Designing in an Uncertain Climate

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July 2023 was the hottest month on record. Floods, wildfires, and other natural disasters are becoming increasingly common and fierce. Climate change and its consequences are having a profound impact on people, buildings, infrastructure, and natural systems. As these challenges have grown, so has the architecture and engineering industry's commitment to developing strategies to mitigate and overcome them.

While architects and engineers must increasingly consider the changing climate in building designs, the current landscape's rapid pace of change offers new obstacles. Previously reliable weather data for variables like temperature, rainfall, wind pressure, and snow loads are becoming obsolete. Since 1980, the 341 weather and climate natural disasters in the United States have cost more than $2.47 trillion. Weather and climate disasters exceeded $165 billion in damage costs in 2022 alone, and displaced more than 3 million people.

Planners and designers have a unique opportunity to protect public interest by designing structures that are resilient against climate change and can contribute to a regenerative future. Achieving this can be daunting and overwhelming. At HDR, we take a five-step approach to help clients achieve smart, resilient design:

- Identify climate risk
- Perform risk and vulnerability assessment
- Sort priorities
- Develop resiliency strategies
- Implement strategies for a transformative future

By grounding these activities in data, we consider each client's unique needs and provide solutions for a myriad of projects and climate scenarios.

Putting Projected Climate Data to Work

IDENTIFY CLIMATE RISK

The process begins by conducting an analysis to identify the project's exposure to identified climate hazards. The analysis utilizes historical climate trends to set the baseline for understanding projected future climate trends and correlating the project's vulnerabilities to probable climate scenarios. This analysis can be done at any scale, allowing for consideration of hyper-local weather trends, which are becoming more pronounced.

PERFORM RISK AND VULNERABILITY ASSESSMENT

Using this data from the climate hazard analysis, we can perform a risk and vulnerability assessment to identify and quantify risk to the project related to climate change. The assessment considers how sensitive each element of a project is to climate change, the degree to which each aspect can be modified to adapt to climate risks, the probability of a climate event occurring, and the severity of the consequences. This data-driven exercise is informed by stakeholder and institutional knowledge along with firsthand experience. When necessary, 3D modeling can assist with visualizations of climate phenomena like storm surges and rising sea levels to help all stakeholders understand their future impact.

SORT PRIORITIES

Reviewing the risk and vulnerability assessment alongside the client's mission, we can prioritize resiliency efforts and preserve the most critical aspects of each project. Prioritization takes into consideration technical feasibility, projected impact, regulatory context, cost-benefit assessment, and stakeholder acceptance. It is an iterative process working with the project team and the client group.

DEVELOP RESILIENCY STRATEGIES

With priorities in order, we can take an informed approach to developing resiliency strategies unique to the project, while factoring possible interventions at the regional scale and engaging key partners. These strategies are informed by tapping into best practices developed from our extensive global portfolio of resilient projects. Our experts have developed hurricane resilient hospitals, restored coastal living shorelines, and engineered climate-adapted transit systems to name a few examples. We look for strategies to help our client achieve an integrated climate action plan that maximizes valuable resources. We can look at aspects of a project with higher flooding risk, extreme heat exposure, and other risks. We then use that information to mitigate flood risk, address extreme heat, or mitigate another resilience concern. This is accomplished through smart design solutions such as maximizing planting opportunities, increasing tree cover, raising buildings, adding flood protections, or reallocating program to upper floors and allow the building to recover after a storm.

A Long-Term Vision with A Scalable Approach

All of these steps are part of the larger mission to deliver a transformative future for clients who are grappling with uncertainty. The risk and vulnerability assessment and resulting resiliency strategies provide a roadmap toward achieving a sustainable, resilient project. Our cross-disciplinary team works to consider resiliency strategies that encompass environmental, economic and societal issues to develop a unique plan for each client's budget and goals. These strategies can be further integrated into the project in many different forms, including a Climate Action Plan or new design guidelines.

To be most effective and cost efficient, this process should be integrated from the beginning of the project to ensure that findings can be implemented into the design. This process can be scaled for each budget and project scenario to best address the client needs and priorities. Whether a small renovation of an existing building or a large-scale new development, fighting climate change and preparing the built environment for a resilient future should be integrated in the design process to best support clients through future climate impacts.

About the Author

Nathalie Beauvais, AIA, is the climate resiliency lead for architecture and planning at HDR. Nathalie brings design and stakeholder engagement to the forefront of her projects, working for the development of resilient buildings, grey and green infrastructures, nature-based solutions, and innovation for integrated design approaches. Her work also centers on the built and social environments and economic impact assessments.

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