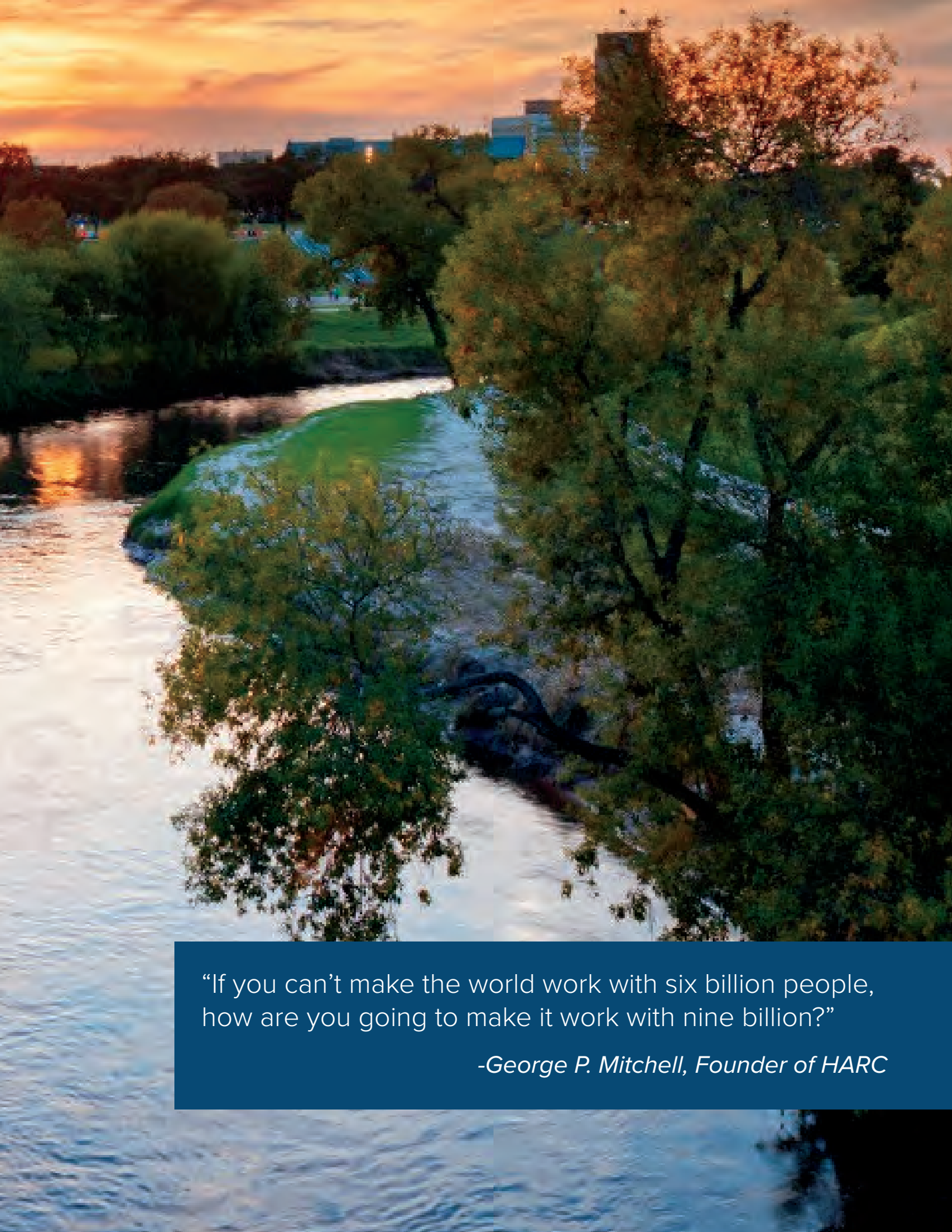
# STRATEGIC PLAN 2023-2025

HARC

Sunset at Buffalo Bayou, Houston, Texas



"If you can't make the world work with six billion people, how are you going to make it work with nine billion?"

*-George P. Mitchell, Founder of HARC*

# BOARD OF DIRECTORS

J. Todd Mitchell, Chair
Cullen K. Geiselman, PhD, Vice Chair

Raymond E. Cline, Jr., PhD
Lisa A. Gonzalez
John L. Hall
Ramanan Krishnamoorti, PhD
L. James Lester, PhD
B. Greg Mitchell, PhD
Paul R. Nelson
Thad “Bo” Smith
Bruce Tough, JD
Spiros N. Vassilakis, CFA
Margaret Vaughan Cox

Inside HARC’s Living Lab

# TABLE OF CONTENTS



# LETTER FROM THE PRESIDENT

HARC will begin its fifth decade in 2023, in what promises to be a time of unprecedented change.

We are an independent, non-partisan research hub, focused on identifying and implementing scalable solutions at the intersection of sustainability, resilience, and climate equity. Our mission is to apply science to drive energy, air, water, and resilience solutions for a sustainable and equitable future. Our agenda for the next three years is outlined in our 2023-2025 Strategic Plan.

It is estimated that the world's population will increase 13% by 2030 to 8.6 billion people. The United States and the State of Texas are experiencing similar levels of growth and are estimated to reach populations of 359 million and 34.9 million, respectively, in 2030. The additional energy required to support this phenomenal growth will increase pollution, further strain water supplies, exacerbate food insecurity challenges, and make efforts to address human starvation more difficult. These perplexing realities are complicated by the changing climate, which is producing increasingly more extreme weather.

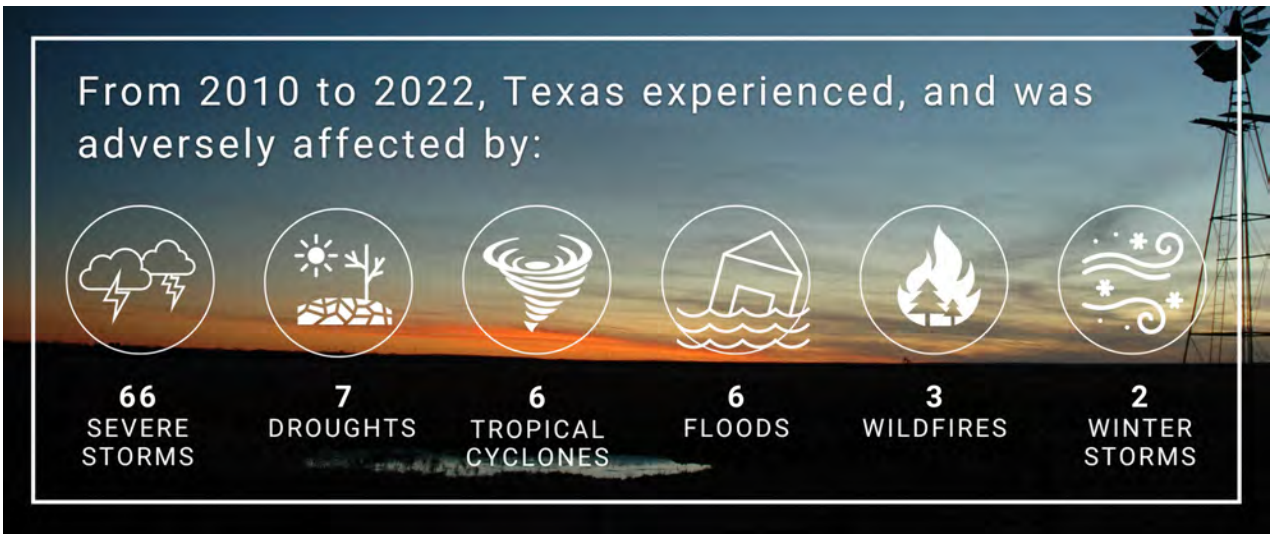
From 2010 to 2022, Texas experienced, and was adversely affected by, 66 severe storms, seven droughts, six tropical cyclones, six floods, three wildfires, and two winter storms. These were billion-dollar disasters. Poor and impoverished people are impacted the most by these natural disasters, and are rightly demanding thoughtful and consistent actions to address not only community resilience challenges, but also the social, economic, and environmental inequities they face.

It is estimated that the world's population will increase 13% by 2030 to 8.6 billion people. The United States and the State of Texas are estimated to reach populations of 359 million and 34.9 million, respectively, in 2030.

A sustainable, resilient, and equitable future truly hangs in the balance.

Fortunately, the energy sector has started to transition to zero and low carbon sources of energy, including clean hydrogen, geothermal, and large scale renewables. This is a much needed focus since scientists have linked the recent more powerful and frequent natural disasters to fossil fuels. Exponential growth of energy efficiency and clean, small electric grid-connected sources of electricity (including demand response, roof-top and community solar, and storage) are needed to ensure grid reliability and resilience, and to reduce energy burdens and inequities. In the near term, we must also reduce the threats and impacts from diminished water quality and supply resulting from droughts and flooding, and extreme heat resulting from climate change. The loss of biodiversity, stresses from land use changes, and aging infrastructure must also be addressed.

HARC's work is centered in Texas and along the Gulf Coast; however, we are committed to engaging all levels of government, the private sector, academia, philanthropy, and communities to create sustainable resilience and climate equity solutions that are replicable and scalable across the country.




Over the next three years, we will focus on applying our independent scientific analysis and research, technology validations, and solutions' implementation on the following four priorities:

- Implementing impactful, sustainable, solutions-driven research to **protect our environment and natural resources, and to promote resilience and climate equity.**
- Strategically **supporting the broad deployment of clean distributed energy resources** to decarbonize the power system, ensure electric grid reliability and resilience, reduce costs, and lessen energy burdens.
- **Accelerating decarbonization and resilience practices in the commercial sector** by raising awareness of HARC's net zero building and sustainable site, and offering consulting expertise in sustainable commercial building practices.
- **Championing climate equity in underserved communities** through the development and launch of the Climate Equity and Community Engagement Initiative.

These priorities demonstrate HARC's commitment to addressing the most pressing sustainability, resilience, and climate equity issues facing the world today.

We look forward to the challenge and to applying science to find the right solutions.

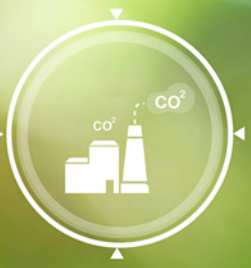
Sincerely,

John Hall
President and CEO


$CO_2$

# OUR MISSION

HARC applies science to drive energy, air, water, and resilience solutions for a sustainable and equitable future.




# OUR VISION

We envision a world where:

- natural resources are sustainably used and equitably distributed;
- the economy is viable and ensures the well-being of current and future generations;
- society is fully engaged in the stewardship and enrichment of nature; and
- effective action is consistently taken to ensure all communities thrive.

# WHO WE ARE

HARC is an independent and non-partisan research hub. Our leadership and research staff have broad experience in basic and applied science, data analytics and geospatial analyses, program and project implementation, technology development and adoption, policy analysis, and stakeholder engagement and communications. This diversity of insight and experience, combined with exceptional grants and contract management, communications, finance, and operations expertise, allows us to respond to the needs of a variety of sponsors, stakeholders, and partner organizations.

Our credibility within communities and among regional, national, and international associations enables us to work collaboratively with practitioners from numerous scientific disciplines and organizations across Texas, the United States, and other parts of the world to develop solutions to some of our most pressing issues.

# WHAT WE DO

HARC identifies and implements scalable solutions at the intersection of sustainability, resilience, and climate equity. Our core areas of research are energy, air, and water.


Inside HARC's Living Lab

# OUR GUIDING PRINCIPLES

In all that we do, HARC is guided by the following principles:

- We are committed to solid, non-partisan science and analysis.
- We believe diversity is essential to the most successful systems, solutions, and outcomes.
- We are committed to equal opportunity and access for all.
- We value community and are committed to building collaborations to understand the needs of the communities in which we work.
- We believe in teamwork to achieve common goals.
- We practice transparency in how we operate as a business and how we work within the community.

Demonstrable respect for all humans, nature, and our planet is at the core of what we do and how we do it.

# OUR FOCUS

A sustainable, resilient, and equitable future hangs in the balance.

Energy drives our society's economy and fuels our overall standard of living. However, the vast majority of our energy systems release greenhouse gases, a leading cause of climate change, and generate pollutants that adversely affect human health. In the wake of numerous natural disasters and science linking energy use to climate change, the energy sector has begun to embrace a transition from reliance on fossil fuels to more sustainable sources of energy, such as carbon capture, clean hydrogen, geothermal, and renewables (e.g., solar, wind, hydro). Other ways of cutting greenhouse gas emissions and other pollutants in the near term must also be championed, including higher levels of energy efficiency, other clean distributed energy resources, and sustainable building design, such as HARC's Living Lab. In the near term, we also must reduce the threats and impacts from diminished water quality and supply due to droughts and flooding and extreme heat from climate impacts. Underserved communities often experience the first and worst climate impacts and can benefit from planning and program development for climate equity.

Resilience must be a priority as well since the changing climate is fueling more frequent, powerful, and devastating natural disasters. The five most costly and deadly hurricanes in the United States' history occurred in recent years and demonstrate this imperative. Focusing on scientifically sound research, we can help communities identify, develop, and implement plans, programs, and policies to tackle the growing threat of climate change for vulnerable people.

# HOW WE'VE RESPONDED

HARC embodies our mission. We designed and built our LEED Platinum home to be a net-zero commercial building, the first in the state of Texas. Stated simply, our building produces more energy than it needs to operate. HARC's "Living Lab" and 3.5-acre campus demonstrates the power and practicality of sustainable design and maintenance, making it a nationally recognized model. Within this exemplary and inspiring home, our research teams have worked with partners and funders to develop and implement the following initiatives over the last three years:

HARC's Living Lab

- **Resilience Science Information Network (RESIN)** – a portal that brings together climate scenario, environmental, and socio-economic data sets to identify cross-connections to support communities engaged in climate resilience and adaptation efforts along the Upper Texas Gulf Coast
- **Pythias Analytics** – a climate risk and opportunity assessment that helps the energy sector anticipate, prepare for, and adapt to future climate impacts
- **City of Houston's first Climate Action Plan** – providing strategic assistance to the City of Houston to develop and implement the City's nationally recognized climate and resilience plans
- **Texas Clean Energy Hub** – an online portal that includes interactive tools and other information to help in the acceleration and adoption of best energy practices for commercial and residential buildings
- **Houston Harris Heat Action Team (H3AT)** – a campaign to measure and map the hottest and coolest places in Houston and Harris County to support development and implementation of needed mitigation
- **Towards a Healthy, Resilient, Inclusive Vision for Everyone (THRIVE)** – an initiative to develop climate equity and resilience in Port Arthur, Texas
- **Weatherization Enhancement and Innovation Project** – an innovative weatherization and cost-effective deployment program for underserved communities
- **Galveston Bay Report Card** – a citizen-driven, scientific analysis of the health of Galveston Bay and the surrounding watersheds, which spans 24,000 square miles and includes half of Texas' population
- **Sustainability of Engineered Rivers in Arid Lands (SERIDAS)** – a study of the future sustainability of ten heavily engineered rivers around the world (including the Tigris, Nile, and the Rio Grande), analyzing future water supply and risks resulting from climate change
- **Low Impact Development (LID)** – a construction and performance analysis of LID practices in the City of Houston to advance community resilience
- **Galveston Bay Estuary Resilience Action Plan** – a stakeholder-driven estuary resilience plan
- **Powered for Good** – a U.S. Department of Energy (DOE) Solar Energy Technology Office project to develop and deliver an innovative solar + storage model in low-income communities
- **DOE Advanced Manufacturing Office Community Energy Systems** – a decision tool for non-technical users to assess the viability of community energy systems

# OUR WORK

HARC's independent scientific research uniquely positions us to work effectively with local, state, and federal governments, as well as the private sector, academia, philanthropy, and other communities in an objective manner. We apply science to solve the challenging problems related to sustainability, resilience, and climate equity. Our non-biased approach provides us the flexibility to manage multi-million dollar projects involving multiple institutions and disciplines, and to create practical solutions that are scalable and equitable.

We apply science to solve the challenging problems related to sustainability, resilience, and climate equity.

**Over the next three years, HARC will focus its non-partisan and independent scientific analysis and research, technology validations, and solutions' implementation on the following four priorities:**

**Protecting our environment and natural resources and promoting resilience and climate equity** with the implementation of impactful, sustainable, solutions-driven research to improve the management of air quality and water resources.

**Supporting broad deployment of clean distributed energy resources** to decarbonize the power system, ensure electric grid reliability and resilience, reduce costs, and lessen energy burdens.

**Accelerating decarbonization and resilience practices in the commercial sector** by raising awareness of HARC's net zero building and sustainable site, and offering consulting expertise in sustainable commercial building practices.

**Championing climate equity in underserved communities** through the deployment and launch of the Climate Equity and Community Engagement Initiative.

These priorities constitute HARC's ambitious agenda for the future and demonstrate our commitment to addressing the most pressing sustainability, resilience, and climate equity challenges facing the world today.

# SUSTAINABILITY REQUIRES A COMMITMENT

HARC defines sustainability as engaging in practices that consider and support ecological, societal, and economic health and vitality. Sustainability presumes that resources are finite and must be conserved, protected, and distributed in a manner that meets the needs of the present without compromising the ability of future generations to meet their own needs.

A panoramic view of Lake Houston

# OUR 2023-2025 STRATEGIC PLAN

# STRATEGIC INITIATIVE 1

## Implement Impactful, Solutions-Driven Research

### Goal

Build impactful energy, air, water, resilience, and climate equity research programs that advance sustainability, environmental policy, technology, and science.

### Rationale

We face increasing demands on natural resources, growing impacts from climate change, loss of biodiversity, stresses from land use change, and threats from aging infrastructure. Climate impacts threaten our water supply even as demand for water continues to grow. Extreme temperatures and more intense and frequent storms and droughts are a call for innovative planning and action. Science-based solutions and independent analyses are needed to address overlapping economic, environmental, and community needs. Implementing solutions that offer multiple benefits, such as nature-based infrastructure, will be critical to success. For example, intact and functioning coastal wetlands offer flooding mitigation, water quality improvement, carbon emissions off-sets, and habitat for fish and wildlife. Efforts to mitigate and adapt for the impacts of sea level rise will protect considerable coastal assets, such as power plants, underserved communities, and critical coastal habitats.

## Actions

1. Develop and disseminate applied science to inform public sector sustainability, climate equity, and resilience policies at the local, state, and national levels to support the attainment of the United States' 2050 net zero goal.
2. Develop a robust life-cycle assessment initiative to help organizations and policymakers to better understand and quantify the impacts of new energy, water, building, agriculture, and transportation infrastructure investments on the natural environment and communities.
3. Create visualization tools and data platforms in support of local, state, and national planning related to climate, resilience, and the protection of natural resources.
4. Advance the protection and resilience of water, coastal, and habitat resources through the creation of data infographics, decision support tools, and collaborative stakeholder processes and partnerships.
5. Assess climate and energy transition impacts on water, coastal, habitat, and other natural resources through the development of climate planning tools and connecting communities to transparent data science.
6. Lead regional efforts in advanced air quality and climate analytics models to inform the development and implementation of resilience and climate equity strategies, policies, and programs.
7. Advance collaborative scientific knowledge, data and spatial analysis, technology, innovation, and research management capabilities to support climate mitigation, adaptation, and resilience.
8. Collaborate with partners to develop and implement models and approaches that achieve net zero water use in offices, buildings, and other facilities.

Climate impacts threaten our water supply even as demand for water continues to grow.

# STRATEGIC INITIATIVE 2

## Support Broad Deployment of Clean Distributive Energy Resources

### Goal

Develop models, approaches, and pathways to expand the use of clean distributive energy resources to decarbonize the energy sector.

According to the EPA, 120 million tons of Texas' greenhouse gas emissions, 25% of its total, come from the production of electricity.[1]

### Rationale

Electric power grids in the United States and around the world face enormous challenges in providing electricity to growing populations and expanding economies as they work to decarbonize. According to the U.S. Environmental Protection Agency (EPA), 120 million tons of Texas' greenhouse gas emissions, 25% of its total, come from the production of electricity.[1] Delivering electricity reliably as extreme weather becomes normalized requires resilience to be built into the system. This is a particular challenge for Texas' stand-alone grid.

Clean distributed energy resources (DERs) such as energy efficiency, rooftop and community solar, demand response, and storage have the potential to address the problem by reducing the demand for electricity from the power grid without affecting our quality of life. Clean DERs include several technologies that may be used to add electricity to the grid or reduce the need for the resource, especially during times of peak demand. Clean DERs are virtually emission free, have the potential to reduce utility bills, and can improve grid resilience. They can also facilitate the achievement of net zero in the energy sector.

HARC has experienced the effectiveness of DERs at our net zero building. Using DERs, HARC's Living Lab produces significantly more kWhs than it consumes, resulting in an average credit from the utility of over $1,000 a year, and perhaps more importantly, saving over 77,000 pounds of CO2 emissions a year.

The US Department of Energy (DOE) and other energy experts estimate that Texas has the potential to meet approximately 15% of its future energy needs through energy efficiency, which alone would result in the reduction of approximately 23 million tons of greenhouse gas emissions. Broad deployment of various other clean DERs would provide significant additional reductions.


[1] https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions

## Actions

1. Engage utilities, public sector entities (cities, counties, school districts, housing authorities), and clean energy providers to develop cost-effective approaches to implement clean energy solutions at their facilities, including microgrids, to assure community energy resilience.

2. Develop streamlined and effective models for home weatherization and energy efficiency, as well as commercial and industrial energy efficiency programs, so that they may reach underserved households and small businesses, reduce energy costs, and provide increased community resilience.

3. Develop strategies and approaches to broadly deploy DERs to support decarbonization and resilience of the energy sector.

4. Develop effective pathways to pilot, test, validate, and implement clean energy and transportation solutions to accelerate their broad adoption.

Distributed Energy Resources (DERs) include: rooftop solar, natural gas turbines, wind turbines, biomass generators, reciprocating engines, fuel cells, cogeneration, battery storage, electric vehicles (EV), and EV chargers.

# STRATEGIC INITIATIVE 3

## Promote HARC's Living Lab and Cultivate a Sustainable Commercial Building Consulting Practice

### Goal

Promote HARC's LEED Platinum, net zero building, and its sustainable campus as a Living Lab and provide expertise to accelerate decarbonization and resilience practices in the commercial sector and increase HARC's net revenues.

### Rationale

Commercial buildings in the United States waste significant amounts of energy, water, and other resources. This costly waste is attributed to ineffective building management, substandard and poor design, or a combination of both. The commercial sector accounts for approximately 13% of the greenhouse gas emissions in the United States[2] due to energy, water, and other waste.

In stark contrast, HARC operates one of the most resource efficient, sustainable buildings in the United States. Through good design and a keen desire to maximize campus sustainability and efficiency, HARC operates the only net zero, LEED Platinum commercial building in Texas. This was not accomplished through the use of expensive equipment or cutting-edge technology, but as the result of a strong desire to build and operate a highly efficient and sustainable campus that can be emulated and cost-effectively scaled by others.

HARC shares these best practices and lessons learned through its Living Lab, allowing ongoing testing and validation of new efficiency and sustainability approaches, ranging from urban forest management to testing the latest plug-load technology. All insight can be passed on to building designers, owners, and operators to facilitate and support their work to reduce greenhouse gas emissions and achieve the national goal of net zero by 2050.

The commercial sector accounts for approximately 13% of the greenhouse gas emissions in the United States[2] due to energy, water, and other waste.

[2] https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions

## Actions

1. Update and expand HARC's facilities management plan to support the operation and maintenance of maximum building efficiency; facilitate the maintenance of LEED, Energy Star, and Net Zero building certification, and pursue sustainability frameworks such as Nature Based Solutions (NBS) and Low Impact Development (LID), carbon, waste, and/or water certifications.
2. Adapt HARC's building systems to reduce CO2 emissions by installing energy storage and demand response systems.
3. Leverage HARC's Living Lab by operating as a third-party validator of technologies to support sustainable technology deployment and developing sustainability frameworks for organizations looking to reduce carbon footprint and become more resilient.
4. Consolidate and strengthen HARC's position as the expert in building data use and optimization through demonstrations, webinars, and whitepapers to help other organizations enhance sustainability.
5. Provide technical assistance and support to companies and organizations that have a strong commitment to sustainability, including reductions to their carbon footprint, by providing them the opportunity to assess, test, and validate clean and complementary technologies and best practices.
6. Collaborate with stakeholders from the built environment and energy sectors to investigate and examine methods and approaches to determine how clean onsite energy efficiency, generation, and other best sustainable practices can support greater development of net zero buildings and sustainable sites.
7. Launch a consulting practice centered on HARC's green building expertise and capabilities, including LID and NBS, to local governments, businesses, potential partners, the development community, and other entities to accelerate decarbonization of the commercial sector.
8. Continue to host public and school tours of HARC's home.

HARC shares these best practices and lessons learned through its Living Lab, allowing ongoing testing and validation of new efficiency and sustainability approaches.

# STRATEGIC INITIATIVE 4

## Develop and Launch the Climate Equity and Community Engagement Initiative

### Goal

Establish the Climate Equity and Community Engagement Initiative (CECEI) at HARC to inform and support co-development and implementation of climate equity and resilience initiatives in underserved communities.

### Rationale

While the benefits of energy are vast, its production has caused serious problems for underserved and fenceline communities. The air toxins, particulates, and other air pollutants emitted by industrial facilities that operate in close proximity to these communities have serious health consequences. Aging and deteriorating infrastructure and flooding also tend to exist in these communities. These environmental challenges and the absence of public and private investments in underserved and fenceline communities have combined to create climate inequities. Low and zero-emitting sources of energy that are expected to result from the current energy transition, along with deliberate and strategic community investments, are effective pathways to climate equity. The just distribution of these and other benefits is crucial. Prioritized efforts are required to balance access to key resources while protecting underserved communities and populations from environmental hazards, regardless of race, income, or other characteristics.

HARC is committed to collaborating with businesses, government, and communities to develop and implement effective solutions to address climate equity, with a focus in the energy and water sectors.

Prioritized efforts are required to balance access to key resources while protecting underserved communities and populations from environmental hazards, regardless of race, income, or other characteristics.

## Actions

1. Continue to advance equity, diversity, inclusion, and accessibility at HARC through partnerships with Historically Black Colleges and Universities and minority-serving institutions, internal employee recruitment and retention practices, and internship programs.
2. Identify key organizations and leaders within underserved communities and establish strong working relationships that will result in understanding community needs and concerns related to climate equity and sustainability.
3. In consultation and partnership with stakeholders from underserved communities, develop intellectual, financial, natural, political, and social capital to co-create and implement community projects and initiatives that address climate equity and resilience.
4. Establish the Climate Equity and Community Engagement Council to advise and support the CECEI. This Council will be composed of representatives from underserved communities.
5. Work with underserved communities to build their expertise and capacity to implement climate equity and resilience solutions and to co-develop strategic initiatives to address these needs.
6. Integrate community engagement and climate equity metrics into HARC programs.
7. Collaborate and work with federal agencies to develop models and analytical tools to evaluate and quantify the flow of benefits to underserved communities resulting from federal climate and infrastructure investments, and identify the negative effects that funded projects may have on these communities to ensure that they are effectively addressed.

HARC is committed to collaborating with businesses, government, and communities to develop and implement effective solutions to address climate equity.

# GLOSSARY

**Climate Equity** – ensures the just distribution of the benefits of climate protection efforts and alleviates unequal burdens created by climate change. Climate equity works to balance access to key resources, while protecting underserved communities and populations from environmental hazards, regardless of race, income, or other characteristics.

**Distributed Energy Resources (DER)** – technologies for generating and managing electricity at the place of consumption, thereby decentralizing the power grid. DER systems can be sized to meet a particular need and installed onsite, allowing a facility to operate independently of the electric power grid by choice or out of necessity. The technologies can lower costs for consumers, improve the reliability and resilience of the power grid, and increase equity in the power sector. Examples include rooftop solar photovoltaic units, natural gas turbines, microturbines, wind turbines, combustion turbines, biomass generators, reciprocating engines, fuel cells, cogeneration, tri-generation units, battery storage, electric vehicles (EV) and EV chargers, and demand response applications.

**Fenceline Communities** – members of the general population living in close proximity to a source of pollution, such as air emitting facilities or a receiving waterbody, and who therefore may be disproportionately exposed to a chemical undergoing risk evaluation by the Environmental Protection Agency. Fenceline communities are neighborhoods near or adjacent to industrial facilities, refineries, ports, and chemical facilities, which often puts these communities in the direct path of accidents, spills, explosions, toxic emissions, and exposures to chemicals over long periods of time. The community is directly affected by the traffic, noise, operations, and chemical and fossil fuel emissions from the nearby facilities.

**Net Zero Building** – a building that is designed and built to consume as little energy as possible, and that produces enough renewable energy to meet or exceed its own annual energy consumption requirements, thereby reducing the use of non-renewable energy in the building sector. Also known as a “zero energy building” or ZEB, the building uses cost-effective measures to reduce energy usage through energy efficiency, and includes energy systems that produce enough energy to meet remaining energy needs.

**Resilience** – the ability of social, economic, and ecosystems to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to climate.

**Sustainability** – engaging in practices that consider and support ecological, societal, and economic health and vitality. Sustainability presumes that resources are finite and must be conserved, protected, and distributed in a manner that meets the needs of the present without compromising the ability of future generations to meet their own needs.

**Underserved Communities** – populations or groups sharing a particular characteristic, as well as geographic communities, that have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life, that have limited or no access to resources, or that are otherwise marginalized and/or disenfranchised, including people of color, those with low to moderate incomes, and other populations that may be disproportionately impacted by environmental harms and risks.

A stream in The Woodlands, Texas

HARC

8801 Gosling Road
The Woodlands, Texas 77381

4200 San Jacinto Street
Houston, Texas 77004

HARCresearch.org