



May 2024

Climate Action Plans Support Long-Term Infrastructure Benefits

How strategic planning can enhance safety and deliver cost-saving solutions

INTRODUCTION

Extreme climate-related events are becoming increasingly common as much of the world’s population faces unprecedented heat waves, historic flooding, wildfires, and intense storms. As a result, the effects of climate change on aging infrastructure are potentially becoming more severe, and the impacts on people are increasingly more costly.¹ Bridges are experiencing more stress, roadways are buckling, rail tracks are warping, water and sewer systems’ operations are disrupted, electrical providers are experiencing outages, and coastal areas are flooding. Critical infrastructure assets that are not resilient to climate-related events may take significant time to rebuild and restore, if an event occurs.

While the goal has always been to plan, design, and build projects that endure, the impact of climate change means infrastructure owners and operators require even more from planners and designers. The probability of events occurring, and the magnitude of damage should these events come to fruition, are important considerations. Not only do the impacts to our existing infrastructure need to be addressed, but we must plan our new infrastructure, which is intended to last 40, 50 and even 100 years, within the context of our evolving climate. Past performance and many current design standards may not always reflect the effects of these extreme events and changing climate conditions. As a result, they may not be reliable for future infrastructure development. HDR can help infrastructure owners build projects that factor in the changes we are experiencing from a climate perspective, helping to minimize emergency repair costs.

Climate action planning is part of a responsible infrastructure planning strategy. Planning around climate change now may help avoid expensive fixes in the future. Federal, state, and local public agencies, as well as private companies, are recognizing this reality and the importance of considering sustainability and resilience in our infrastructure planning and design. Moving from planning to implementation is even more relevant, given the severity and frequency of climate-related events.

In this article, HDR professionals expand on the drivers of this enhanced interest in more climate-resilient design and how climate action planning can support the delivery of infrastructure projects that reflect greater sustainability and resilience. We review what these terms mean, how planning projects to respond to climate activity can inform and enhance project delivery, and what funding is available to support these efforts.



In January 2023, one-third of the contiguous U.S. was in drought. The average U.S. temperature for December 2023 was 7.3°F above average, ranking warmest in a 129-year record.

1. <https://www.epa.gov/climateimpacts/climate-change-impacts-built-environment>

Source: [National Oceanic and Atmospheric Administration](#)

DAMAGES FROM EXTREME EVENTS

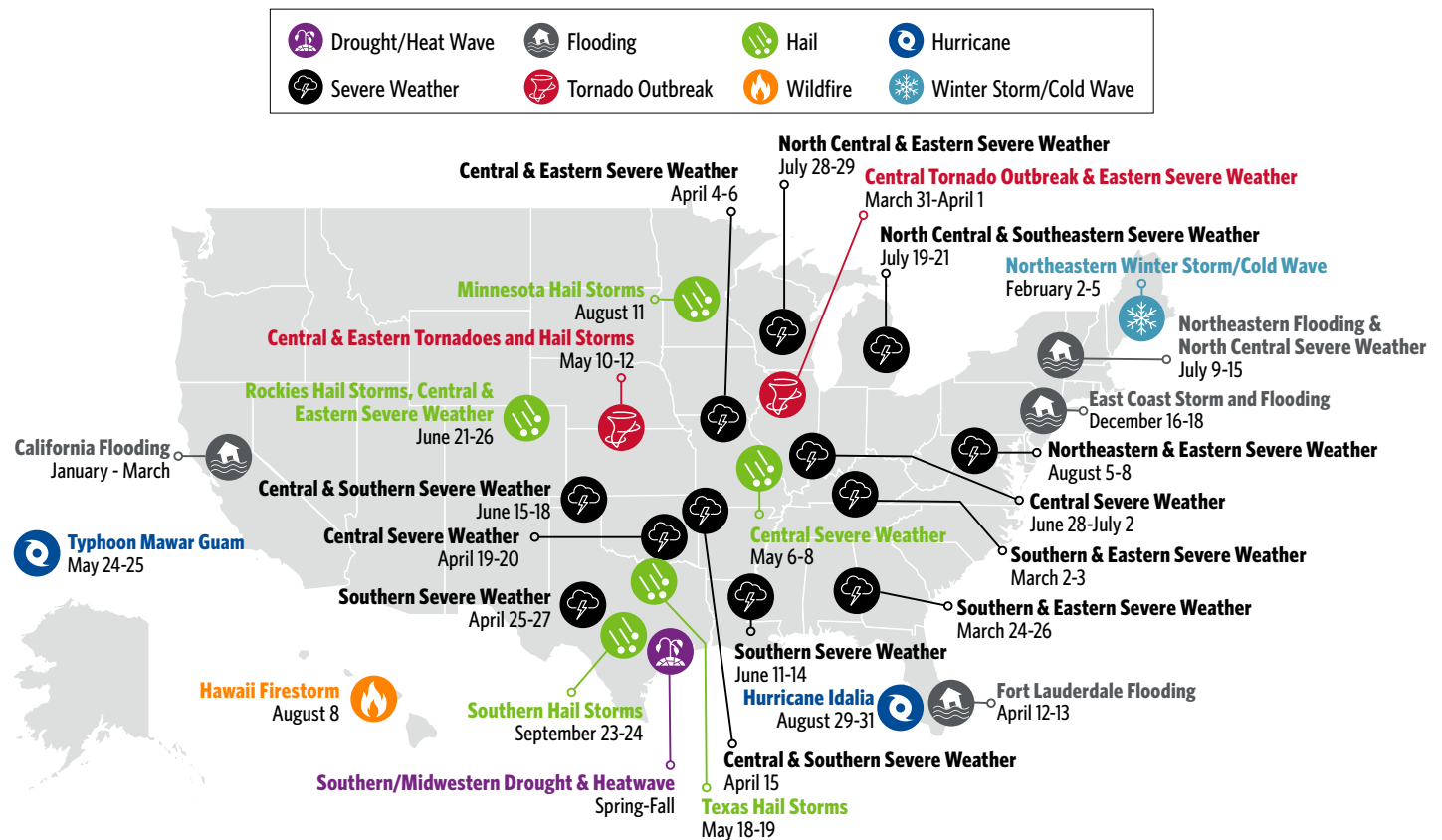
In 2023, the United States experienced 28 confirmed weather and climate disaster incidents, each causing damages surpassing \$1 billion (see **Exhibit 1**).² According to the National Oceanic and Atmospheric Administration (NOAA), 2023 surpassed the previous annual record of 22 events in 2020. These billion-dollar incidents are comprised of one drought event, four flooding events, 19 cases of severe storms, two tropical cyclones, one wildfire event, and one occurrence of a winter storm. Collectively, these incidents have led to 492 deaths. The 2023 tally of billion-dollar climate disasters more than triples the annual average of 8.5 events recorded between 1980 and 2023. Moreover, the most recent five-year period (2019-2023) has seen an even higher average of 20.4 billion-dollar events per year (adjusted for inflation).³

In December 2023, an atmospheric river in Southern California brought more than one month's total rain in a single hour. In the same month, intense rainfall in South Carolina flooded several neighborhoods, trapping residents.



Source: [National Oceanic and Atmospheric Administration](https://www.noaa.gov/billion-dollar-weather-and-climate-disasters)

Exhibit 1. U.S. 2023 Billion-Dollar Weather and Climate Disasters



Source: [National Oceanic and Atmospheric Administration, Billion-Dollar Weather and Climate Disasters](https://www.noaa.gov/billion-dollar-weather-and-climate-disasters)

2. www.ncei.noaa.gov/access/billions/events.pdf

3. www.ncei.noaa.gov/access/billions/

The frequency and severity of these disasters impact all. Municipalities, states, and regions across the country are being challenged to address the effects of these extreme events, many of which are unexpected or cause greater harm than anticipated. The result is the disruption of daily lives and unplanned expenses to address the damage caused. This new normal affects and necessitates adjustments for individuals, public agencies, and private companies. **Exhibit 2** (on the following page) illustrates the five-year annual average costs due to these extreme events from 1980 to 2023. The past year exceeded \$94.2 billion in damages, with an overall increasing trend of annual damages.

DRIVERS OF CLIMATE ACTION

Extreme events associated with climate have contributed to changes and increases in funding available to mitigate and adapt to climate change, state-level greenhouse gas (GHG) emissions target setting and climate action planning, as well as private sector actions.

Federal Funding to Support Action

There has been an increase in climate-related reporting requirements in recent years, both nationally and globally. In March 2024, the U.S. Securities and Exchange Commission adopted rules to enhance and standardize climate-related disclosures by public companies, seeking more consistent and reliable information about the financial effects of climate risks. This follows similar mandatory financial disclosure



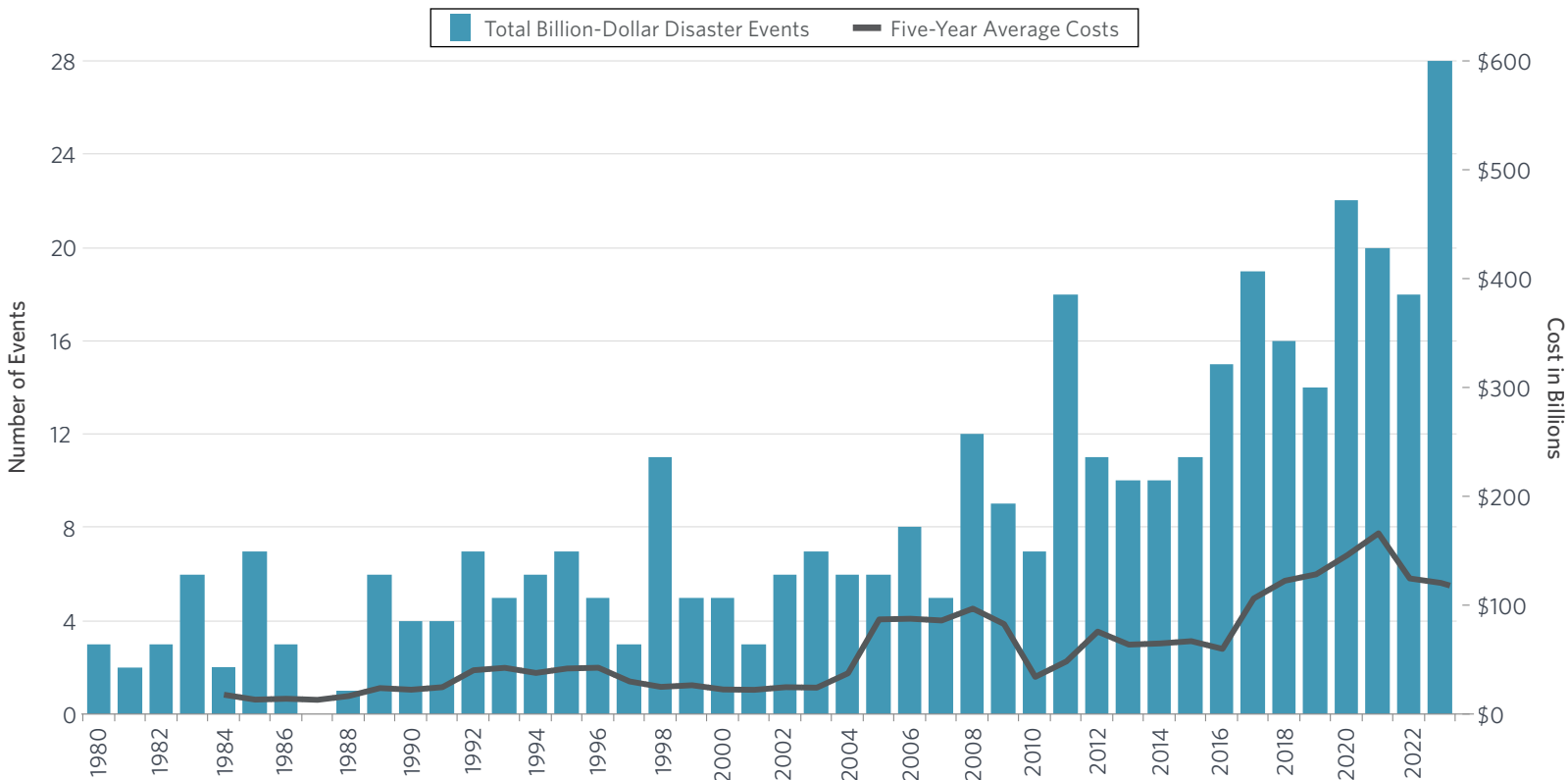
requirements in the United Kingdom and Europe.⁴ Federal legislation, such as the Bipartisan Infrastructure Law (BIL) and Inflation Reduction Act (IRA), have appropriated significant funding to facilitate climate action. Many discretionary grant programs have modified review criteria to encourage sustainable and resilient actions such as low energy usage, nature-based solutions to adapt to sea level and other climate events, and other strategies that encourage forward-looking planning that encompasses carbon reduction strategies, resilience plans, electrification initiatives, and more. The magnitude of the federal commitment to confronting climate challenges is evident in the conservatively estimated but substantial \$50 billion allocated to infrastructure resilience through the BIL alone, underscoring a transformative commitment to safeguarding our future against climate uncertainties.⁵

A variety of programs were initiated in light of this funding, but one specific program focuses on mitigating GHG emissions and adapting to the impacts of climate. In March 2023, \$250 million was made available for states and large cities to develop climate action plans. These planning grants, administered through the Environmental Protection Agency (EPA), are the first tranche of funding for states, local governments, tribes, and territories from the IRA's \$5 billion Climate Pollution Reduction Grants (CPRG) program. Nearly all 50 states, more than 60 metro areas, territories and tribes received funding to support climate action planning. Key outputs of this program are a Priority Climate Action Plan, a Comprehensive Climate Action Plan, and identified projects to support GHG emissions reduction and/or resilience across all sectors. The IRA also provides \$4.61 billion for grants to implement the measures prioritized during the planning activities. The EPA's CPRG program is just one example of the funding made available by the IRA to support sustainable and resilient infrastructure design.

4. [U.K. Department for Business, Energy & Industrial Strategy](#)

5. The White House, A Guidebook to the Bipartisan Infrastructure Law for State, Local, Tribal, and Territorial Governments, and Other Partners 264 (May 2022)

Exhibit 2. 1980-2023 United States Billion-Dollar Disaster Events (CPI-Adjusted)



Updated March 8, 2024

Source: [National Oceanic and Atmospheric Administration, Billion-Dollar Weather and Climate Disasters](#)

Beyond funding, we are seeing potential regulatory changes. For example, the EPA’s Council on Environmental Quality has issued interim guidance that affects National Environmental Policy Act (NEPA) and climate change guidance by requiring a project life-cycle carbon report; measuring upstream and downstream emissions; collecting and summarizing every related climate goal/target; and evaluating alternatives for fuels and materials from a carbon intensity perspective. HDR is already relying on this guidance to inform its air quality efforts.

State Activities

These federal efforts are consistent with climate action planning at the state level; 33 states now have climate action plans or are developing one,⁶ 23 states and the District of Columbia have executive and/or statutory⁷ GHG emissions targets,⁸ and 6 states have introduced and/or passed procurement policies⁹ that relate to embodied carbon.¹⁰ Since 2018, state-level adaptation plans and actions increased by 32% while new state-level mitigation measures have increased by 14%. There is good reason to incorporate climate considerations into planning efforts. A study funded by the U.S. Department of Housing and Urban Development, “The Natural Hazard Mitigation Saves: 2019 Report,” presented a benefit-cost analysis of the effects of adopting updated building codes. The results are summarized in **Exhibit 3** and show that there is a savings of up to \$7 for every \$1 of federal grant money invested to address different hazards. Public-sector investment in mitigation since 1995 by FEMA, EDA, and HUD cost the country \$27 billion but is estimated to save \$160 billion, meaning an overall \$6 saved per \$1 invested.






The confluence of grant funding evaluation criteria, state commitments, and regulatory requirements necessitates that industry stakeholders and infrastructure professionals better understand the meaning of sustainable and resilient design. This is further emphasized by actions occurring in the private sector.

For example, the increasing prevalence, duration, and intensity of extreme weather events due to climate change are driving higher insurance premiums or restrictions in coverage as insurers strive to reflect the growing impacts of these disasters.¹¹ While this shift is a necessary and expected response to escalating costs associated with natural catastrophes, it poses significant challenges for middle- and low-income property owners or renters, potentially causing financial strain or forcing them to move because of rising housing costs associated with insurance premium increases.

As insurance becomes less affordable and more properties face abandonment or plummeting values, this phenomenon can trigger a cascade of implications for infrastructure and governmental

6. www.c2es.org/document/climate-action-plans/
 7. www.ncsl.org/energy/greenhouse-gas-emissions-reduction-targets-and-market-based-policies#requirements
 8. www.c2es.org/document/greenhouse-gas-emissions-targets/
 9. carbonleadershipforum.org/what-is-a-buy-clean-policy/
 10. carbonleadershipforum.org/what-is-a-buy-clean-policy/
 11. www.reuters.com/sustainability/sustainable-finance-reporting/esg-watch-battered-all-fronts-insurance-industry-struggles-rise-climate-2023-11-06/

Exhibit 3. FEMA Hazard Mitigation Graphic

NATIONAL BENEFIT-COST RATIO (BCR) PER PERIL <small>*BCR numbers in this study have been rounded</small>	BEYOND CODE REQUIREMENTS	FEDERALLY FUNDED
Overall Hazard Benefit-Cost Ratio	\$4:1	\$6:1
 Riverine Flood	\$5:1	\$7:1
 Hurricane Surge	\$7:1	N/A
 Wind	\$5:1	\$5:1
 Earthquake	\$4:1	\$3:1
 Wildland-Urban Interface Fire	\$4:1	\$3:1

Sources: [Natural Institute of Building Sciences, 2019](https://www.nibs.org/research/2019/06/20/the-natural-hazard-mitigation-saves-2019-report/)



Adapting to new circumstances can provide economic and social benefits, especially if we develop smart solutions that harness the energy and human capital of this great city. The **HDR Climate Adaptation Plan** presents the City’s first attempt at **identifying the infrastructure** that is vulnerable to officially forecasted sea level rise, storm surge, rain, and heat projections and **presents options for adaptation**. It’s a foundation that will take much collaboration, commitment and partnerships from all sectors in our community as well as county, state, and federal government to move forward timely and effectively.

Thomas Barwin | Former Sarasota City Manager





“Sustainability” is the act of balancing environmental, social, and economic needs of the built and natural environments for present and future generations. It often translates to holistic practices that mitigate climate impacts and resource depletion.

“Resilience” refers to the ability to withstand and recover from disturbances, shocks, or stressors. It focuses on building systems, communities, and infrastructure that can withstand, adapt, and bounce back from adversity. Resilience strategies help communities and ecosystems withstand and adapt to the impacts of climate change.

“Mitigation” aims to reduce the amount and rate of future climate change by reducing emissions of heat-trapping gases from the atmosphere.

“Adaptation” is the process of adjusting to an actual or expected environmental change and its effects in a way that seeks to moderate harm or exploit beneficial opportunities.



decision-making. Abandoned or devalued properties may lead to inequitable population migration, potentially leaving areas uninhabited or unattractive for further investment. Consequently, discussions at the infrastructure and governmental levels will need to address the maintenance, expansion, or abandonment of infrastructure in regions where economic and population dynamics have shifted due to insurance-driven property challenges, necessitating a thoughtful and adaptive response to these complex, intertwined challenges.

Because of these types of climate change drivers and their ensuing impacts, consideration of mitigation and adaptation strategies is becoming increasingly important when planning, designing, funding, and constructing infrastructure.

CLIMATE ACTION PLANS AND THEIR PURPOSE

Climate action plans are one way to consider both sustainability and resilience, as they are roadmaps to reduce emissions and related climate impacts. Typically, the plans include detailed, prioritized actions to achieve the reductions with measurable targets. The effectiveness of climate action planning lies in the ability to translate these reduction targets into actionable steps. Identifying a diverse range of measures, policies, and projects that an organization can adopt to fulfill its climate goals helps minimize emissions and enhance overall sustainability.

Climate action plans identify a baseline condition, as well as actions to help improve it, and they are often focused on those who may be most vulnerable to the impacts of climate change. These actions frequently encompass sectors, including transportation, buildings and facilities, energy production, industry, agriculture, and waste management, that comprise our client base.

At its core, a climate action plan centers on mitigating the root cause of climate change: GHG emissions. However, a comprehensive climate action plan goes beyond emissions reduction by incorporating additional components to foster holistic resilience and environmental stewardship. Resilience strategies play a vital role in preparing communities to adapt and respond to the escalating impacts of climate change. These strategies encourage the longevity and effectiveness of the plan and may involve investing in, for example, climate-resilient infrastructure, creating early warning systems for extreme weather events, developing emergency plans, and fostering community education on disaster preparedness.

By offering a comprehensive and strategic roadmap designed to address the urgent challenges posed by climate change within a specific region or jurisdiction, climate action plans serve as essential blueprints for governments, organizations, and communities to collaboratively combat global warming and its associated impacts — with the aim of transitioning toward a sustainable and resilient future.

These plans can be a first step toward broader climate-focused planning, which can be expanded to consider the risk of a disaster as well as the magnitude of the impact, should the event occur. This information can inform capital planning as well as project prioritization and potentially reduce the lifecycle costs of an infrastructure investment by planning for an event rather than incurring emergency response costs, should the event occur.

CLIMATE ACTION PLANS AND INFRASTRUCTURE PROJECTS

Climate action plans lay the groundwork for more resilient infrastructure projects that may result in increased performance and longevity of infrastructure assets, enhanced energy security, project cost savings, green job creation, and identification of untapped economic opportunities — all while demonstrating to stakeholders our responsible stewardship of the environment. Embracing climate-conscious practices bolsters the resilience of communities and industries alike, better equipping them to navigate the uncertainties of a changing climate and encouraging longevity in the face of adversity.

HDR supports infrastructure owners and operators by using data to inform decision-making, including consideration of climate data. We also leverage planning and design practices related to sustainable and resilient design to help build infrastructure that lasts its full lifecycle. As thought leaders, we currently provide training to Federal Highway Administration and select Department of Transportation professionals through the National Highway Institute. These complex, climate-related challenges require innovative and comprehensive solutions, and HDR's professionals provide these agencies with approaches to incorporating climate change considerations into federally funded programs. Our sustainability and resilience experts can help you prepare for unexpected climate disasters and support other infrastructure owners and decision-makers with a variety of climate-focused planning and design solutions, which include:

- Decarbonization Planning and GHG Inventories to help set a GHG emissions baseline and targets and to use when designing high-performance buildings and more sustainable horizontal infrastructure.
- Sustainability Program Management, including incorporation of decarbonization, sustainability, and resilience strategies into an organization's design guidelines, performance specifications, procurement processes, and contract documents.
- Climate Change Risk and Vulnerability Assessment to identify climate risks based on available science and conduct vulnerability assessments to identify assets that are most at risk.
- Adaptation Planning to help map a strategic path toward a sustainable, equitable, economically sound, and resilient future.
- Resilient Design, including our regenerative design framework — generating sustainable, regenerative, and restorative design strategies for existing buildings and infrastructure — and advancing our work in building performance analytics, climate science, and carbon reduction strategies, among others.
- Economic Analysis and Decision-Making Support to help analyze the sustainability-focused elements of economic investments or consider the probability of a climate-related event occurring and its associated costs.
- Infrastructure Funding Opportunity Review and Strategy Support to identify additional resources for key capital projects, analyze funding opportunities to pursue, and prepare competitive grant applications to fill funding gaps.

For more information, contact:



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As A&E professionals, our goal is to plan and design projects with minimal climate impacts and improved resilience, based on quality data, industry practices, and the needs of the community in which the project will reside. We now have more data and information available about our changing climate, and we should use it. Integrating sustainability and resilience considerations into a project's selection and delivery should not be considered new. It is simply using more and better information to support the quality planning, engineering, and architecture that we have always sought to deliver to our clients and our communities.



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Adaptation to our changing climate is an important component of planning for a successful future for our communities and the people who live in them. Considering climate change as part of a holistic approach to risk management, design, decision support, sustainability, and capital planning represents a new paradigm for the standard of care within our industry.



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We take a thoughtful approach to the unique challenges coastal areas face, such as rising seas, coastal flooding, and erosion. Our team seeks to develop forward-looking strategies to address risk, with the goal of resilient infrastructure and natural resources that protect and enrich the lives of those in coastal communities.