



HGA

RESILIENCE PLANNING & PRACTICE



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ABOUT HGA

Founded in 1953, HGA is a national, interdisciplinary design firm rooted in architecture, engineering, and planning. We believe that enduring, impactful design results from deep insight into the people and passions within each unique environment.

We approach every project equipped with the knowledge gained from 70 years of experience, and focused on designing resilient communities for the next 70 years and beyond.

With 13 offices located across the U.S., we offer specialized design services for clients in the arts, community, corporate, education, healthcare, government, science and technology, and energy markets.



ARCHITECTURE



COMMISSIONING



DIGITAL PRACTICE



ENGINEERING



TECHNOLOGY



INTERIOR DESIGN



LANDSCAPE
ARCHITECTURE



LIGHTING DESIGN



PLANNING



SUSTAINABILITY &
RESILIENCE

► RESILIENCE AND DESIGN

The concept of **resilience** has always been part of strong design planning. But the external risks that have the potential to disrupt have grown exponentially in recent years: public health emergencies, climate change impacts, natural disasters, infrastructure failures, security risks, social stressors, and economic disruptions.

As our world becomes more complex, so too must our solutions for weathering chaotic times. It has become urgent to anticipate and plan for risk to protect the well-being of all communities and their physical environments.



1,000 +

Critical Facilities

1,200+

Safety & Security Projects

12

Climate Resilient Planning Projects

11

Energy Microgrid Projects

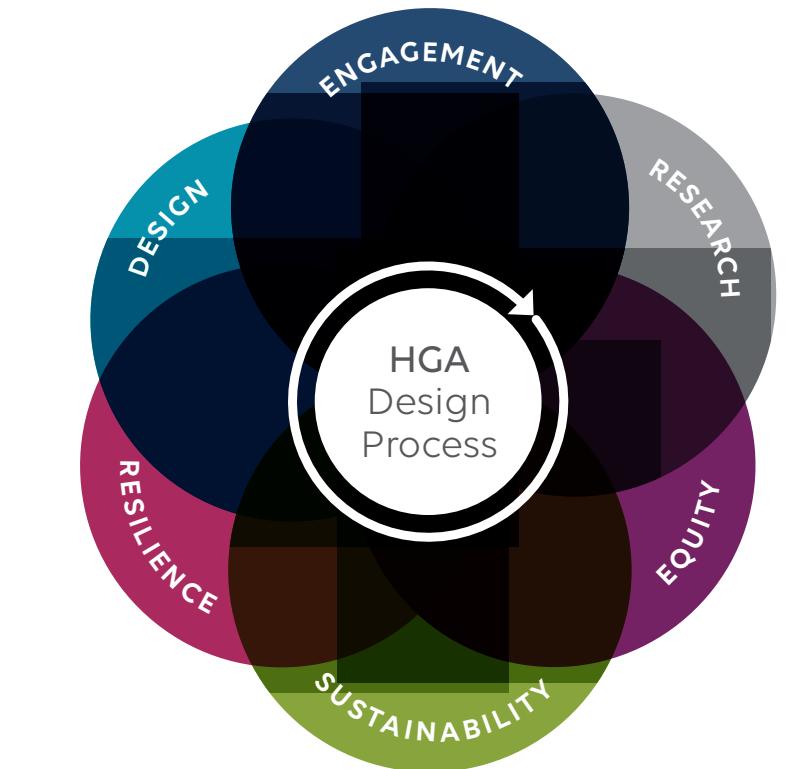
RESILIENCE

The capacity of individuals, communities, institutions, businesses, and systems to

SURVIVE, ADAPT, AND GROW

no matter what kinds of chronic stresses and acute shocks they experience.

- Rockefeller Foundation



HOLISTIC APPROACH

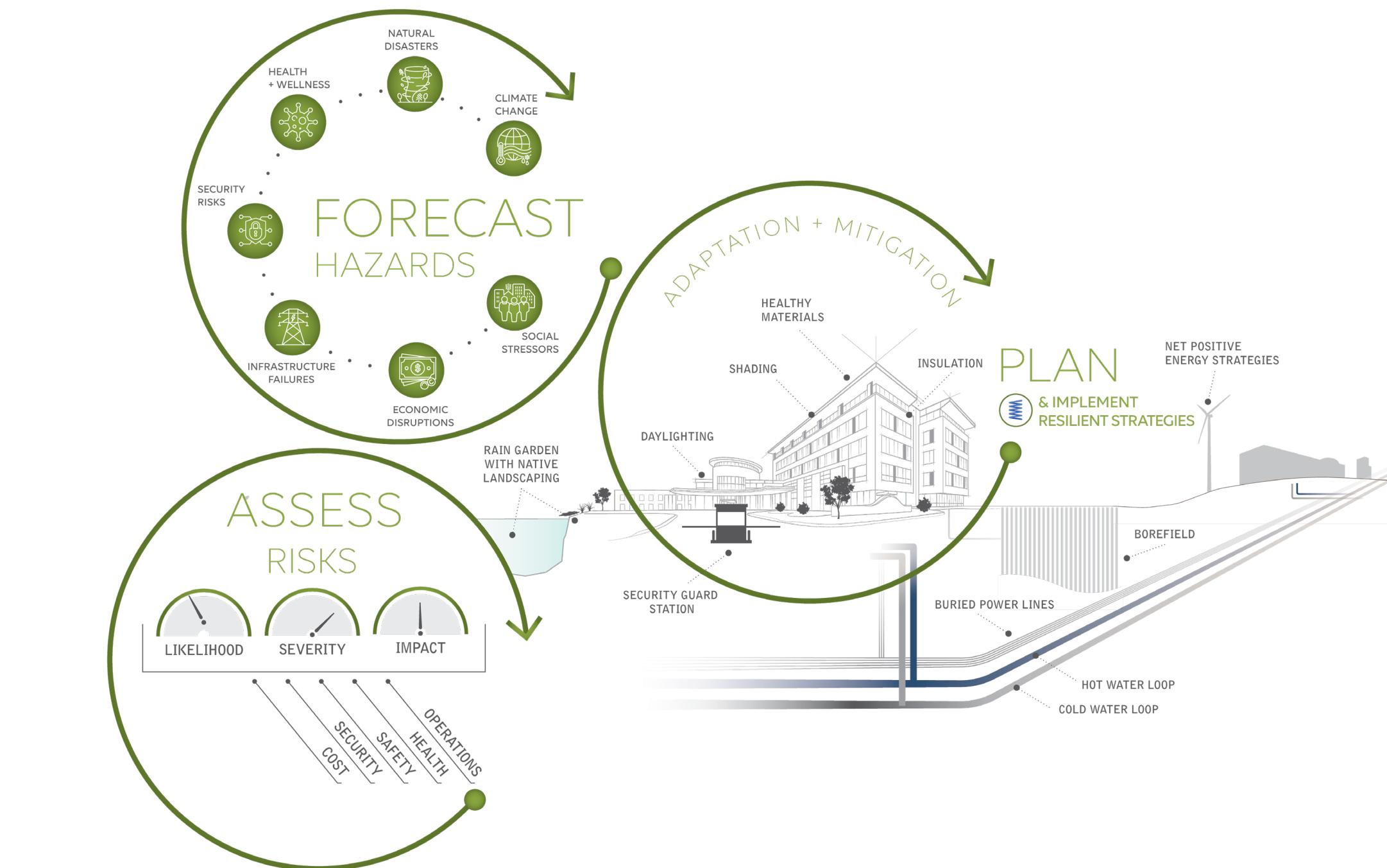
HGA's approach acknowledges the holistic and interconnected nature of design. By leveraging not only our expertise, but also thoughtful research and stakeholder engagement, we are able to create meaningful projects that make a positive impact for people and places.



► PLANNING FOR RESILIENCE

Planning for resilience is a multifaceted process that considers building type, business operations, and geographic location. Each industry requires a targeted approach, yet each benefits from a strategic process that forecasts all potential hazards, assesses risk, and plans for resilient responses.

ALL HAZARDS APPROACH:



► SERVICES

RESILIENCE PLANNING

HGA's resilience practice group performs comprehensive resilience plans for clients across industries. The planning process includes forecasting potential hazards, assessing the likelihood and impact of each, and planning responsive mitigation strategies. By introducing a framework for resilience, we deliver solutions that better prepare organizations and communities for the unknowns that lie ahead. Resilience planning often includes engaging with local stakeholders to identify how they might play a role in building resilience—ensuring that the built environment enhances social cohesion with safe gathering areas, community spaces, and inclusive, accessible design.



City of St. Louis Park, Minnesota | Westwood Hills Nature Center

SCALABLE RESILIENCE PLANNING

Our resilience planning is scalable to the project, from a single facility to a campus to a city, region, or statewide project. We work with clients to not only create comprehensive resilience plans but also facilitate coordination between single entities and larger organizations (ex: a hospital with a utility or municipality and vice versa).



STATE
CALIFORNIA

REGION
BAY AREA

COUNTY
SAN FRANCISCO

MUNICIPALITY

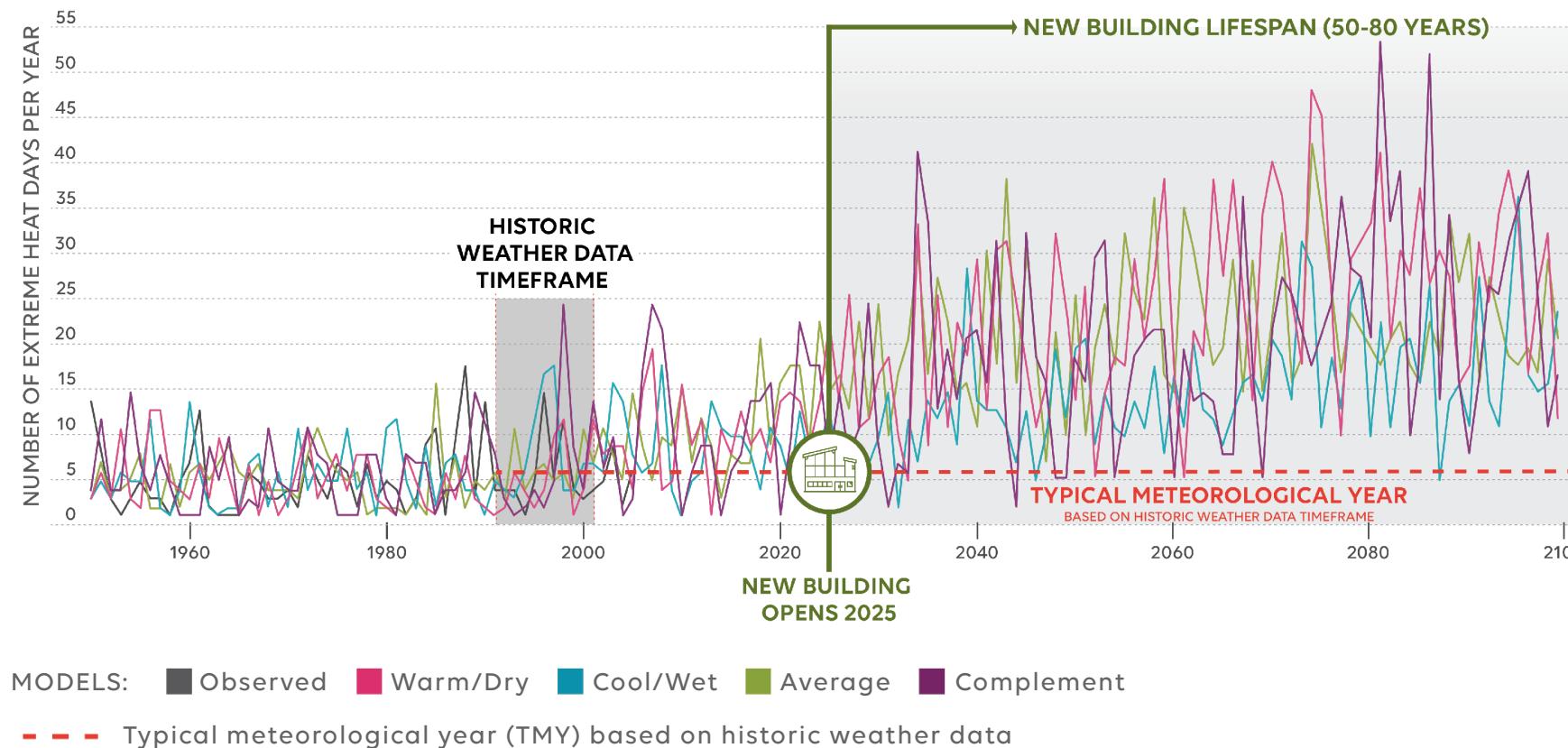
DISTRICT

SITE PARCEL

CLIMATE CHANGE ADAPTATION

Climate resilience focuses on adapting to current conditions as well as preparing for future impacts like rising temperatures, extreme precipitation, and drought. HGA has been at the forefront of working with climate scientists to understand and use climate projection data to project plausible climate futures over the lifespan of the building, landscape, and systems, and respond with resilient and sustainable strategies.

RISKS OF USING HISTORIC WEATHER DATA FOR BUILDING DESIGN

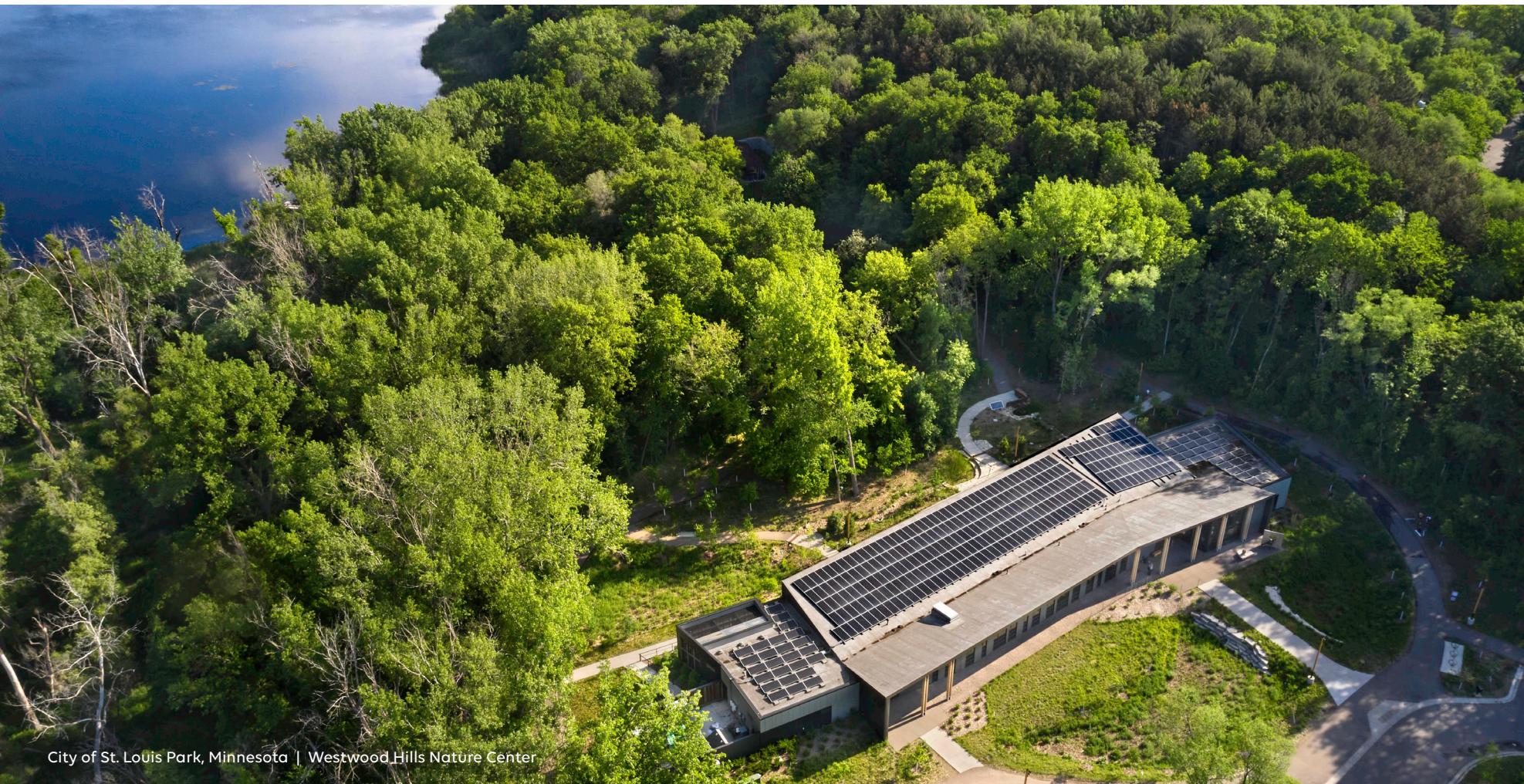


Model location: Sacramento, CA with a daily maximum temperature above 103.9 °F and a medium emissions (RCP 4.5) scenario.
Source: Cal-Adapt. Data: LOCA Downscaled CMIP5 Climate Projections (Scripps Institution of Oceanography), Gridded Observed Meteorological Data (University of Colorado Boulder), LOCA Derived Products (Geospatial Innovation Facility).

► SERVICES

INTEGRATING CLIMATE RESILIENCE WITH SUSTAINABILITY

HGA's deep expertise in sustainable planning and design provides a foundation for minimizing the carbon impact of buildings and infrastructure. Our climate resilience work builds on this foundation to prepare for and respond to the specific challenges posed by a changing climate. By integrating both approaches, we can create more robust and responsible design solutions that contribute to a sustainable and resilient future.

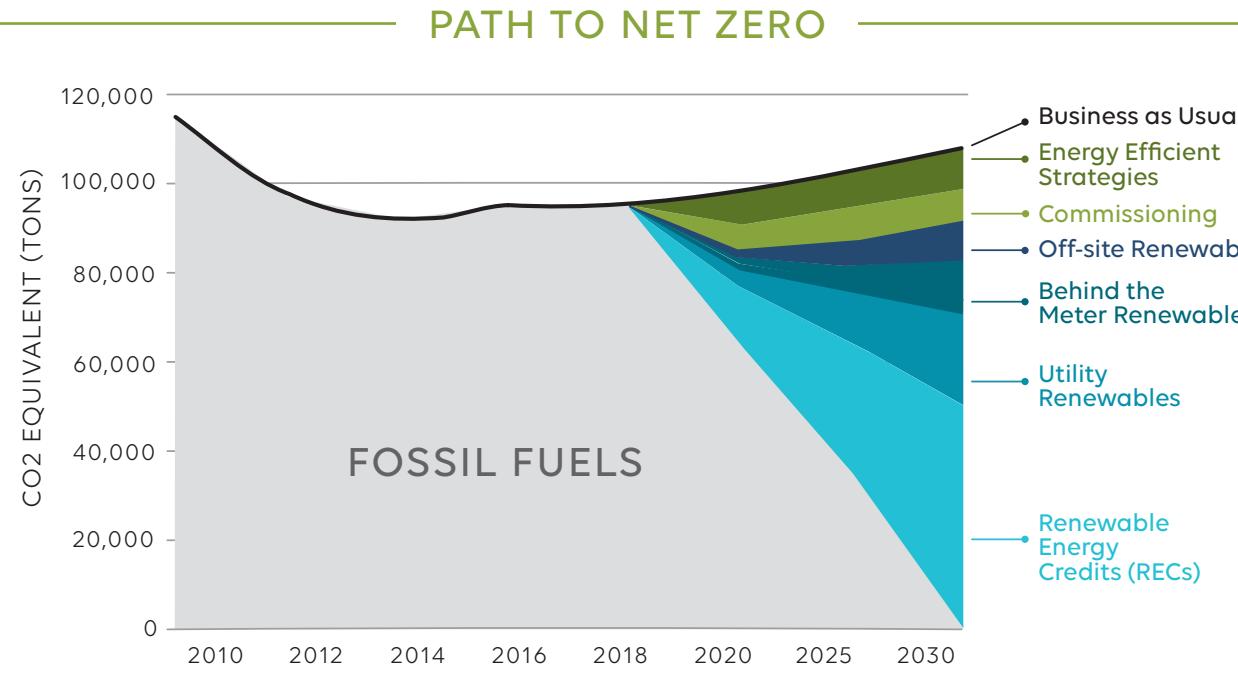


CLIMATE RESILIENCE SERVICES

- Climate risk assessment
- Climate resilience / adaptation planning
- Infrastructure resilience
- Stress-testing design against climate projections
- Energy modeling using climate projection data
- Using climate projection data for site / system analysis, and all Sustainable Design Services
- Scenario planning
- Climate adaptive design solutions

SUSTAINABLE DESIGN SERVICES

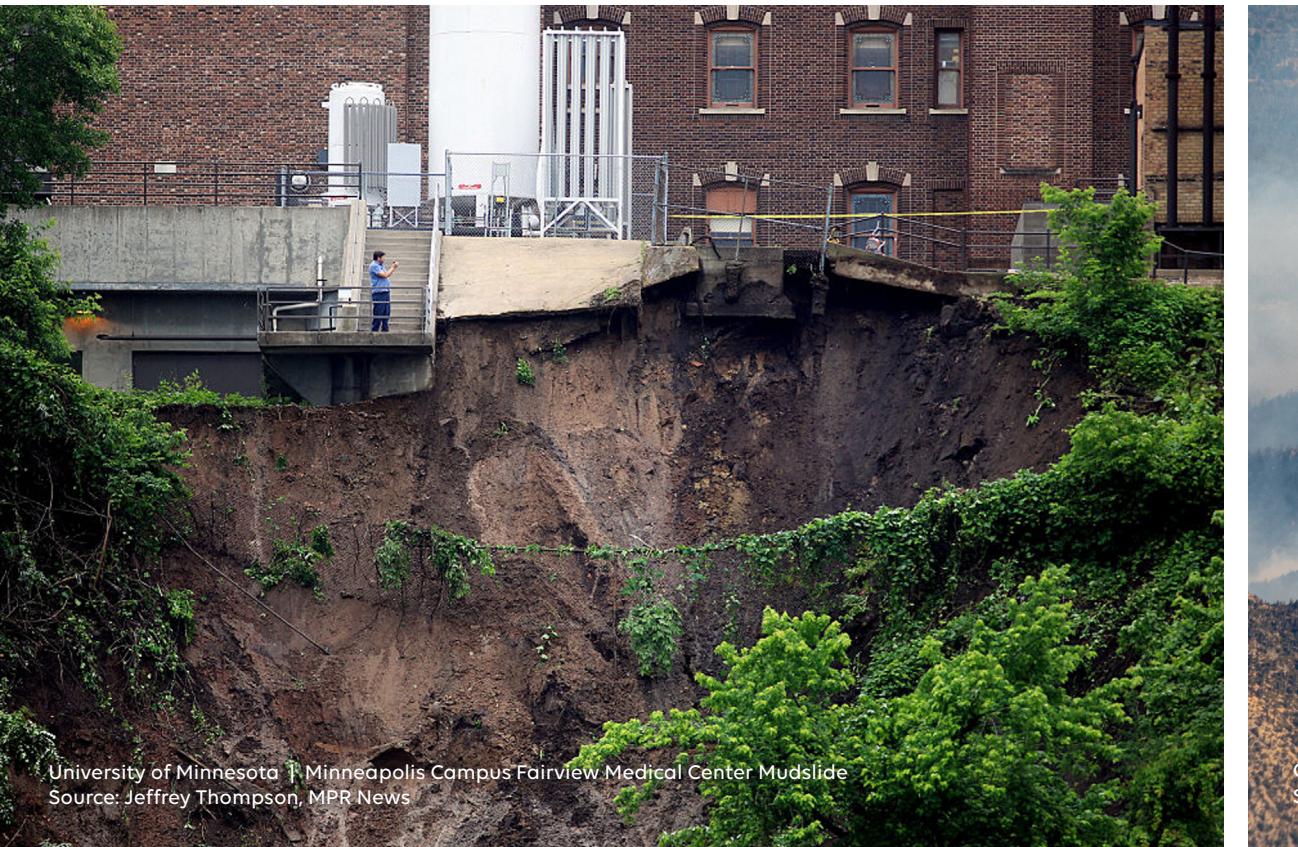
- Sustainability planning
- Carbon neutral planning
- Net Zero Energy design
- Third-party certifications (ex: LEED, WELL)
- Passive strategies
- Energy modeling
- Envelope and glazing thermal modeling
- Daylight analysis
- Life cycle assessment



► SERVICES

NATURAL DISASTER MITIGATION

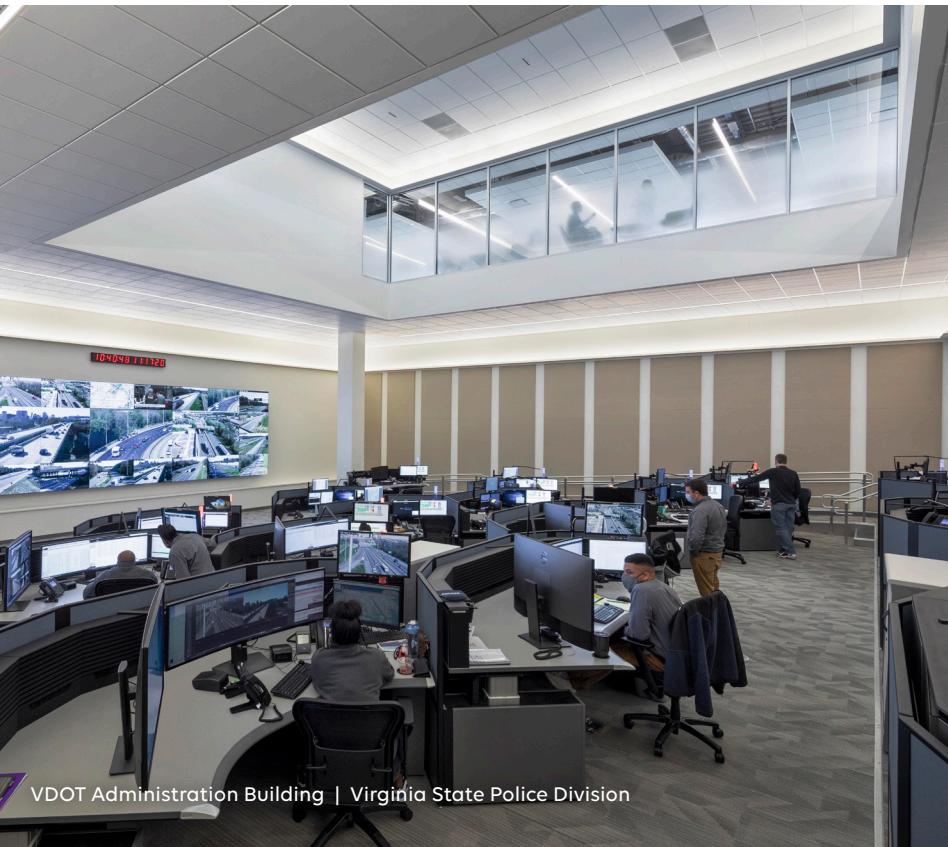
Our resilience practice group includes experts in hazard mitigation due to natural disasters, with structural engineers experienced in regions prone to hazardous seismic activity, as well as engineers with expertise in fire alarm, fire suppression systems, and life safety code compliance.



ENERGY RESILIENCE

HGA's building performance engineers have deep expertise in developing resilient infrastructure systems to help maintain essential services during disruptions and aid in a faster recovery, including:

- Smart grids, microgrids, and distributed energy
- Redundant and backup systems for critical infrastructure such as power supply, water supply, and communication networks
- Smart technologies that integrate and monitor building systems, enabling real-time data collection, control and safety



► SERVICES

SAFETY & SECURITY

HGA's resilience planning process includes assessing threats to safety and security and determining potential impact based on the vulnerability of the facility or location. This creates a baseline for developing mitigation strategies to protect property and building occupants.

STRATEGIES CAN INCLUDE:

- Safe, secure, code-compliant design informed by security and fire-protection engineering specialists
- Backup power systems
- Self-healing networks
- Data and system backup plans
- Multi-layered access controls (physical & digital)
- Zoning and compartmentalization to limit the spread of hazards / breaches
- Fire and intrusion detection systems
- Safety and security training
- Collaboration between departments and stakeholders to develop coordinated responses



HEALTH & WELLNESS

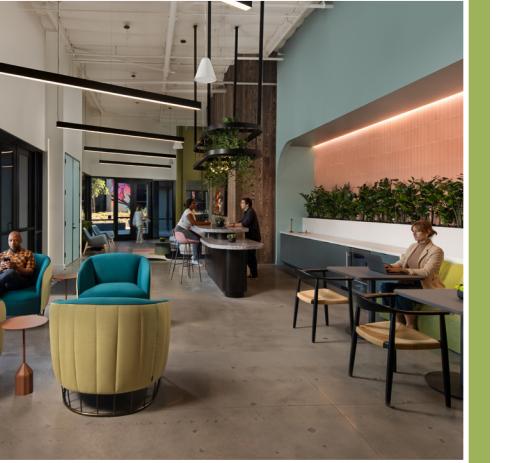
HGA is setting industry standards designing for healthy indoor air quality and infection control in hospitals, the most critical of facilities. Equipped with that level of expertise, we can create solutions for multiple building types, including essential government buildings, schools, museums, and workplaces. From designing controlled isolation areas to designing state-of-the-art HVAC systems, we build tailored strategies with each client to ensure the health and wellness of occupants.

As a symbol of our own commitment to the health and safety of staff and visitors, nine HGA offices have achieved WELL Health-Safety Ratings by the International WELL Building Institute, and we anticipate our remaining four offices to achieve the seal in 2024. The rating assesses Cleaning / Sanitization, Emergency Preparedness, Health Service, Air and Water Quality, Stakeholder Engagement / Communication, and Innovation.

► CUSTOMIZED RESILIENCE SERVICES

With a purpose-driven approach to planning and design, we help clients protect what matters in the face of complex challenges. Our interdisciplinary team of specialists understands the unique challenges faced by the markets we serve and provides customized services in response.

REAL ESTATE PORTFOLIOS



Portfolio managers need to serve the needs and meet the expectations of their customers, employees, and investors. We partner with these clients to help them not only respond to major disruptions but also proactively advance and grow, in particular when addressing environmental, social, and corporate governance (ESG) goals.

CULTURAL TREASURES



Museums and cultural centers are important stewards of culture and heritage. We help these organizations fulfill their missions to preserve and protect their collections by considering possible hazards like climate, security, infrastructure, pollution, and pests, and determining where to focus resources to have the biggest impact.

CITIES & REGIONS



Cities of all sizes need to prepare for natural and human-made stressors—from earthquakes, flooding, and wildfires to social and economic volatility. We help municipalities large and small plan and organize for resilience to significantly increase their ability to weather these hazards and rebound quickly after they occur.

CAMPUSES



Colleges and universities are identifying resilience as a core design principle to meet ambitious sustainability goals, plan for potential risks from natural and human-driven shocks and stressors, and address uncertain future uses for buildings. We help these clients plan and organize for resilience to significantly increase the chances of weathering these hazards and rebounding stronger than ever.

CRITICAL FACILITIES



Hospitals and other critical 24/7 emergency facilities need to ensure safe and continuous operations in the face of hazards, especially during public health emergencies. We help clients address resilience across the organization—from designing flexible public spaces to accommodating varying bed capacity to developing adaptable HVAC systems.

► RETURN ON INVESTMENT (ROI)

Resilience planning not only provides clients the greatest possible reduction in future risk-associated costs, which can be astronomical, but also allows them to envision a future of survival, adaptation, and growth.

RESILIENCE & POSITIVE RETURN OVER TIME

- Cost savings from avoided damages and downtime due to natural disaster, accidents, security breaches, etc.
- Reduced insurance costs for organizations with robust resilience plans
- Compliance with regulatory requirements
- Reduced legal liabilities due to damage or injury
- Ability to seize new opportunities by being prepared for change



HGA's cost estimating services help clients analyze possible ROI based on mitigated risk, and make informed decisions about which strategies will be most impactful and cost-effective.



Texas A&M University, Kingsville | Music Education Building



McGough Construction Headquarters | Rooftop Solar Panels

“

Climate adaptation initiatives—

those that help people, animals, and plants to survive despite rising climate volatility rather than trying to reverse it—
receive only 7% of climate-related investment.

They deserve far greater business investment.

Solutions that are low cost, proven to be effective, and have immediate impact include early warning systems for extreme weather events, coastal barriers, water desalination and wastewater treatment, vertical farming and hydroponic agriculture, improved cooling and insulation systems, 3D printed and modular housing, and many other measures.”

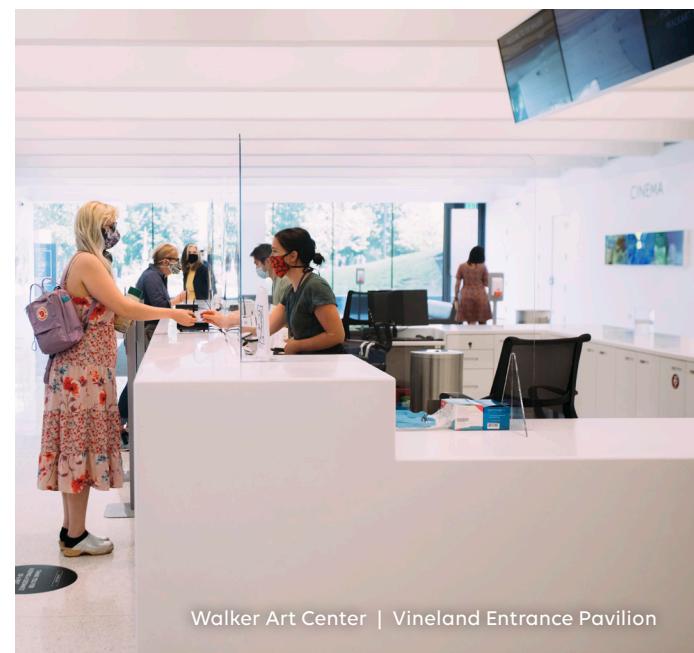
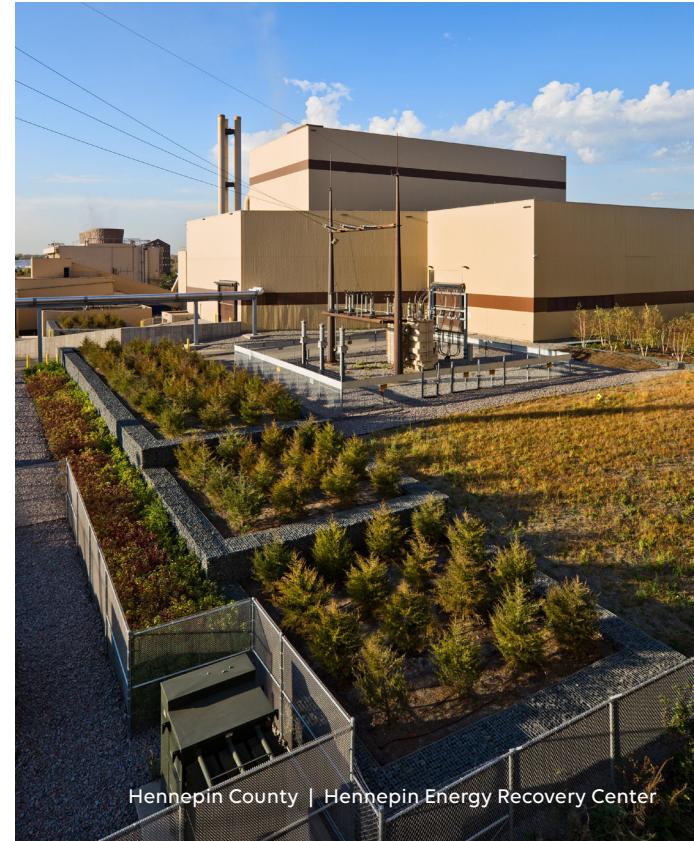
- Harvard Business Journal

It's Time to Invest in Climate Adaptation

	ADOPT CODE	ABOVE CODE	BUILDING RETROFIT	LIFELINE RETROFIT	FEDERAL GRANTS
OVERALL BENEFIT-COST RATIO	11:1	4:1	4:1	4:1	6:1
COST (\$ BILLION)	\$1/year	\$4/year	\$520	\$0.6	\$27
BENEFIT (\$ BILLION)	\$13/year	\$16/year	\$2200	\$2.5	\$160
Riverine Flood	6:1	5:1	6:1	8:1	7:1
Hurricane Surge	N/A	7:1	N/A	N/A	N/A
Wind	10:1	5:1	6:1	7:1	5:1
Earthquake	12:1	4:1	13:1	3:1	3:1
Wildland Urban Interface Fire	NA	4:1	2:1	N/A	3:1

► OUTCOMES

- An understanding of short and long-term costs/benefits and ROI of resilience planning
- Prioritization of needs through an interdisciplinary, integrated approach (ex: security vs. code compliance)
- Addressing the psychology vs. probability of potential hazards
- Performance-based design tailored to each project and client
- Solutions based on scientific research and data from government, institutional, and insurance industry sources
- Energy systems that meet goals for resilience as well as efficiency
- Integrated and adaptive systems, including central utility plants
- Facilities hardened to natural disaster and significant threats to safety and security
- Heightened indoor air quality, healthier materials, and tighter building envelopes to withstand effects of outdoor air extremes
- Business continuity and preparedness for emergency response and recovery
- Climate adaptation strategies for life of building and infrastructure



TENNESSEE STATE MUSEUM

PRESERVING HISTORY THROUGH RESILIENT DESIGN



NASHVILLE, TENNESSEE

The state-of-the-art Tennessee State Museum opened in 2018 to illuminate the rich history of Tennessee and enliven Nashville's Bicentennial Mall. HGA brought full interdisciplinary design services to this inspirational and distinctive cultural facility.

Within the first two years after opening, the museum was faced with two major hazardous events. On March 3, 2020, a severe tornado hit the city of Nashville—the 6th costliest in U.S.

history—and one week later, COVID-19 caused shutdowns in Nashville and across the country. However, as a result of a planning and design process that addressed future resilience, the museum was able to withstand and quickly recover in the face of these challenges.

Early in the process, a hazard assessment was performed by the Department of Homeland Security that addressed safety, security, and natural disaster risks, including tornadoes and

flooding. This assessment was incorporated into hazard mitigation and adaptation plans, including a highly resilient design for the building. After protecting the staff and public, protecting the artifacts of the state's history was a primary goal. All artifacts were placed on the second floor, above prior flood plains, to avoid possible water damage. Exterior material selection was informed by high-velocity wind and water testing, resulting in a triple-glazing system for the



LONG-LASTING FREEZE
No impact to museum operations

FLOODING
No museum outage

BOMBING
Explosion at AT&T building caused loss of internet and cell service. Museum closed for 10 days.

TORNADO
No museum outage, incidental damage, provided community services and shelter after event

museum's glass curtain walls. (During the tornado, flying debris—including a picnic table—shattered only the outer pane of glass, leaving the remaining panes to protect the interior of the museum and its collections from wind and water damage.) Steel structural beams, single and double-width cement block, and a thick stone veneer formed an almost indestructible exterior. Redundant systems were used, including a dual generator, to ensure that life safety and mechanical systems supporting the galleries would continue to run during a power outage.

The museum also went through the re-accreditation process with the American Association of Museums in the midst of opening, during which disaster preparedness, first response, and crisis communications plans were reviewed.

Due to the administration's conscientious planning for resilience within the organization, its operations, and its facility, the museum was able to open its doors to the public just two days after the tornado. In addition to galleries being open, the museum became a much-needed shelter and gathering space for the community, providing access to bathrooms, water, snacks, WiFi, and phone charges.

One week later, when the COVID-19 pandemic forced the museum to close again, museum administration quickly responded using a mission-focused lens to develop and revise plans, and bring in the tools and skills needed to move forward. Not even four months later, the building reopened with modified operations.

DERBY LINE LAND PORT OF ENTRY

A RESILIENT, WELCOMING BORDER ENTRY



DERBY, VERMONT

HGA worked closely with the General Services Administration (GSA) and Customs and Border Protection (CBP) to identify goals for this project, including: balancing programmatic and operational needs with security and safety; energy/environmental performance requirements and LEED-Gold certification; and a dignified presence.

One of the first GSA projects to consider climate projections in design, this resilient facility was designed to perform through

anticipated changes in climate, to exceed energy standards required by code, and to withstand any other hazards inherent to the region and function of the building. Resilience measures included increased soil cover over utilities to ensure frost protection, adequate snow storage areas, and oversized roof drainage and stormwater accommodations for larger storm events. Embedded into the welcoming architecture are extensive security measures including bullet resistant glass and various vehicular scanning systems.

Energy use is reduced through LED light fixtures, occupancy sensor control, and the integration of natural daylighting. Innovative heating/cooling strategies include dedicated outdoor air systems, variable refrigerant flow, and radiant in-floor heating systems, as well as energy recovery. Renewable/redundant energy resources are implemented via a 50kW solar array on the site, providing over 5% of the facility's yearly energy consumption. The result is a symbolic and welcoming arrival experience supported by secure, efficient operations and a sustainable, resilient design.

FOREST EDGE ELEMENTARY, OREGON SCHOOL DISTRICT

ENERGY TRANSITION RESILIENCE



FITCHBURG, WISCONSIN

Forest Edge Elementary School, the first Net Zero Energy (NZE) school in Wisconsin, is offsetting 100% of its on-site energy needs. Realizing not only cost savings, but also the ability to create a living lab and model of sustainability, the school utilizes state-of-the-art technologies including a microgrid with 125kW/250kWh battery storage, a 646 kW solar photovoltaic (PV) system, and a geothermal heating and cooling system. 100% of the building's energy needs are provided from electricity.

The microgrid system works in tandem with the battery and the 1,704 solar panel system array, storing excess solar energy produced. This energy can then be strategically deployed back into the school to meet other energy demands or it can be fed back into the main power grid system, making Forest Edge's impact reach beyond its own walls.

The challenge of designing a NZE elementary school—with no additional costs over the life of the school—needed an outside-the-box

approach from the start. Low-interest green bonds, which help fund projects with positive environmental and / or climate benefits were utilized and NZE performance was stipulated in the green bond documentation.

These investments in energy efficiency, renewable energy, and sustainability have saved the district over \$60,000/year since the school's completion in July 2020, and positions the school district well as the regional utilities begin to transition to fossil fuel free energy sources in the future.

THE GLICK CENTER, METROHEALTH SYSTEM

PROTECTING THE FUTURE OF INNOVATIVE HEALTHCARE



CLEVELAND, OHIO

HGA reimagined the master plan for MetroHealth's campus, and led the planning, design, and engineering of The Glick Center, an 11-story state-of-the-art acute care hospital. The first EcoDistrict-certified hospital in the U.S., MetroHealth represents a paradigm shift in how a healthcare facility can lead a neighborhood revitalization focused on equity and well-being.

The outcome of a research-driven, collaborative design process, the goal was to design a cost-effective, sustainable, and patient-focused hospital. The new site needed to allow for a robust degree of flexibility

and adaptability, considering events and operations that may occur 50 years into the future. To that end, resilience planning was conducted before and throughout the design process.

The team modeled baseline and anticipated use of steam and demand for heating and cooling to determine peak system loads and equipment sizing considerations. Then, using a resilience assessment tool, the team determined the greatest risks to hospital patients, business services, and physical assets. These included severe thunderstorms, water, and electrical failures. Resulting resilience

strategies included built-in redundant systems that exceed code requirements and ensure continuous operations in case of utility or equipment failure, and robust emergency power systems with multiple generators. Efficient process and equipment design provide reliable and resilient power to support mission critical operations while highly efficient infrastructure systems reduce energy, heat and water usage, resulting in significant savings:

- 51% gas reduction
- 66 EUI reduction
- 1,900 MT CO₂ reduction
- 45,800 mmbtu reduction

CONFIDENTIAL FORTUNE 10 COMPANY

ADDRESSING GLOBAL SECURITY THROUGH TECHNOLOGY DESIGN



CONFIDENTIAL LOCATION

With over 7,000 card readers and 6,100 cameras processing over one million events a week, few security systems are as large as this client's, which grew as operations expanded through acquisition and organic growth. As a result, the client was experiencing system stability challenges that impacted the speed of transactions and growing concerns about possible loss of important secure data.

Technology and security system specialists from HGA were engaged to evaluate the client's existing integrated security system architecture and make recommendations for the ideal future state based on the client's

unique environment and usage, and a roadmap for migrating the existing system to that state.

Our process included meeting with a diverse array of stakeholders from all areas of the organization to gather data on challenges with the existing security system of the client's facilities. These meetings generated a complete picture of the present environment and the optimal path for enhancements. The team also researched options for improving performance by meeting with system manufacturers to discuss recommended best practices and benchmarking the client's security systems against other companies.

HGA created a report detailing existing conditions, suggestions to overcome existing challenges, ideal future state, and budget estimates for each recommendation. After reviewing with the client, we prioritized the recommendations and create a phased approach for adoption that the client could use to seek capital funding. As the recommendations were implemented and the system performed to expectations, the client saw a positive impact on business operations. As additional midterm and longterm recommendations are phased in, the expectation is that they will be equally valuable and produce additional return on investment.

HGA



Source: 2010 Sean R. Heavey

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