both formal and informal settings—we are continually educators and learners. Begin by identifying the region's greatest educational needs—both in terms of subject matter and target audiences—and assess local capacity to meet those needs. Uplift and amplify existing programs in schools, professional associations, and certification bodies that already teach bio-based material practices. Recommend amendments to other programs that could be adapted to include this content. At the professional level, transparent knowledge sharing—especially around implementation challenges and successes—should be encouraged.

Finance

The financial system poses both obstacles and opportunities in scaling bio-based materials. A critical step is to assess the range of financial mechanisms and institutions available locally and beyond, evaluating their relevance and accessibility for material producers, builders, and developers. Finance should not only support growth, but also reflect regenerative economic values that prioritize long-term ecological and social well-being.

Data

Reliable data underpins trust, investment, and effective decision-making. It also forms the foundation for advocacy and education. Market demand data can support funding applications and attract investment. Mapping exercises can reveal strategic points of intervention in the supply ecosystem. Quantifying the social and environmental benefits of bio-based materials can increase adoption by demonstrating value to stakeholders.

Innovation

Innovation must be nurtured through supportive infrastructure, pilot projects, and engagement with research institutions. While innovation can occur across the entire system, it was most commonly identified at the product and building scale. Manufacturers can partner with universities to develop and test new materials. Designers and builders can explore creative applications that serve as both functional and educational case studies, helping to normalize and inspire the use of bio-based materials.





Groups explored opportunities, challenges, and potential strategies for scaling bio-based materials.

BBMC Going Forward

To end the Summit, the Bio-based Materials Collective Steering Committee outlined organisation changes going forward:

1. We are moving from the current model of five static Working Groups to Task Groups that will form based on passion and demand, and retire on completion of the task. It is intended to empower BBMC members to work on tangible tasks that will lead to the scaling of bio-based materials, providing longer term organisational flexibility and better matching the expertise of collective members with the work ahead.
2. We also celebrated that the Steering Committee for 2025 will include several new members sourced from the Working Group Co-Chairs: **Billy Craig, Veronica Ochoa, Zbigniew Grabowski**, as well as BBMC co-founders and original Steering Committee members **Jacob Deva Racusin, Ace McArleton, and James Kitchin**. Since the summit, co-founder and original steering committee member Brian Sandford also submitted his resignation from the Steering Committee, and hopes to devote his BBMC time to upcoming tasks. Thank you so much, Brian, for your awesome work in support of our collective!
3. James Kitchin and Ace McArleton also presented, on behalf of Rachel Stern, the developing Bio-Based Materials Trade Association status, which is actively being shepherded as a potential Task Group.

Looking Ahead

The 2025 Summit was a reflection of the growing energy, commitment, and creativity within this movement. It strengthened connections, surfaced new ideas, and reaffirmed our shared goal: to create a built environment rooted in regional, regenerative materials that support climate, community, and ecological resilience. We look forward to a vibrant, collaborative and productive year ahead.



Over 80 BBMC members brought energy, knowledge and creativity to the Summit.



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Thank you

The 2025 Summit was organised by Ace McArleton, Brian Sandford, Billy Craig, Jacob Deva Racusin, and James Kitchin.

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Appendix A: Full list of solutions from the workshop

Source Materials, facilitated by Ace McArleton and Jen Daniels

Agriculture, forestry, and aquaculture systems are the foundation to a growing bio-based building movement. Building materials are also critical in adding value by providing offtake for primary products as well as byproducts from farms and forests.

- **Landscape-level Planning and Coordination:** This involves collaborative efforts between diverse groups, such as affordable housing initiatives and land trusts, to coordinate efforts like land swaps or strategically planning the best locations for development and growing of bio-based materials.
- **Integrated Systems:** The long-term trajectory of the bio-based building movement requires significant integration with food systems. This means looking to food systems solutions for local and regional shared production.
- **Defining and Working at Appropriate Scales:** It is crucial to consider what "scale" truly means for different stakeholders (e.g., a 25-mile radius for a mill) and to avoid endlessly scaling, instead focusing on what genuinely works, such as community, city, watershed, or bioregion levels, where a bioregion is the smallest self-sufficient unit. This involves understanding the varied timelines relevant to different natural elements, from salamanders to trees and the Earth itself, and considering multiple generational horizons.
- **Promoting Low-Value Materials:** A key action is to promote the use of low-grade materials. About two thirds of a tree is wasted residuals from sawing in mills and from harvests in wood production. These materials also come from tending practices that benefit ecosystem health, highlighting the need to improve the overall health of every product, not just high-value ones like mass timber. Similarly, a significant amount of wool is currently being thrown away because the value is in the meat or in certain types of wool. Actions include researching bottlenecks in the material supply chain (e.g., through interviews with farmers, foresters and mills), developing shared infrastructure for processing, and promoting the use of the whole product.
- **Reinvigorating Infrastructure:** A critical solution is to rebuild and support the systemic material processing infrastructure that has declined. This might involve building new facilities or leveraging existing older infrastructure, requiring community investment and resources.
- **Shared Processing Facilities:** Shared processing facilities "Mill Hubs" (similar to Food Hub models) to share the capital expense of investing in these machines. For wood, these could include portable sawmills, veneer-making setups, and engineered wood clamps. The idea extends to portable processing equipment, such as mobile scouring units for wool, that can go directly to farms at harvest time, reducing costs for individual farmers and enabling community co-op shares.
- **Product Development Spaces:** This involves messy lab work and exploration spaces to learn from mistakes, leading to the creation of spaces where successful processes and products can be showcased and shared. These could be more advanced centres that research material properties (e.g., lignin in hemp for binding), which is essential for developing new bio-based materials.
- **Shifting Economic Paradigms:** The group discussed the need to create solutions within a "value change" framework that departs from traditional economic structures. This includes engaging alternative economists to develop and understand new cost comparison models. This could include creating new markets that incentivise and pay for climate and biodiversity



benefits. This requires a cultural shift towards valuing different benefits. Initiatives like the "Regen Network" that pay farmers for regenerative practices are cited as examples.

- **Long-term, Regenerative Financing:** The conversation highlights the fragility of relying solely on federal or private "one-off" funding. There is a call for exploring local, community-based, and regenerative financing mechanisms that are sustainable over the long term. Community funding models, potentially inspired by successful fundraising campaigns for personal needs, are suggested as a way to support farmers and projects.
- **Working at the Speed of Trust:** A crucial first step is to slow down the process, working at the "speed of trust" to build strong relationships and ensure alignment among all stakeholders. This is seen as the foundational "currency" for navigating a changing world. We can start to build these relationships by learning about each other's work, designers can walk with foresters, and vice versa.
- **Diverse Participation:** Solutions require engaging a wide range of participants, as each perspective is a vital part of the larger narrative. This includes engaging diverse communities, addressing social issues, and ensuring that integration is not performative but genuinely beneficial to all actors in the system. Finding "bridge makers" who have established relationships and skills in bridging different groups is also essential. Solutions must involve engaging with people who hold different perspectives, even those who disagree. This includes interacting with individuals who may not use specific terms (e.g., "climate change") but share common values, such as wanting healthy land for their animals. Focusing on shared values rather than specific vocabulary is key.
- **Weaving Knowledge Systems:** The approach advocates for weaving indigenous knowledge with Western thought, rather than eliminating one for the other. This involves combining scientific understanding with storytelling and traditional teachings.
- **Festivals and Markets:** Facilitating direct sales of local building materials at Farmers Markets can build community joy and local benefits. Hosting festivals (e.g., forest and farm festivals) can bring the public directly to source materials, remaking the "spirit of the commons" and harvest traditions.
- **Regional Policy:** Local and regional governance can play a role in creating regional support systems, especially in lieu of federal government action. This fosters regional coordination and builds regional economies. Demand can also be driven by government organisation e.g., the military's requirement to use US-sourced wool in uniforms also provides an existing demand channel.
- **Mapping Resources:** To understand regional production capacity, it is essential to improve mapping tools for source materials. This involves identifying ecological resources, producers, government and non-profit partners (including private sector, academia, and technical assistance), and communicators/educators of value.

Manufacturers, facilitated by Greg Bossie and Jacob Deva Racusin

Manufacturers create products from raw materials and other products. Manufacturers are navigating regulatory and client needs but ultimately need investment in machinery and people to produce the quantity of products reliably needed for construction.

- **Common Business Interests:** Shaping the BBMC in part so its manufacturing members common business interests are supported is considered as a key solution. This included the leadership to lobby politicians and coordinate industry efforts, as well as facilitating mentorship from advanced bio-based material manufacturers overseas.

- **Adopting a Policy Action Plan:** Creating a comprehensive policy action plan is proposed to coordinate the effort of accelerating the adoption of bio-based materials by addressing regulatory barriers. This action plan would be delivered through advocacy and lobbying efforts and should be coordinated with groups doing this at a state and federal level.
- **Market Research:** Growth of bio-based manufacturing needs to be based on bio-regional market research to understand the downstream customer needs and the upstream material supply.
- **Workforce Education:** Scaling up the manufacturing of bio-based materials will rely on a larger number of educated workers in more rural areas, close to the source of the materials. Supporting workforce development is key to long term success and introducing a certification scheme is one option.
- **Regenerative Sources:** Understanding and communicating the benefits of regenerative agriculture and forestry to market stakeholders can increase support for the products and any cost premium compared to unsustainably sourced products.
- **Utilising Data:** Share stories of good practice that are backed by environmental and social data. This would likely require new calculation methodologies to be established, such as Product Category Rules for Environmental Product Declarations.
- **Learning from Europe:** Understand what lessons can be learnt from bio-based material manufacturers in Europe, where they have benefited from cohesive unions, strong leadership, a culture of conscious consumption, and how those might be applicable to North America.
- **Creating Networks:** Build material specific networks of regional material sources and suppliers for product manufacturers, as well as networks of architects, engineers, and developers who can implement these products and provide feedback for improvements.
- **"Living Labs":** Utilise spaces and in collaboration with Universities for testing prototypes and fostering innovation. This reduces costs for experimentation and testing.
- **Pitch Day:** Organise a pitch day for product manufacturers to present their innovation and business opportunity to impact investors.

Design & Construction, facilitated by Brian Sandford, Dan Singer and Olga Carcassi

Architects, engineers, and builders specify and implement bio-based materials in real projects. By choosing and demonstrating their use, they help normalize these materials, improve construction know-how, and build market demand.

- **Foster Partnerships:** Engage with the existing community of architects, contractors, sub-contractors, engineers, and developers to understand how to incorporate bio-based products across multiple projects.
- **Community as Client:** Engage the community to understand their material, economic and nature needs. Educate the community about the benefit of bio-based materials to a community's health, economy and culture, and empower them to challenge the status quo of material choice in their community.
- **Professional Education:** Develop programs to educate contractors and designers on the facts of bio-based and conventional materials. These education programmes should be tailored to address the stakeholders concerns or motivations, such as cost, climate, or health.
- **Speakers Guild:** Identify who in the community can effectively communicate to different audiences - community members, professionals, city planners, and officials - the benefits of bio-based materials and engage them when the opportunity arises.



- **Transparent Knowledge Transfer:** Create a platform to share lessons learnt, including successes and failures, in the implementation of bio-based materials on projects. This would require a safe space, free of contracts and repercussions.
- **Educate in Schools:** Bring bio-based materials into the classroom, starting with higher education so students become familiar with them and have fun in the process. Look to schools that may already be doing this.
- **Pilot Projects:** Develop pilot projects to demonstrate innovative solutions, identifying the right client and project type. Ideally, these are larger than single-family homes and replicable at a broader scale, like multi-family passive houses. Publicising successes and providing tours to designers, builders and developers can generate more demand.
- **Increase Use of Life Cycle Assessments (LCAs):** Highlight the benefits of life cycle assessment modeling and share results, getting more architects and builders educated on how to do their own LCAs using tools that recognise biogenic carbon storage.
- **Expose True Costs:** Address the prevalence of cheap petrochemicals by exposing their full costs, including health and environmental, to promote sustainable alternatives.
- **Engage with Local Municipalities:** Identify and collaborate with city and state government decision-makers to demonstrate how bio-based materials could help them achieve their goals. Opportunities for alignment are most obviously in achieving climate targets and reducing energy consumption.

Owners & Developers, facilitated by Billy Craig

Owners and developers of buildings of all sizes fund and approve projects that incorporate bio-based materials. Their willingness to invest in these solutions drives market adoption, especially when aligned with sustainability goals or certifications.

- **Involving owner developers:** A primary pathway towards success is engaging owner developers in the conversation, specifically those who can influence the use of bio-based materials from land into buildings. This includes identifying who these owner developers are and if they are represented.
- **Engaging funders:** The BioFI network, which focuses on biofinance and is related to the Buckminster Fuller Institute, is a source of funding for bioregional projects, particularly with traction in the Pacific Northwest and efforts in the Northeast. BioFI offers single-source funding, mentorship, and expertise. Access to funding more generally is seen as crucial. Other "climate capital" such as the International Climate Bond Initiative, which provides better rates for states meeting higher energy efficiency targets, could also be accessed.
- **Reaching existing developer communities:** Broadcasting the message about bio-based materials to existing developer communities, such as through events like the "Vermont Developers Forum," could be beneficial. This targets private real estate developers who are already involved in projects and have money.
- **Involving contractors:** Training contractors on how to use bio-based materials is a key hurdle, as contractors are often risk-averse and prefer known methods. The aim is to demonstrate that new materials can be easier to build with and do not require significant upcharges.
- **Working with insurers:** Insurance is a major hurdle, with no neat category for materials like mass timber, leading to potentially doubled or tripled policy costs. A previous successful approach involved insurers like Firemen's Fund offering premium discounts for LEED-certified spaces, tied to operations and maintenance training programmes, as these spaces were deemed safer. The goal is to lower risk and create a reward concept for insurers. Eventually,



mandatory carbon tracking in building codes could lead to insurance companies settling down their rates for bio-based materials due to reduced liability.

- **Broader value definition:** A long-term goal is to make a case for embodied carbon increasing a building's value and getting appraisers to include this in their valuations. This could tie to tax incentives, making properties with bio-based materials more valuable due to reduced tax bills.
- **Engaging economic development agencies:** These agencies often link economic revitalisation, housing, and workforce development, aligning with the values of regional material economies and job creation from local resources.
- **Influencing school building authorities:** Organisations like the Massachusetts School Building Authority (MSBA) offer incentives for going above and beyond in LEED points; getting them to offer additional funding (e.g., a 2% increase) for projects using carbon-sequestering bio-based materials could have a significant impact across Massachusetts.
- **Collaborating with realtors:** For residential properties, realtors could play a role by integrating information about mindful or healthy materials into MLS (Multiple Listing Service) disclosures, similar to green plaques or Energy Star ratings.
- **Leveraging affordable housing programmes:** The Qualified Allocation Plan (QAP) process for affordable housing, which offers points for specific building standards (like Passive House), could be replicated for bio-based materials. Integrating bio-based materials as a points measure in QAPs could rapidly increase their adoption, as seen with Passive House in Pennsylvania and other New England states.
- **Non-profit organisations and individual leaders:** Non-profits and respected regional leaders are vital for fostering the cultural will to change, educating, and providing training, acting as first movers in regenerative thinking.
- **Work with aligned owners:** The group discussed whether to focus efforts on specific project types (e.g., residential, commercial, affordable housing, senior living) or client types (e.g., institutions, private developers). Institutions with climate commitments (like universities, Google, Amazon, Microsoft) are seen as significant opportunities because they already have carbon goals and capital, making it less of an uphill battle to convince them.
- **Material substitutions:** A distinction is made between bio-based materials that are "easy replacements" fitting existing slots without process changes, and those requiring fundamental changes in the builder/developer's approach. Initially focusing on easy replacements might reduce resistance and facilitate scale.
- **Adaptive reuse:** Recognising the different challenges and financial commitments involved in using bio-based materials in new construction versus existing or historic buildings. Getting historic preservation entities on board with energy aspects and bio-based materials in renovations is a worthwhile but challenging goal.
- **Replicating successful models:** Learning from successful cases where unique owners like David Hall funded hemp-crete projects, though acknowledging such individual initiatives may not be easily scalable. The success of Passive House adoption through QAP incentives is seen as a replicable model for bio-based materials.
- **Defining a bioregion and identifying allies:** A key step is to define a bioregion and identify allies within the various stakeholder groups (financial, insurance, economic development, codes, standards, utilities, states).
- **Inquiry and data gathering:** Asking specific questions to these influencers, such as whether project size (single-family vs. commercial) impacts insurance or capital access, to understand barriers and build allies. Identifying friendly banks for debt capital and bringing them into the BBMC network is an example.



- **Addressing supply issues:** Ensuring material suppliers are willing to carry bio-based products and make them readily available, rather than requiring special orders. While some businesses prefer to keep their material sourcing and product distribution within a 25-mile radius due to carbon footprint or belief systems, the question remains whether this is scalable or if broader market penetration (e.g., Home Depot) is necessary.
- **Cultural shift:** Acknowledging that many issues can be solved, but the underlying problem is a cultural one requiring the "will to change" up and down the board, fostered by non-profits and trusted leaders.