

2024



EMBODIED CARBON ACTION PLAN



IMEG'S 2024 EMBODIED CARBON ACTION PLAN

A message from Laura Hagan, Structural Sustainability Lead:

Welcome to our 2024 ECAP! We are now three years into our commitment to SE 2050 as a signatory firm. In the pages to come, you will discover, or be reminded, about how we are continuing our path to target bigger goals that will increase our embodied carbon reductions in IMEG projects.

Last year, we made some significant changes in how we aim to achieve our near-term goal of 30% embodied carbon reductions by 2030. Read on to discover what is now underway and learn more about what IMEG's structural group is being prepared to accomplish. Of course, we also have several new, modified, and ongoing goals, which we are looking forward to achieving with all of you!

Laura Hagan



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EMBODIED CARBON DEFINED

According to the [Carbon Leadership Forum](#), embodied carbon refers to the greenhouse gas emissions arising from the manufacturing, transportation, installation, maintenance, and disposal of building materials. This includes all the materials that go into a building, from the time they are extracted from their source all the way through their installation, removal, disposal, or reuse. These different periods of a building material's life translate directly to the building's life stages.



EMBODIED CARBON ACTION PLAN



The goal of the [SE 2050 Challenge](#)—to attain net zero embodied carbon structural systems by the year 2050—is a tall order. Achieving this is possible, however, and we at IMEG can do our part to help the industry meet the challenge, guided along the way by this Embodied Carbon Action Plan (ECAP).

This year, to better push forward with our embodied carbon reduction goals, IMEG officially kicked off its new Structural Sustainability Initiative (SSI). The IMEG SSI is comprised of an overarching plan that now extends to the year 2030, ultimately aligning with SE 2050's goal. To enact the SSI, the Making Change Action Plan (MCAP) was created as the main vehicle through which to engage the IMEG structural staff. The MCAP targets different areas of IMEG's structural work and proposes changes so that all engineers can begin implementing improved procedures in all structural practices. To do this, we began implementing quarterly action items that focus on different aspects of our work, from conversations with clients to specification writing and structural design. We plan to continue this practice through 2024 and beyond as we learn more about the techniques and strategies that we, as structural staff, can employ to lower the embodied carbon in our buildings. Action items that have been instituted to date and those we are looking to include in the future are discussed in this document.

IMEG's ECAP is comprised of the following four sections, each of which examines an aspect of the effort to reduce and sequester embodied carbon in the built environment.

EDUCATE: This section provides information on the internal and external educational resources available or in development. These resources will increase our knowledge about embodied carbon, life cycle assessment (LCA), and other related sustainability topics.

REPORT: The reporting and tracking of embodied carbon data is a key piece of the SE 2050 Commitment. This section of the ECAP explains how we plan to calculate, track, and share project-based embodied carbon results.

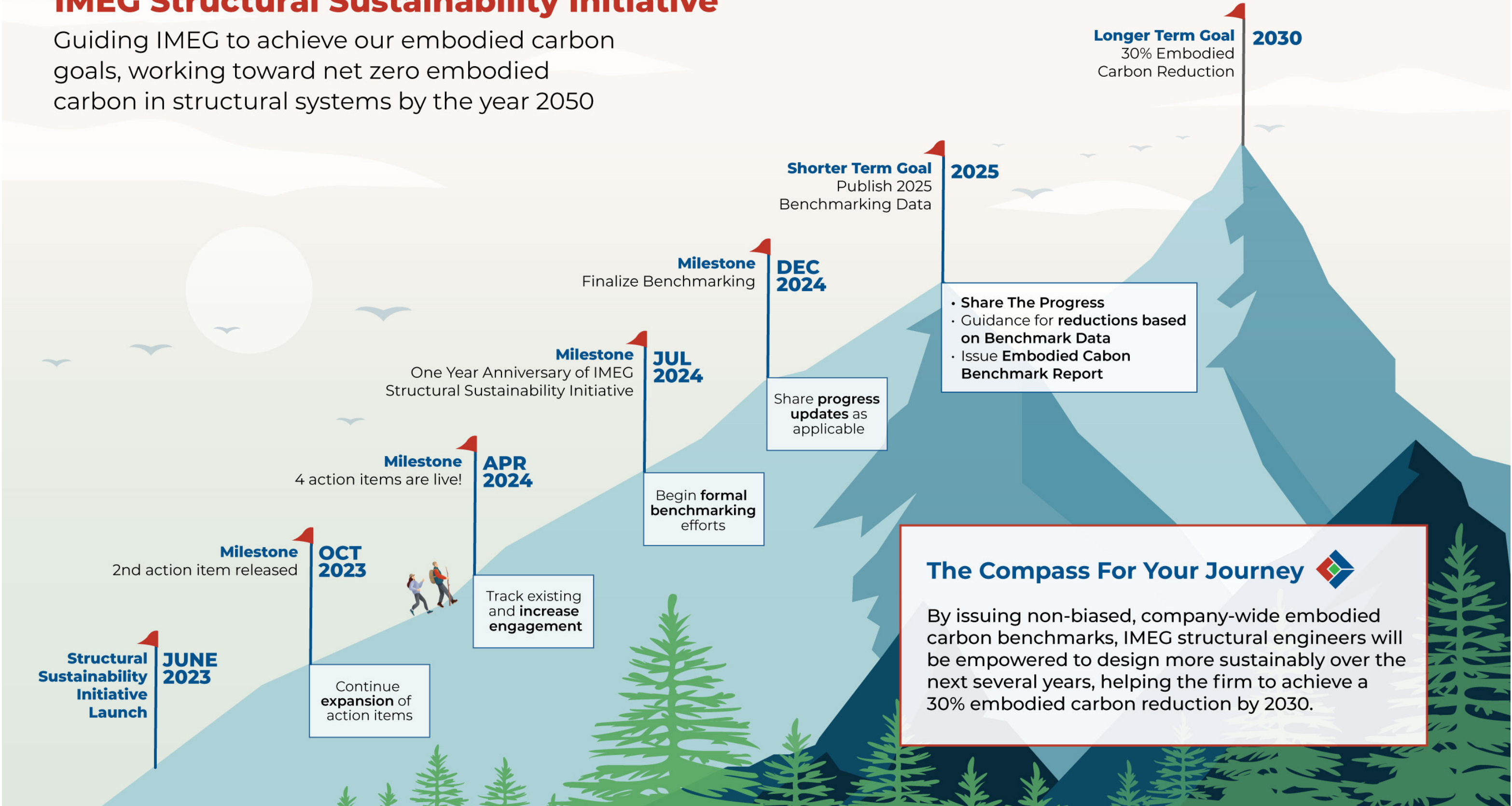
REDUCE: This section explains IMEG's goals and how we will engage in the effort to make reductions in the embodied carbon of structural systems.

ADVOCATE: As the SE 2050 Challenge is firm-led, it is our responsibility as IMEG employee-owners to advocate for lower embodied carbon using all means available. This section delves into several ways IMEG plans to share knowledge about embodied carbon and promote its reduction within the structural industry and the adjacent construction and developer industries. We will be encouraging all employees to adopt these actions.

After reading the ECAP, we hope you will be inspired to learn more, ask questions of your IMEG coworkers as well as your design teams and contractors, and share knowledgeable insight on embodied carbon reduction and associated sustainability topics.

IMEG Structural Sustainability Initiative

Guiding IMEG to achieve our embodied carbon goals, working toward net zero embodied carbon in structural systems by the year 2050



When developing the Making Change Action Plan, we identified two goals: setting benchmarking data by 2025 on which to base future projects and hitting 30% embodied carbon reduction by 2030. We then added milestones consisting of the action items, all of which are discussed in different sections of the ECAP.



1 EDUCATE

IMEG's corporate educational philosophy is one of continual learning and frequent sharing of knowledge and experience with each other. Our journey toward making a meaningful impact on embodied carbon in the built environment continues. We have launched the Structural Sustainability Initiative (SSI) and the Making Change Action Plan (MCAP) in the effort to incorporate more sustainable design strategies for our structural staff and create sustainable design toolkits that can be continuously referenced in the future.

Additionally, we continue learning about sustainability and embodied carbon through our internal education and training programs. These different initiatives blend our firm-wide passion for people and engineering with our passion for the planet.

RESOURCES

Multi-media

IMEG strives to ensure our education program accommodates all types of learning styles. We are leveraging a combination of internal and external resources that include live presentations, on-demand videos, written guides, handouts, blogs, and articles. These resources will be continually developed, expanded, and updated, and currently include:

- Resources and presentations on IMEG's intranet, Compass Plus
- Internal database of IMEG project LCA results
- Blogs, guides, webinars, videos, and podcasts on the [IMEG Insights](#) section of our website

Task force support

IMEG has two firmwide groups committed to sustainable practices at the highest level that are available as resources in our embodied carbon reduction efforts.

The Sustainable Design Task Force is an interdisciplinary group of structural, mechanical, electrical, plumbing, technology, and civil peers who work to evolve our design practice toward low carbon solutions and position IMEG as a leader in the industry as a signatory firm of AIA 2030, MEP 2040, and SE 2050. The group also strives to:

- Tackle carbon disclosure reporting for our firm and create the framework, design practice, and education for embodied carbon reductions
- Further reduce MEP embodied carbon and evolve zero operational carbon initiatives as part of MEP 2040
- Continually evolve our standard specifications and design standards to enhance sustainability and carbon reduction on every IMEG project

Long term, the group looks to evolve its influence to include operations and the decarbonization of buildings and campuses. To learn more or join the group, contact IMEG Director of Sustainability [Adam McMillen](#).

The Structural Sustainability Task Force (SSTF) is primarily responsible for emboldening the structural embodied carbon reduction effort and driving the commitment to SE 2050. To this end, the SSTF is focused on researching and sharing its knowledge, expanding IMEG's resource base on embodied carbon and life cycle assessments, encouraging interest in sustainability in structural systems, and fostering healthy discussions. The SSTF is also the driving force behind IMEG's SSI and the accompanying MCAP.

EMBODIED CARBON REDUCTION CHAMPION



Laura Hagan, PE
San Francisco
Building Performance
Consultant

Laura Hagan, IMEG's Embodied Carbon Reduction Champion, works with all IMEG structural offices to embrace SE 2050 and advance embodied carbon reduction efforts.

Laura is passionate about sustainability, and while she strives to make sustainable choices in her life outside of the office, she realizes the scale of change is much greater in her professional role at IMEG. When that is multiplied by IMEG's hundreds of structural employees and thousands of projects completed every year, the impact will be huge!

Laura also is the leader of the embodied carbon services IMEG offers and chairs the firm's Structural Sustainability Task Force. [Contact Laura](#) if you would like to join this group.

This group continues to:

- Promote a holistic and sustainability-forward mindset when designing projects
- Develop and share useful guidance documents regarding embodied carbon
- Develop a group of trained LCA experts

Internal engagement

The implementation of the SSI and the activation of the MCAP were highly successful ventures undertaken internally at IMEG in 2023. Between June 2023 and January 2024, we successfully launched three action items themed around advocacy and sustainable specifications on a quarterly basis and have several more action items to be released in the coming months. Our intent with the action items is to help you build a sustainable design toolkit, giving you multiple strategies to choose from on a project-by-project basis. We have received positive feedback on the MCAP and are working to take it even further to maximize the potential for embodied carbon to be a topic on as many projects as possible.

External education

In the last year, IMEG developed several external-facing presentations through multiple communication channels featuring different sustainability topics. These included deeper dives into material-specific embodied carbon strategies for concrete, wood,

and steel, as well as more general decarbonization topics. Our intent is to continue this outreach and create additional public resources that help educate and guide all project stakeholders toward more sustainable designs. ([For an example of how we are engaging with clients and owners, read about our new EcoMeter Tool.](#))

2024 ECAP Goals



- Educate IMEG employee-owners on the different strategies we are pursuing through MCAP action items
- Continue to update our internal resource center for structural sustainability strategies and educational information
- Institute mandatory structural sustainability training for all new structural employees
- Have continuous conversations with staff in various regions to gauge next steps in structural sustainability at the local level



Adobe North Tower, San Francisco, utilized CarbonCure.

2 REPORT

It is critical that we track the embodied carbon of completed IMEG projects so we can collect, organize, and report this data to establish not only our own baseline for project materials, building types, and other factors, but also contribute to the national benchmark that will be developed in the coming years by SE 2050. The following key steps and tools will assist us in our reporting.

Determining embodied carbon of structural materials:

To provide an effective evaluation of structural materials and estimate the amount of carbon, both generated and embodied, in a particular project, all phases of a material's production must be considered. An Environmental Product Declaration (EPD) outlines all the operations required in manufacturing a material and the carbon contribution of each process. As part of our reporting process, it is important that we understand which products to use for different projects and different regions of the country. By tracking which EPDs are used, and what other options are available, we will be able to more effectively model and track the cost and environmental impacts of the different materials.

We will use information from projects and from various available material databases to expand our library of EPDs. We have created an EPD database that can be used for LCAs in their early stages. These are the generic and industry average EPDs for a variety of materials that we have observed on numerous projects in the past year.



The Lark Hotel in Bozeman, MT, utilized cross-laminated timber.

Extracting material quantities: To have consistent results from project to project and office to office, we must start with a uniform template of naming conventions and types so that the output is also uniform and easily comparable between projects. IMEG standards for Revit models are very well set to extract material quantities for performing an LCA. We are also utilizing company-wide Revit plugins and spreadsheets to pull quantities from the models and drawings that will be consistent with company standards and provide uniform results. Utilization of OneClick LCA in the workflow of life cycle assessments helps to keep track of input material quantities at each stage of the project life cycle.

Life cycle assessment methodology: For our contributions to the SE 2050 database, we intend to focus our embodied carbon reductions in the A1-



The Bend in East Moline, IL, utilized modular construction.

A5 stages of the life cycle. We will consider stages B1-B7, C1-C4, and all aspects of stage D when completing a whole building life cycle assessment as required for LEED or other building certification programs. A dedicated group of individuals across the company performs these assessments using OneClick LCA software. The assessment is set up using a standardized approach so that the input and output are consistent and more easily compared, and so that trends can be observed and incorporated into the process to maximize proficiency. In one recently submitted project for LEEDv4, targeting the Materials and Resources Credit for Building Life-Cycle Impact Reduction, we were able to achieve a 30% reduction in embodied carbon compared to the baseline design.

IMEG internal embodied carbon database: We have developed an internal database to track the embodied carbon results for the projects for which we do life cycle assessments. This database is key in its purpose to track information for our reporting efforts. Currently, we are working to build out the database to complete

internal benchmarking. As the database grows, we will be able to identify trends as defined by project type, material, and geographic bases.

Embodied carbon benchmarking: This year marks the time for a concerted effort in increasing the number of projects included in our embodied carbon database so that we can establish benchmarking data for different project types, materials, and geographic locations. The goal is to complete benchmarking by the end of this year to finalize the data and publish it in 2025. This is critical as it will be the baseline from which we will aim for a 30% reduction in embodied carbon by 2030.

Annual project submission to SE 2050 database:

Once a project has been analyzed in OneClick LCA, the output will be documented and submitted to the SE 2050 database. IMEG is committed to contributing an increasing amount of embodied carbon data from life cycle assessments each calendar year. We will reevaluate these project submission goals and make appropriate adjustments for future years. In addition to the SE 2050 submission, this data will be used as IMEG's internal database to track our own efforts and to evaluate trends that will help us achieve our goals.

2024 ECAP Goals 

- Submit 30 additional projects to the SE 2050 database—12 projects submitted to date
- Complete a structural LCA for at least one project from each of our 25 structural offices
- Add one additional staff member to complete LCAs

3 REDUCE

Specifications

This past year, we tackled embodied carbon reduction in our specifications, specifically for concrete. For this, we updated our concrete specification sections to include lower carbon choices and suggestions.

The first update was to include Portland Limestone Cement (PLC) as the primary and preferred cement option. PLC is an alternative to ordinary Portland Cement that includes a higher proportion of limestone in lieu of typical cement ingredients—which lowers the cement's embodied carbon. This is already a default with concrete producers in some of our regions; we hope our new specification will help spur integration of PLC in other regions where we have projects.

We also added a section for carbon dioxide mineralization in concrete, often known by the name of the main producer, CarbonCure. The addition of this product allows for carbon produced in other processes to be mixed into a concrete design and be permanently stored in the concrete when it solidifies. This is added into the specifications as a preferred addition to all concrete mixes.

Next, we changed our overall language so that changes typically associated with LEED points would be utilized on all projects, not just LEED projects. This includes specifying electric arc furnace (EAF) steel for rebar and specifying the recycled content of rebar.

Lastly, we added an option to add a maximum embodied carbon content in concrete mix designs. This addition is project specific and will need

CONCRETE STRATEGIES AND THEIR CARBON SAVINGS*

Portland Limestone Cement in lieu of ordinary Portland Cement	10% reduction in concrete mix
CarbonCure	5% reduction in concrete mix
Requiring electric arc furnace steel for rebar	75% reduction in rebar, ~1.5% reduction in concrete
Providing maximum embodied carbon quantities	Endless possibilities for carbon reduction quantities based on the maximum requirements provided

***Embodied carbon reductions are approximate and vary by project and mix type.**

understanding of the local market before adding values, but it has already been used on a project and we hope to include it in future ones as well. We also are hoping to establish regional benchmark values for embodied carbon so that setting maximum embodied carbon values is an easy addition to projects.

These specifications were rolled out in Action Items #2 and #3 (as a part of the MCAP) and we look forward to updating other specifications to follow suit. Our next one to tackle is steel.

Regional discussions

To learn more about what fellow staff see regarding carbon reduction goals, we spoke with engineers in various offices to better understand what is happening in different regions. We discovered we still have a way

to go before embodied carbon is a common term for every project, but we were able to determine critical next steps. Many client-facing personnel requested a structural sustainability brochure that could be sent to clients to help promote our services. We are working on producing this and incorporating it as an action item in 2024.

Benchmarking and embodied carbon database

IMEG has already engaged in several initiatives to examine how embodied carbon and the structural engineering industry intersect. For example, IMEG's summer 2021 and summer 2022 structural interns participated in a group project in which they were tasked with establishing embodied carbon calculations and performing structural life cycle assessments with guidance from LCA staff for existing or soon-to-be-built projects. Through this and other ventures, we have completed numerous LCAs. Though we did not achieve our goal of submitting 30 projects to the SE 2050 database in 2023, we do plan to renew this goal for 2024 and institute a stronger plan to ensure achievement.

Overall, we maintain the desire and the need to increase IMEG's embodied carbon database to create a standard embodied carbon baseline that will encompass typical project types and materials. To do this, we are looking to encompass six different building materials and seven different building use types. We strive to ensure that our benchmarks will be comprehensive and consistent to be reliable for all future reduction efforts.

Reduction strategies

In combination with our benchmarking effort, we are looking to develop material-specific reduction strategies to implement so that our future buildings of the same materials and types can be lower in embodied carbon, eventually getting us to net zero.

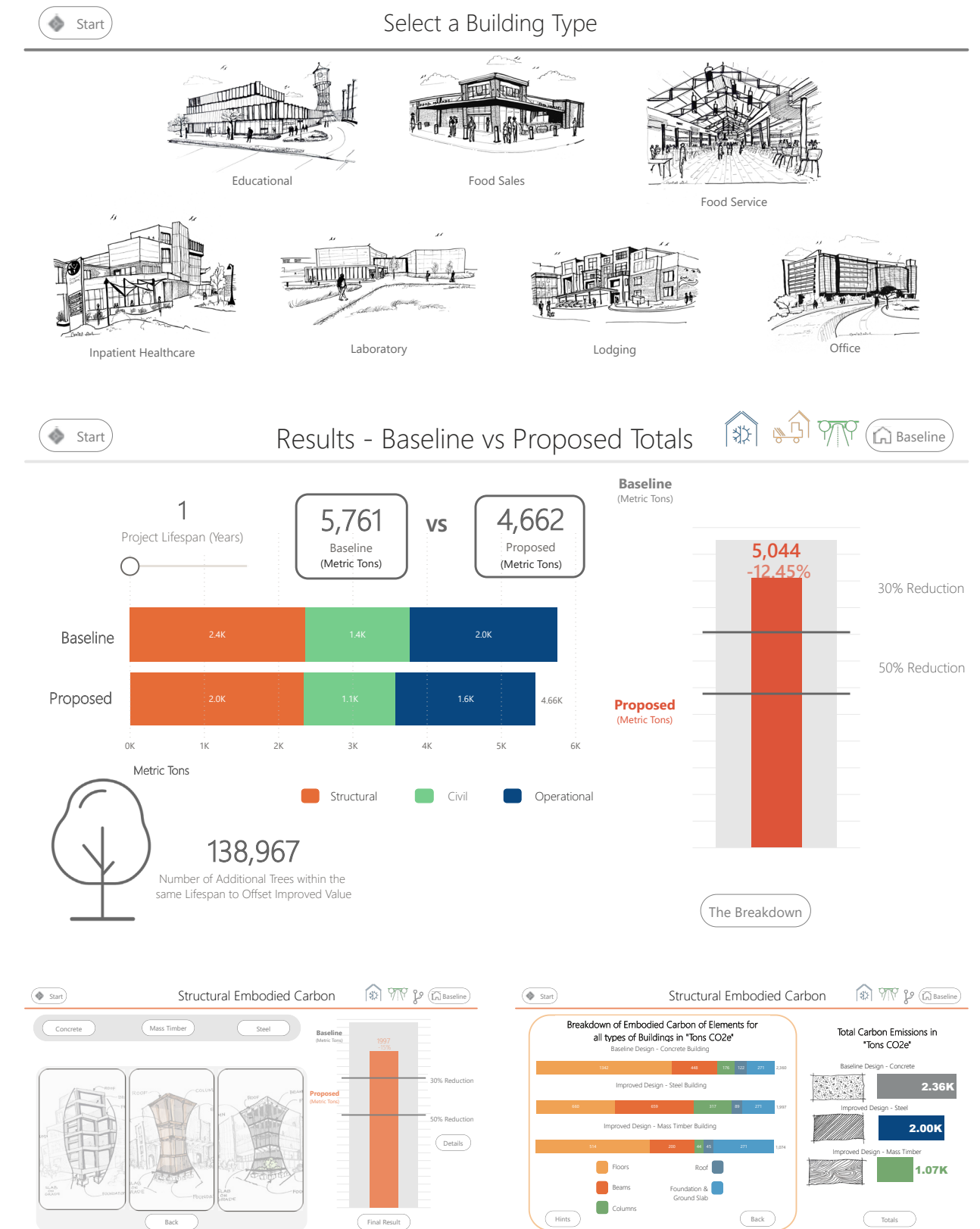
We will also develop resources to specifically address what reduction strategies can be implemented at corresponding design stages, as we fully understand there are differences in what can be done in the conceptual phase of a project versus the construction phase. In the effort to accomplish this, we have set our first specific reduction target to be a 30% reduction from the 2024 benchmark by the year 2030.

EcoMeter tool

To increase knowledge about sustainable development and for incorporation into the conventional workflow of designing and consulting, IMEG has developed the "EcoMeter." The early iteration of this tool focuses on three main contributors of carbon emissions within a site—civil embodied carbon, operational carbon, and structural embodied carbon. First presented at the Iowa Community College Conference in 2023, the tool included the lifetime carbon data and results for a 200,000 square-foot, five-story educational building located in Iowa.

The EcoMeter is an interactive and easy-to-use tool for whole-site carbon calculation that encourages stakeholders to make mindful choices that have positive impacts on the planet. It compares the results from a baseline option to an improved design

ECOMETER TOOL



Sample pages from the EcoMeter tool

option and translates the site carbon emissions to the equivalent of everyday objects, which helps users to better understand the impact of their choices.

The structural part of the EcoMeter enables building owners to reduce the overall carbon footprint of their buildings while still achieving project objectives. By assessing the embodied carbon of the main five structural elements—foundation, floors, beams, columns, and roof—we can compare the global warming potential (GWP) results for structures made of three material types: concrete, steel, and mass timber. The EcoMeter also provides a breakdown of the material’s carbon quantities for every element.

The next version of the EcoMeter will allow users to enter details such as building type, square footage, slab thickness, grid distance, and more. This will allow engineers to tailor the results for project-specific conditions and increase the tool’s instructiveness. The earliest phases of the project’s planning are the ideal times to start sustainable conversation. During this time the EcoMeter can aid in decision-making for all project stakeholders, even in the absence of a 3D model or completed structural design calculations.

2024 ECAP Goals 3

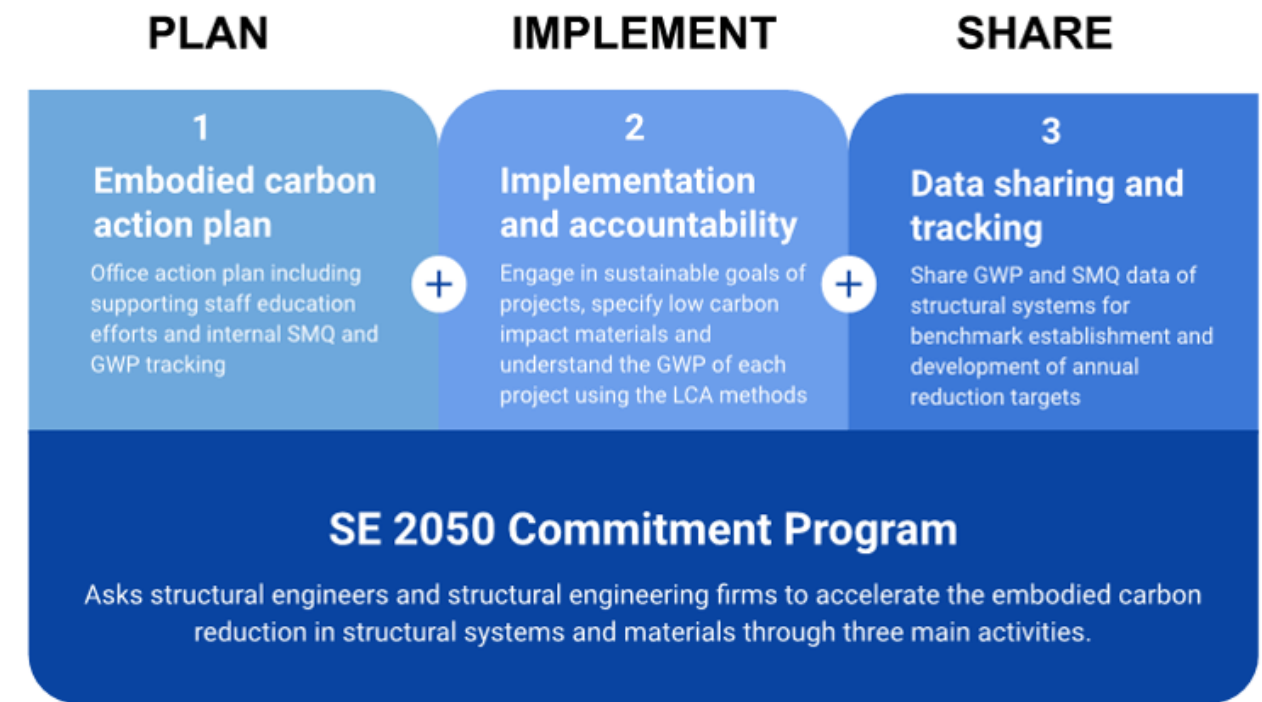
- By the end of 2024, deploy IMEG structural specifications for lowered embodied carbon in steel
- Develop an IMEG standard benchmark for project GWP for building materials (steel, cold-formed steel, concrete, mass timber, light-frame wood, and masonry) and building use (public/corporate, science and technology, education, healthcare, residential, industrial, and mixed-use)
- Create a material-specific embodied carbon reduction plan and share with our structural staff (ongoing)
- Create an embodied carbon reduction plan that lists different strategies for reductions in each stage of the design process
- Produce a client-facing structural sustainability brochure
- By the year 2030, achieve a 30% reduction in average embodied carbon for structural systems based on our 2024 benchmarks

“THE MORE WE UNDERSTAND ABOUT HOW TO MAKE REDUCTIONS IN EMBODIED CARBON, THE BETTER THE BUILDINGS WILL BE FOR ALL.”

— [Laura Hagan, on the IMEG podcast](#)



Lone Rock Retreat in Colorado utilized CLT and rammed earth walls. [Watch a video.](#)



ADVOCATE 4

ADVOCATE

Advocacy remains at the forefront of our effort and includes outreach to clients and internal staff about IMEG’s participation in the SE 2050 Challenge and working with various industries. During the second full year of our ECAP, our advocacy efforts included:

- Discussing implementing sustainable practices in our individual offices
- Talking to clients about ways to reduce embodied carbon in their projects, with the goal of six touchpoints per structural office per quarter (per Action Item #1)
- Giving several external presentations on structural sustainability topics

- Following the Buy Clean Act legislation that is being proposed in our respective team and project locations, as well as at the federal level
- Continuing to ask manufacturers to reduce the embodied carbon of their products and ask for EPDs to encourage the industry to provide them
- Attending external seminars and engaging in discussions about project sustainability goals, the structural engineer’s role, and promoting the practice of sustainability in IMEG’s structural designs

It is important for us to communicate to clients what SE 2050 is, that it parallels the 2030 Challenge (which targets operational carbon emissions) and the MEP 2040 Challenge (which targets reductions in the embodied carbon of mechanical, electrical, and



plumbing systems), and the need for everyone to band together on a global scale.

We must be diligent in explaining that IMEG's commitment to SE 2050 represents our stewardship of the environment through our design practices. We shall share that IMEG has integrated environmentally friendly policies and practices throughout its offices that promote energy, water, and carbon emissions conservation, and waste reduction.

We will continue to communicate and advocate the importance of SE 2050 and the role we play. In addition, we will expand our learning, abilities, and strategies as technology evolves and data is shared through life cycle assessments. An opportunity exists for every type of project to reduce embodied carbon and possibly sequester carbon. IMEG will continue to encourage every project team to measure embodied carbon and implement reduction strategies.

2024 ECAP Goals



- Converse with our clients about opportunities to reduce embodied carbon in their projects, with the goal of six touchpoints per structural office per quarter (this is an ongoing goal)
- Follow the Buy Clean Act legislation that is being proposed in our respective team and project locations, as well as at the federal level (ongoing)
- Continue to ask manufacturers to reduce the embodied carbon of their products and ask for EPDs to encourage the industry to provide them
- Attend external seminars and discuss project sustainability goals, the structural engineer's role, and promote sustainability in IMEG's structural designs (ongoing)
- Mentor a firm new to the embodied carbon plan
- Declare IMEG's commitment to SE 2050 as part of our boilerplate proposal language for all to use

REFLECTIONS ON SE 2050 COMMITMENT

As we look back on all that happened in 2023, one of the biggest shifts we enacted was changing the role of the SSTF from a reactive to a proactive mindset via IMEG's Structural Sustainability Initiative and the Making Change Action Plan. It is time to realize we can no longer delay in the actions needed to achieve the goal of net zero embodied carbon by 2050 and all intermediate goals between now and then. Our intention is to continue to encourage wider adoption of embodied carbon reduction strategies on projects as we continue to formalize the embodied carbon accounting needed to establish benchmarking and future reduction.

Thanks to feedback from you, our structural staff, we were able to identify what was most useful for discussing embodied carbon on projects, provide more guidance for reductions, and engage with more partners of the sustainable mindset. While we did have setbacks—a major one being not having a feasible process for contributing 30 projects to SE 2050's database—we are renewed this year and ready to tackle all our goals.

Looking toward the future

IMEG will continue to build upon this ECAP each year as we push to achieve net zero embodied carbon in our structures. We will continue to evaluate our progress and identify successes and setbacks. We will update our ECAP based on our annual evaluation and per SE 2050 program requirements, including new information on sustainability as well as our expanding technological expertise for calculating and reducing embodied carbon.

Hopefully, this ECAP has piqued your interest in SE 2050 and embodied carbon reductions, and inspired you as an IMEG employee-owner, structural engineer, and steward of the planet. We are all in this together, and we look forward to working with you in this monumental sustainability initiative and doing our part to make a difference.

Structural Sustainability Task Force



Anchila Monks



Olivia Paxson



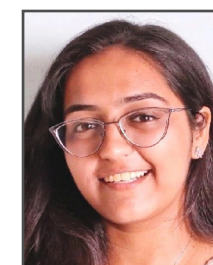
Laura Hagan



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Additional members:

Craig Chamberlain
Adam Law
Julie Hagelshaw

ECAP 2024 GOALS



1. EDUCATE

- Educate IMEG employee-owners on the different strategies we are pursuing through MCAP action items
- Continue to update our internal resource center for structural sustainability strategies and educational information
- Institute mandatory structural sustainability training for all new structural employees
- Have continuous conversations with staff in various regions to gauge next steps in structural sustainability at the local level

3. REDUCE

- By the end of 2024, deploy IMEG structural specifications for lowered embodied carbon in steel
- Develop an IMEG standard benchmark for project GWP for the following project parameters:
 - Building materials: steel, cold-formed steel, concrete, mass timber, light-frame wood, and masonry
 - Building use: public/corporate, science and technology, education, healthcare, residential, industrial, and mixed use
- Create a material-specific embodied carbon reduction plan and share with our structural staff (ongoing)
- Create an embodied carbon reduction plan that lists different strategies for reductions in each stage of the design process
- Produce a client-facing structural sustainability brochure
- By the year 2030, achieve a 30% reduction in average embodied carbon for structural frames based on our 2024 benchmarks

2. REPORT

- Submit 30 additional projects to the SE 2050 database—12 projects submitted to date
- Complete a structural LCA for at least one project from each of our 25 structural offices
- Add one additional staff member to complete LCAs

4. ADVOCATE

- Converse with our clients about opportunities to reduce embodied carbon in their projects, with the goal of six touchpoints per structural office per quarter (ongoing)
- Engage and mentor a firm new to the embodied carbon plan
- Follow the Buy Clean Act legislation that is being proposed in our respective team and project locations, as well as at the federal level (ongoing)
- Continue to ask manufacturers to reduce the embodied carbon of their products and ask for EPDs to encourage the industry to provide them
- Attend external seminars and engage in discussions about project sustainability goals, the structural engineers' role, and promote the practice of sustainability in IMEG's structural designs (ongoing)
- Declare our company's commitment to SE 2050 as part of our boilerplate proposal language for all to use

