



## Amplifying real estate sustainability impact through generative design

Real estate developers are facing unprecedented pressure from stakeholders for moving the needle on sustainable development as buildings contribute to 42% of emissions, globally.<sup>1</sup> Investors are moving swiftly to decarbonize their portfolios. Tenants are demanding healthier and more sustainable spaces. And regulators are tightening the codes on buildings and emissions.

Approximately 64% of the buildings' emissions are from building operations and 36% are from embodied carbon.<sup>2</sup> By 2035, embodied carbon emissions could likely be over half of the emissions from the built environment.<sup>3</sup> Developers need to improve operational efficiency, optimize material usage, and minimize rework and waste. They also need to improve planning accuracy and be nimble to adapt with future changes in development plans, regulatory requirements, and environmental

standards. Across the building lifecycle, design is a critical stage for enabling a more sustainable future and holds the greatest potential for emissions reduction and overall project savings.<sup>4</sup>

### Urban planning and development faces multiple challenges

Modern urban development involves balancing a myriad of factors such as density, infrastructure, sustainability, and economic viability. Traditionally, the feasibility and design process has been manual and time consuming, especially with real estate developers and government authorities pursuing different goals and objectives.

Developers need to consider the quality of life for residents, including access to daylight, open spaces, and amenities. Developers, architects, and planners also need to collaborate

and design urban neighborhoods that are not only efficient but also sustainable and equitable.

### Generative design tools can help developers to amplify sustainability impact while achieving financial success

Today's generative design tools can integrate financial and utility models into the design process. This includes estimating energy use, waste management, and the potential for rooftop solar installations, ensuring that projects meet sustainability goals throughout their development. Generative design tools, augmented with advanced geospatial capabilities, offer a cutting-edge approach to key real estate development areas such as pre-emptive scenario planning, climate risk assessment, forecasting and innovation.

**1. Pre-emptive scenario planning:**

Generative design tools can revolutionize pre-emptive scenario planning by enabling developers to visualize and evaluate multiple design scenarios efficiently. This allows developers to anticipate potential challenges and opportunities, making informed decisions that optimize for long-term success by balancing economic goals with environmental sustainability and quality-of-life improvements. For example, in a mixed-use development project, developers can simulate various configurations to pre-emptively address issues such as overcrowding, insufficient natural light, and inadequate recreational areas, ultimately creating more livable and sustainable urban environments.

**2. Climate risk assessment:**

Climate change poses significant risks to real estate investments, from rising sea levels to increased frequency of extreme weather events. Developers can now analyze factors such as flood zones, heat islands, and wind patterns to understand the potential impacts of climate change on their projects. This proactive approach allows them to incorporate resilient design

features, such as elevated structures in flood-prone areas, green roofs to mitigate heat island effects and robust building materials to withstand severe weather. Additionally, these tools can provide ongoing estimates of energy use and sustainability metrics, ensuring that projects align with both local regulations and global environmental standards.

**3. Forecasting:**

Accurate forecasting is crucial for the long-term viability of commercial real estate projects. Integrated financial and utility models can enable precise forecasting of costs and resource needs. By simulating various design scenarios, developers can predict financial outcomes, including construction costs, operational expenses and potential revenue streams. For instance, a developer planning a new office complex can forecast the financial impact of different design choices, such as the inclusion of energy-efficient systems or renewable energy sources. These forecasts help developers create economically viable projects that also meet sustainability goals, reducing the risk of unforeseen expenses and ensuring a strong return on investment.

**4. Innovation in design and development:**

By leveraging machine learning and geospatial analysis, today's generative design tools encourage creative and innovative design solutions that balance aesthetic appeal with functional efficiency. Developers can evaluate a wide range of design options quickly, empowering them to experiment with unconventional ideas and optimize for both performance and sustainability.

**The time to act is NOW!**

As the real estate industry continues to navigate the complexities of the 21<sup>st</sup> century, generative design tools are indispensable for shaping a sustainable and prosperous future. By enabling pre-emptive scenario planning, comprehensive climate risk assessment, accurate forecasting, and fostering innovation, developers can create resilient, sustainable and economically viable urban developments. With time running out to meet energy-efficiency, decarbonization, and greenhouse gas emissions-reduction goals, real estate companies must act now to implement net-zero standards by leveraging generative design.

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## End notes:

1. [“Why the built environment?”](#). Architecture 2030. 2023.
2. [“Why the built environment?”](#). Architecture 2030. 2023.
3. [“Generative design tool for optimised operational and embodied carbon”](#). UK Green Building Council. March 2023.
4. [“The future of sustainable real estate is smart”](#). Deloitte Canada. December 2022.

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