ARCHITECTS VS CONTRACTORS VS OWNERS

WHO CAN MOST IMPACT CLIMATE CHANGE IN THE BUILT ENVIRONMENT?

On the 50th anniversary of Earth Day this year, President Joe Biden reaffirmed the United States' commitment towards reducing climate change, pledging to cut greenhouse gas emissions from the country in half by 2030. This pledge is one of many responses to a global call for strong action against climate change, in light of rising temperatures, surges in sea levels, and an increase in extreme weather events around the globe. Achieving drastic cuts in all carbon emissions over the next ten years is critical to limiting global temperature rise to 1.5°C, and a significant part of this responsibility lies with the AEC industry.

It is no secret that buildings contribute to a large share of carbon emissions globally. According to the United National Environment Program, the construction and operation of buildings account for 36 percent of global energy use and 39 percent of energy-related carbon dioxide emissions annually. These emissions, as typically measured, are a combination of two things. The first is from daily energy use for powering lighting, heating, and cooling, known as "operational carbon emissions". Second is the carbon generated throughout the lifecycle of building materials being sourced, manufactured, transported, assembled, maintained, and finally disposed of, which is referred to as the "embodied carbon" of a building, or "upfront carbon". Globally, building operations account for 28 percent of carbon emissions, while embodied carbon accounts for 11 percent of emissions.

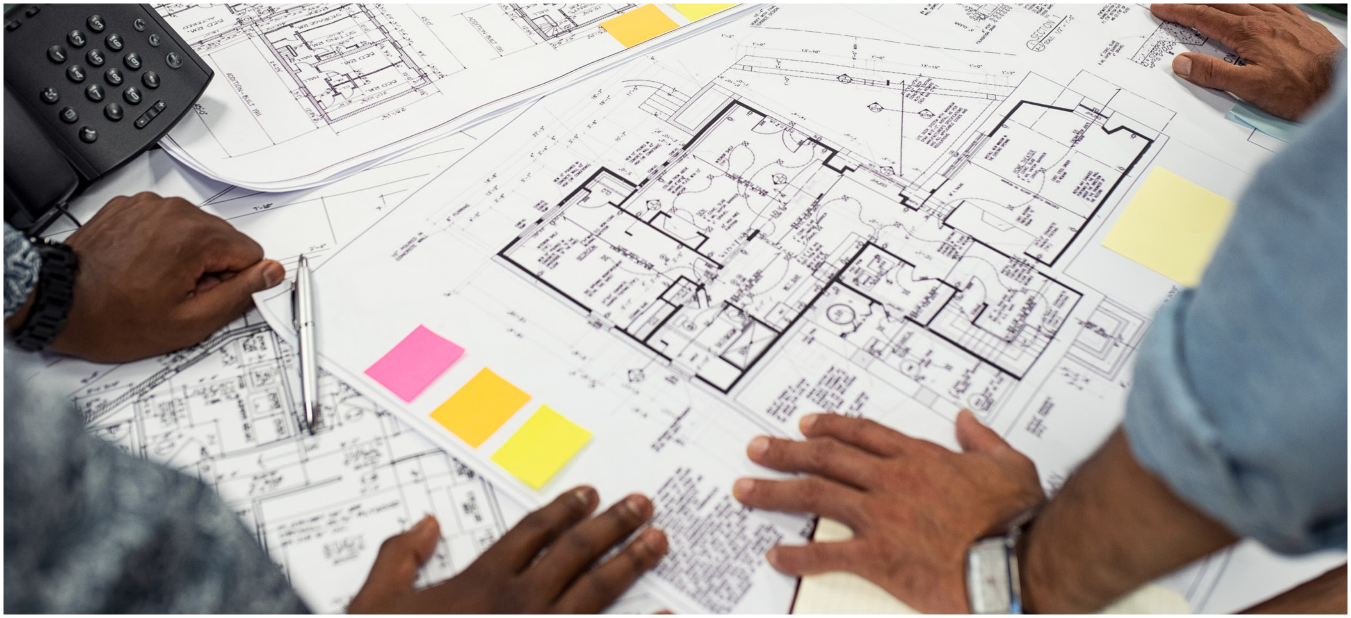
In the coming decade, we need to radically decarbonize the industry if we are to avoid the disastrous consequences of crossing the 1.5°C threshold. Sustainability cannot just be a buzzword anymore — every project must dramatically reduce carbon emissions, and an industry-wide transformation is required with concerted cross-sector collaboration. Architects, contractors, and owners have their own roles to play in dealing with this crisis, by reducing the impact of their activities and their supply chain. So, who can make the biggest impact?

Designing a Better World:

The Architect's Role

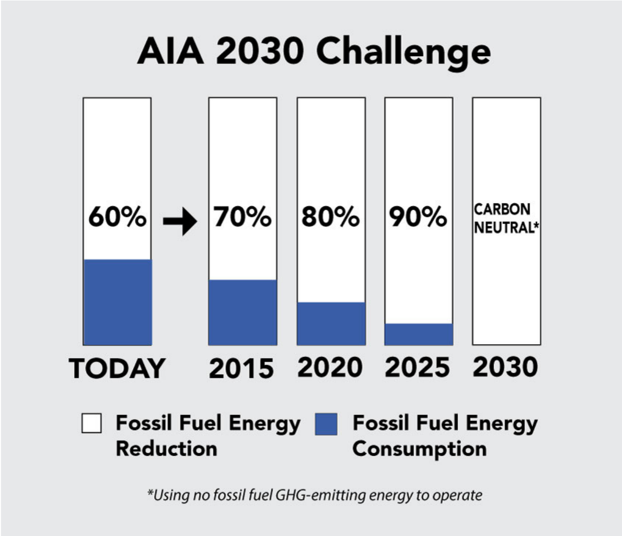
As professionals who give shape to the built environment and the activities occurring within it, architects have a vital role to play in reducing carbon emissions from the building industry. Decisions taken early on in the design process have the potential to reduce a building's reliance on fossil fuel-based energy. This includes the use of passive systems to reduce operational energy demand, eliminating the use of high-embodied energy materials, and making provisions for integrating renewable energy systems in a building.

With global architectural alliances laying out clear plans of action to spearhead decarbonization and a wide array of digital tools available to help design buildings for greater energy efficiency, architects can follow some simple steps to make sustainable design a priority and an essential part of their projects and processes.



1. JOIN THE AIA 2030 COMMITMENT

Joining the AIA 2030 Commitment is the easiest way to measure firm-wide progress on reducing energy use and carbon emissions. The commitment is an extension of the Architecture 2030 Challenge that aims to reduce fossil fuel-based operational energy consumption in new projects and renovations, with the goal of carbon-neutrality in 2030 (using no fossil fuel-based energy to operate). Commitment signatories also gain access to a host of online tools, educational resources, and mentorship opportunities to help achieve this goal. More than 500 firms have already joined the commitment, and in 2017 alone, the tracking of energy use in buildings helped architects reduce their carbon footprint by 17.8 million metric tons of CO_2 per year.



2. REDUCE ENERGY CONSUMPTION THROUGH DESIGN

The first and easiest step to reducing carbon emissions from buildings is to design them for greater energy efficiency. Passive strategies — low or no-tech solutions that improve building performance — can go a long way in reducing energy demand, mitigating the need for active systems. Moreover, they can help create pleasant internal environments with reduced life-cycle costs. Some simple passive strategies include:

i) Massing and orientation to minimize heat gain and passively reduce energy demand.

ii) Introducing external shading elements like overhangs, fins, louvers, and self-shading building forms

iii) Increasing daylight penetration with strategic window placement

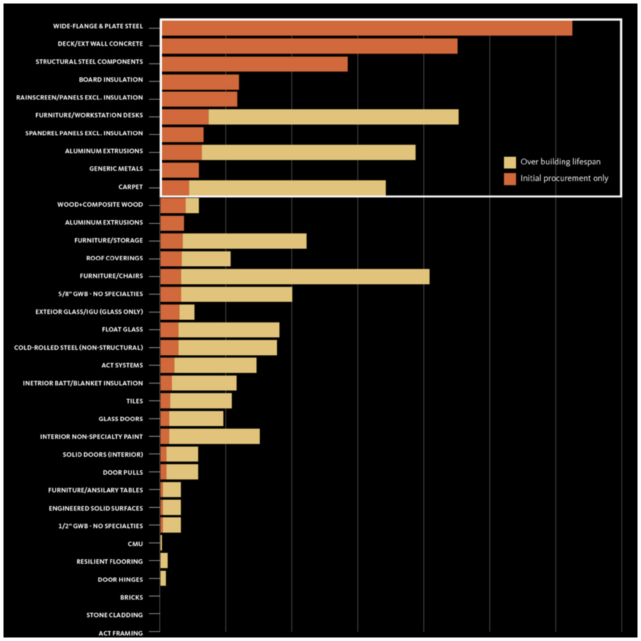
iv) Incorporating natural ventilation

Data-driven and analytical digital tools can help identify the right strategies for buildings at the concept stage of design itself, providing simple metrics and referential diagrams to drive decision-making and client discussions. The 2030 Palette, an online database of sustainable strategies introduced by Architecture 2030, is one such tool that can help designers choose the right systems according to their project's location, size, and typology.

3. SELECT CARBON-SMART MATERIALS

In the next thirty years, the world's building stock is expected to double to cater to a population of 10 billion people. Embodied carbon in these new buildings is predicted to be responsible for half of the entire carbon footprint between now and 2050. Reducing the use of high embodied energy materials is therefore crucial to fighting the climate crisis and meeting the targets set forth by various global organizations.

The simplest and most efficient way to eliminate emissions in building projects is to work with an existing building. To reduce embodied carbon in new constructions, it is necessary to minimize the use of high-embodied energy materials like cement, which accounts for nearly 8% of global emissions, and steel. The embodied energy associated with a material can be found through its global warming potential (GWP), a value that directly indicates a product's carbon impact. The higher the GWP intensity, the more harmful it is to the environment, and the more necessary it is to find suitable low-carbon alternatives. Materials like mass timber are emerging as sustainable alternatives to energy-intensive steel and concrete, providing similar performance characteristics with a much lower GWP value.



As professionals who specify materials for their buildings, architects have the power to reduce embodied carbon in their projects by making responsible material choices. Digital tools can help design efficient spaces that are sized correctly, along with optimizing systems to ensure that one does not specify more material than is needed for the job. Online databases like Architecture 2030's Carbon Smart Material Palette and the EC3 database are great resources to find suitable low-carbon material alternatives.

Image 1: GWP intensities of different materials

4. ADOPT RENEWABLE ENERGY SYSTEMS

To meet net-zero goals, a building must be independent of fossil fuels and produce enough clean energy to offset its annual consumption. Taking it a step further are net-zero carbon buildings, which produce enough renewable energy to meet operational demands and offset embodied carbon emissions. Both of them are reliant on renewable energy, which may be harvested on-site or off-site.

Renewable energy technologies like photovoltaics have become more advanced and cost-effective in the last few years, leading to their widespread adoption in built infrastructure. However, photovoltaics only need to take second priority to low-cost and no-cost solutions, like low-carbon energy solutions, that produce or consume energy with near net-zero greenhouse gas emissions, and cost-neutral green energy contracts that provide renewable energy at prices that are equal to or lower than those of conventional energy sources. However, it is important to remember that renewable systems must be considered only after passive systems have been used exhaustively to reduce the building's operational energy demand.

Climate-Conscious Construction:

The Contractors’ Role

Contractors play a vital role in the building industry — they translate the drawings and ideas of architects into functional, well-serviced buildings. In doing so, they have the power to influence decisions about the specific materials used in the building, the construction processes employed, and the carbon impact of both of these in the long run.

Being a central entity that brings various disciplines under one roof, contractors are responsible for informing the decisions of subcontractors and for providing embodied carbon guidelines in trade selection. Additionally, they can help drive owner and designer decision-making towards reduced carbon emissions, by acting as a source of quality control. However, their area of impact extends beyond these to several other factors, which are discussed below.

1. MATERIAL CHOICES TO REDUCE ENERGY DEMAND

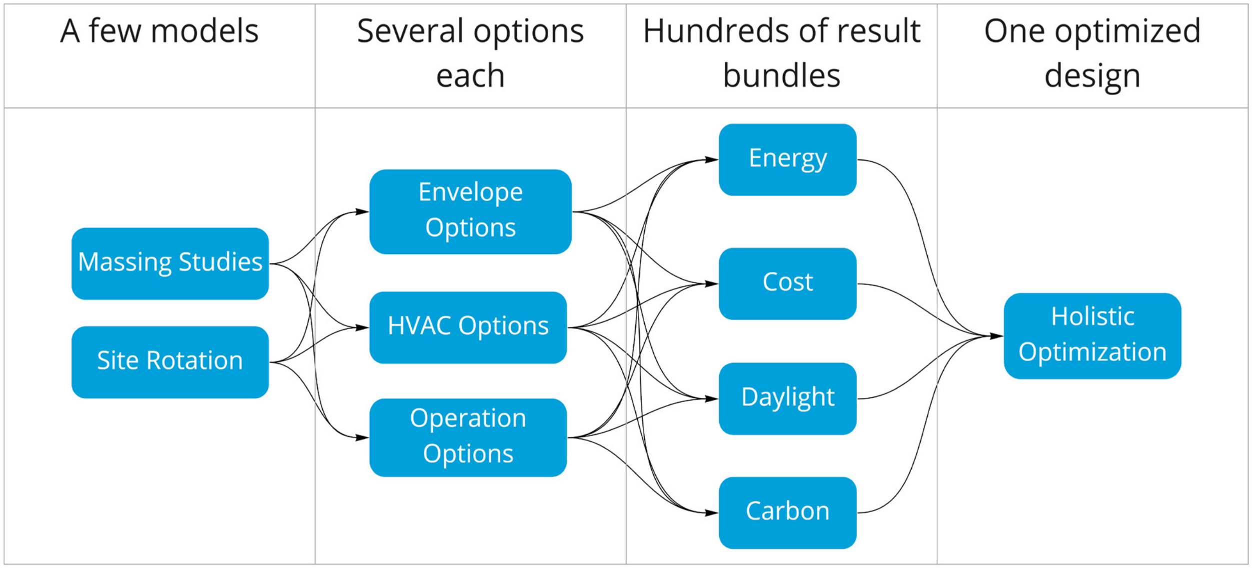
While generic material specifications are provided by designers and architects, the identification and procurement of specific products are done by contractors, which provides an opportunity to enforce trade-specific procurement requirements for low or reduced carbon materials. Local materials can be sourced to reduce transportation emissions, and policies can be enforced to ensure materials are recycled and reused wherever possible. Top Suppliers and Manufacturers even disclose embodied carbon data for the materials they sell through environmental product declarations, which makes it easy to compare and shortlist low-carbon building materials.

2. CLEAN CONSTRUCTION THROUGH RENEWABLES AND PREFABRICATION

Conventional construction processes are highly toxic in nature, with oil-based equipment releasing metric tonnes of fumes everyday reduces air quality in and around construction sites all over the globe. Sourcing plants and equipment that operate on carbon-neutral biofuels or renewable energy can reduce carbon emissions. An on-site renewable energy system can cater to energy demands during construction, transitioning later to the operational phases of the project.

Prefabrication is increasingly being preferred by construction firms, with adoption of such techniques growing at a yearly rate of 6 percent. Manufacturing building parts in a controlled environment and then transporting them to a site reduces carbon emissions, polluting construction activity, and construction times. Prefabrication also minimizes external risks like weather changes, providing greater accuracy. Because elements are pre-made and only assembled on site, they can easily be disassembled and reused, reducing energy demand in new projects by up to 82 percent.

3. INTEGRATING DIGITAL WORKFLOWS AND BUILDING INFORMATION MODELING



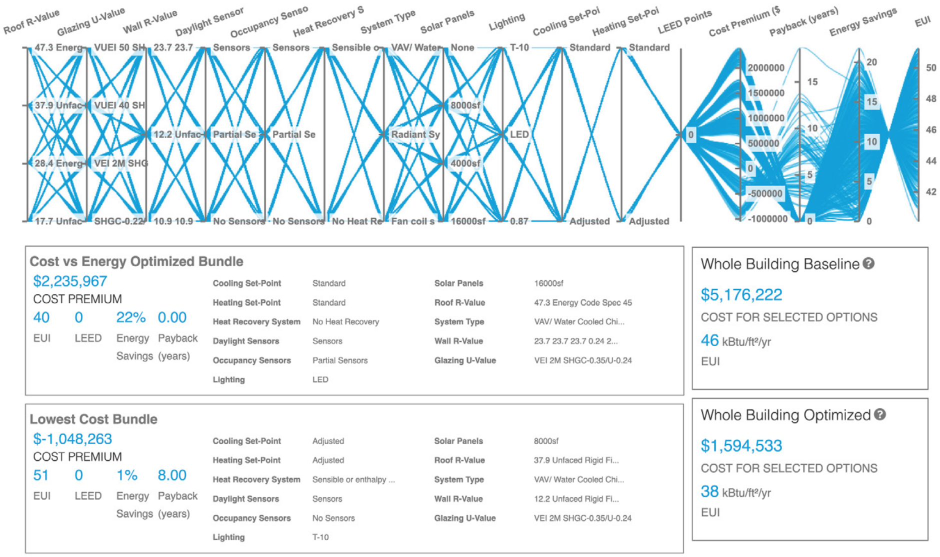
The construction industry is notorious for its slow pace of digitization and paper-based workflows, but the pandemic and a global shift to remote working is spurring a turn towards digitization for greater efficiency and innovation. Digital management systems reduce time spent on administrative tasks and documentation, enabling real-time collaboration between project teams and minimizing project delays.

Building information modeling (BIM) is a highly useful tool to prevent clashes between disciplines and avoid costly site errors and material waste. BIM systems can assist with everything from quantity estimation to project scheduling and cost calculations, interconnecting various project aspects and allowing real-time changes in one aspect to reflect in other related aspects. In tandem with digital plugins, BIM software can help streamline construction procedures to reduce carbon emissions. In the closeout process, its utilization can inform downstream operational decisions like equipment servicing and utility locations for better asset maintenance.

Making Sustainability a Priority:

The Owners' Role

Reducing carbon emissions in buildings has changed from an optional perk to a must-have in buildings because of changing governmental regulations and customer aspirations, leading to the real estate sector and building owners adopting new practices that respond to carbon emissions. A younger generation of tenants are looking for eco-conscious properties to live, work, and play in. Real estate investors are looking to invest in assets with an environmental, social, and governance (ESG) mandate, especially those properties that are geared to achieve World Green Building Council (WGBC) targets and UN Sustainable Development Goals (SDGs). Similarly, sustainability is a growing priority for commercial buildings, as employees look to work in places that reflect the values they believe in, making it an incentive attracting the best talent in the market. As carbon-consciousness becomes increasingly important for owners today, there are some simple steps that they can take in addressing and mitigating climate change.



1. EDUCATION ON VALUE ADDITIONS FROM SUSTAINABILITY

The operational costs of sustainable buildings are proven to be lower than their non-green counterparts, and most value-add investors are looking for means to decrease their electricity and water consumption across portfolios to bring down cost. To push sustainability, industry-wide education on cost saving from sustainability and green building conversions are imperative.

2. ADAPTIVE REUSE OF EXISTING PROPERTIES

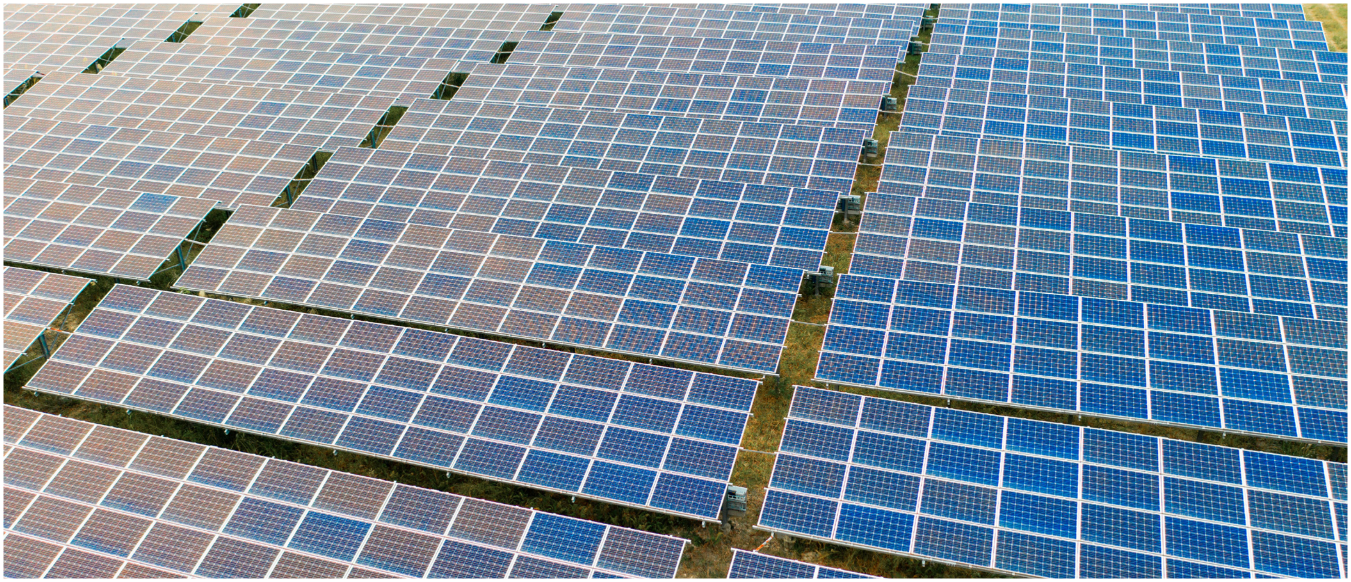
"The greenest building is one that's already built," says Carl Elefante, FAIA, 2018 AIA President. Recycling buildings allow owners to save up to 40% of carbon emissions and up to 90% of a building's materials, preventing our landfills from filling up with demolition debris. It is also more cost-effective than demolition and new construction, and property owners can often obtain available municipal incentives for converting and repositioning properties. These buildings can be fitted with reengineered envelopes or energy-efficient services (deep energy retrofits) for improved energy performance and resilience to climate hazards.

3. INVESTING IN SMART TECHNOLOGY TO REDUCE OPERATIONAL ENERGY CONSUMPTION

Smart technology has been utilized for sensor-based lighting and thermostat controls for a long time now, aiding smart energy consumption in residential and commercial properties and decreased costs because of the same. Its influence has been extended to monitor utility metering and leak detection, allowing for easy energy monitoring property-wide. Other elements of smart technology assist in enabling the long-term operational efficiency of assets, reducing maintenance and management costs along with energy consumption. performance and resilience to climate hazards.

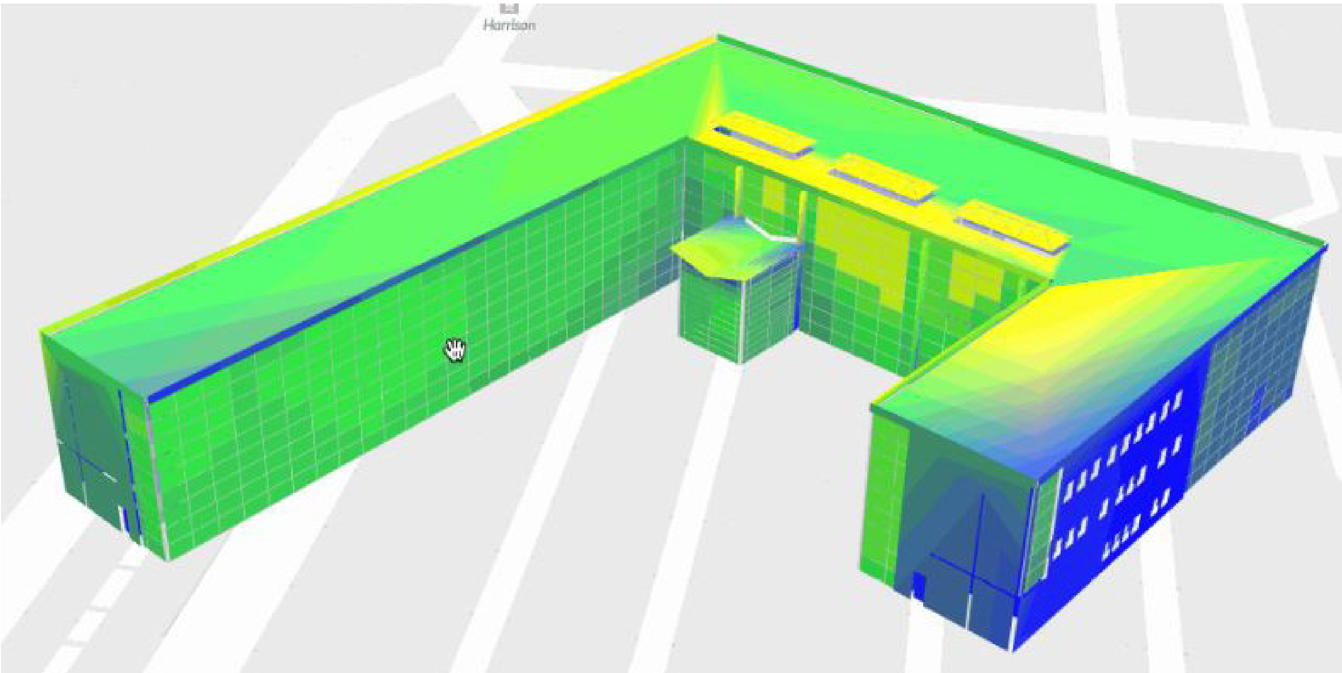
4. INTEGRATING SOLAR AND RAINWATER HARVESTING SYSTEMS PROJECT-WIDE

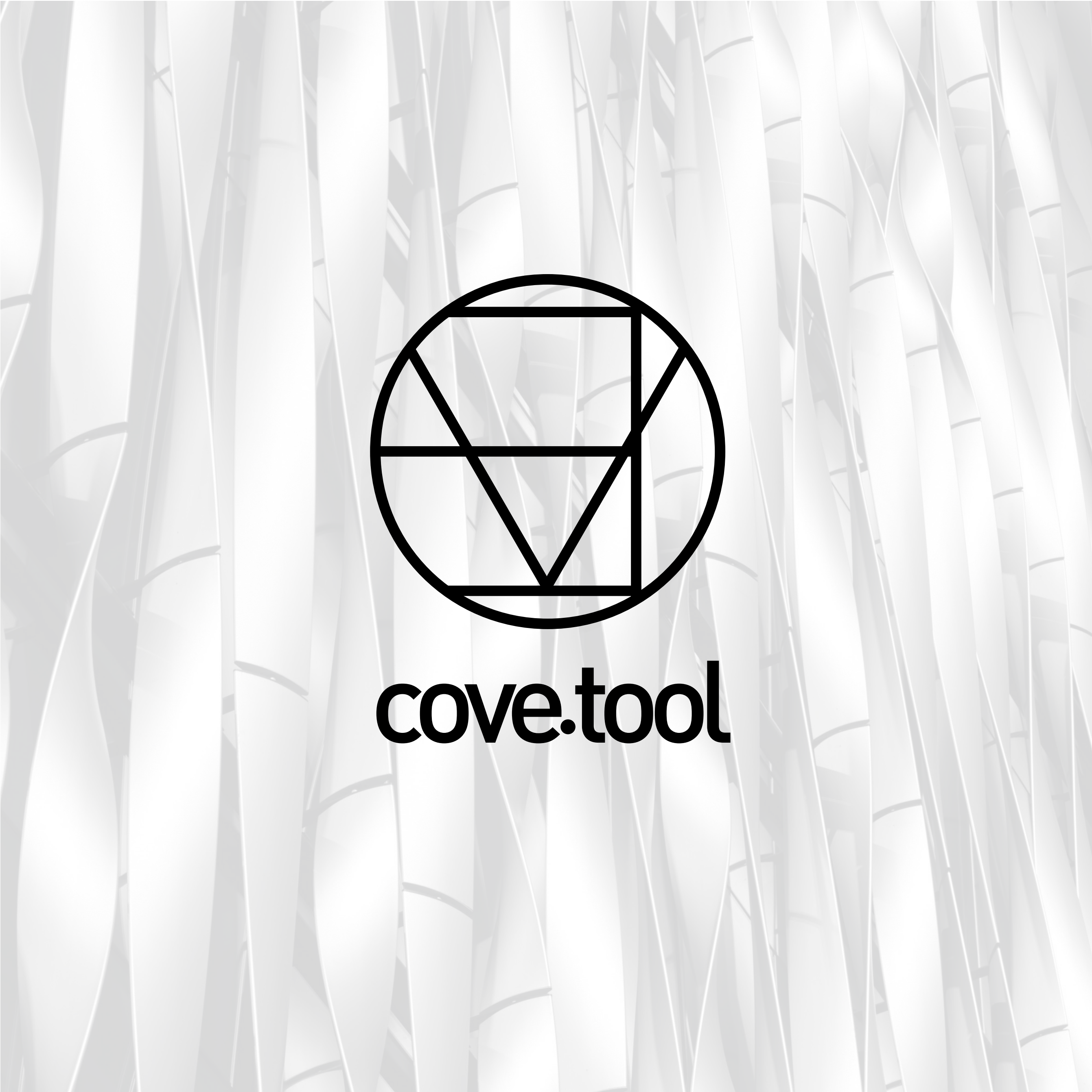
Solar energy has become increasingly cost-effective in recent years, especially when implemented on a large scale. Along with rainwater harvesting systems, it is part of the priorities of climate-conscious consumers, and has an array of municipal, state, and federal incentives supporting its use. Many states have mandated the inclusion of solar systems in new construction, and others are expected to follow suit in the future.



Conclusion

It is clear that reducing carbon emissions in the building industry requires effort from all the three stakeholders involved: owners to drive demand, architects to design for the demand, and contractors to execute design in a climate-conscious manner. Data-driven workflows and analytical tools are making it easier than ever to take sustainability concerns into account in buildings, with powerful digital tools that provide in-depth analyses of a project for its entire lifecycle, and easy-to-use tools that provide quick metrics and graphical representations of information to drive client discussions and design decision-making. External stakeholders like global organizations, advocacy groups, and governments can push for greater efforts and collaboration between owners, contractors, and architects to create a sustainable and carbon-conscious building industry in the future.

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