



HARC

2019

ANNUAL REPORT

HARCresearch.org

Helping people thrive
and nature flourish

Letter from the President and CEO

At Our Best in 2019 and Beyond

HARC President and CEO, Lisa Gonzalez

Photo credit: HARC



The world in which HARC exists is dynamic and extreme events—whether related to natural disasters or public health crises—drive planning and policy efforts across all levels of government and the private sector. Now more than ever there is a need for science-based solutions and independent analyses that address overlapping economic, environmental, and social issues.

HARC has gained wide recognition among funders and partners for its approach to generating actionable information from complex data. Our team of scientists, engineers and geospatial, and policy experts work every day to analyze the many datasets that describe energy, air and water resources, ecosystems, the built environment, and the economic and social well-being of communities. HARC researchers develop information products and tools upon which sound policy and practical decisions can be made to benefit society.

Last year, much of HARC's sustainability research focused on clean energy transition strategies; planning for a low carbon future; understanding connections between water resources, landscapes, and people; analyzing data to reduce the health impacts of air pollution on vulnerable communities; and working to reduce the impacts of climate change through mitigation, resilience, and adaptation efforts.

In addition to our research efforts, in 2019, HARC became the first organization in Texas to operate a LEED Platinum, certified net-zero energy commercial building. This 18,600 square foot living lab allows HARC scientists and engineers to test new building technologies and collect real-time data. Our building represents a targeted response action to achieve reductions in greenhouse gas emissions and serves as an evidence-based model for architectural designers, developers, and builders in the Gulf Coast region.

In 2019, HARC's Board of Directors approved a three-year strategic plan that focuses on six key initiatives: Excellence in Science and Research, Technology and Policy Impacts, Community Connections, Green Building Showcase, Collaborative Culture, and Organizational Growth. With this plan as a blueprint for the future, HARC seeks to provide transformative research and top-tier science that speak to our legacy as a science-based, sustainability organization.

With our multi-disciplinary, innovative team, HARC is positioned to enter the next decade ready to address the most pressing sustainability challenges and opportunities. We are building a dedicated, multidisciplinary Climate Program that will use data analytics to facilitate a greater understanding of climate risk in Texas and facilitate the diffusion and adoption of climate mitigation and adaptation strategies. This new program will enhance our ability to provide robust analyses and applied research in support of technical assistance and science-based policies for the private and public sectors.

The successes highlighted in the following pages are the result of ongoing partnerships and innovative collaborations. We express sincere appreciation and gratitude to our supporters, especially our partners and the funders that make HARC's work possible. The challenges ahead can sometimes seem daunting. However, increasing recognition of the importance of clean energy solutions and decarbonization, coordinated and green approaches to water management, and clean air for the health of communities show that there is a growing movement for a more sustainable future. We at HARC look forward to working with you to make the future brighter for generations to come.

Sincerely,

A handwritten signature in black ink, appearing to read 'Lisa Gonzalez'.

Lisa Gonzalez

President & Chief Executive Officer

HARC

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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



Galveston Bay, the 7th largest estuary in the U.S. and the largest estuary in Texas, is a vital ecological and economic resource for our region.

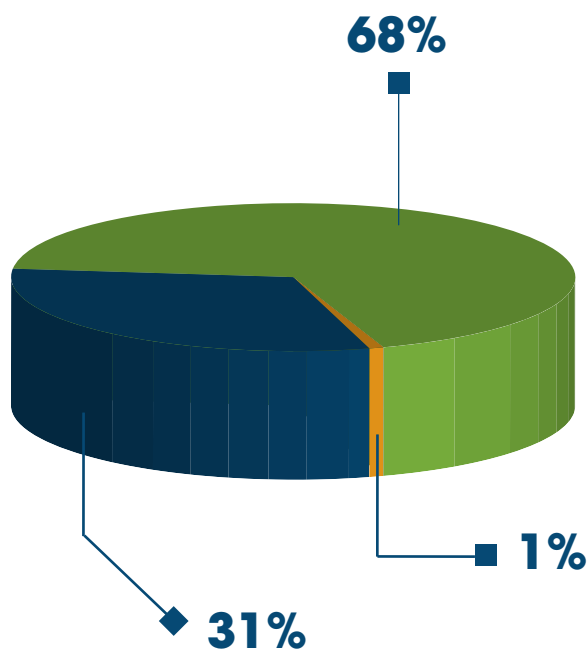
Photo credit: Galveston Bay Foundation

2019 FINANCIALS

Fiscal Year: January 1 - December 31

TOTAL OPERATING EXPENSES

\$4,397,999



\$2,994,713

Program Services

\$1,370,243

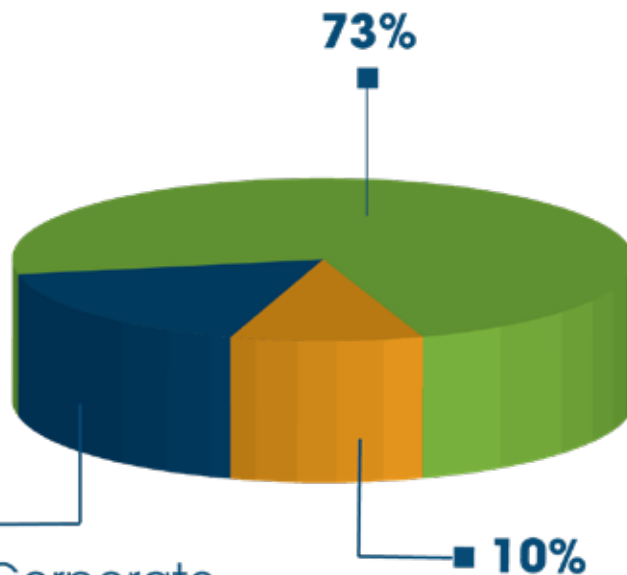
Management and Support

\$33,043

Fundraising

OPERATING REVENUE

Federal and Federal Flow-Through



73%

17%

Foundation and Corporate

10%

State and Local Government

EXCELLENCE IN RESEARCH AND SCIENCE

HARC works collaboratively with a diverse array of partners and stakeholders to find solutions that balance environmental quality, economic well-being, and social equity. We embrace scientific principles that contribute to a sustainable future that helps people thrive and nature flourish.

HARC's ongoing success tackling the biggest challenges in sustainability spans nearly four decades of innovative, science-based research and technology development. Throughout our history, HARC's vision for promoting thriving economies, flourishing ecosystems, and healthy communities has remained steady and consistent.

Texas Residential Passive Survivability

In partnership with Texas' State Energy Conservation Office, the Residential Passive Survivability guide serves homeowners as a resource to maintain, build, or renovate homes to increase energy efficiency and sustainability.

Photo credit: HARC

EXCELLENCE IN RESEARCH AND SCIENCE

HARC's Clean Energy group provides research, tools, and technical assistance as the global community works to decarbonize the electric power sector and mitigate physical climate risk. HARC's continued efforts will guide policymakers and industry leaders towards improvements in areas such as electric power resilience, energy efficiency, distributed energy resources, and low impact oil and gas exploration.

Combined Heat and Power Technical Assistance Partnership (CHP TAP)

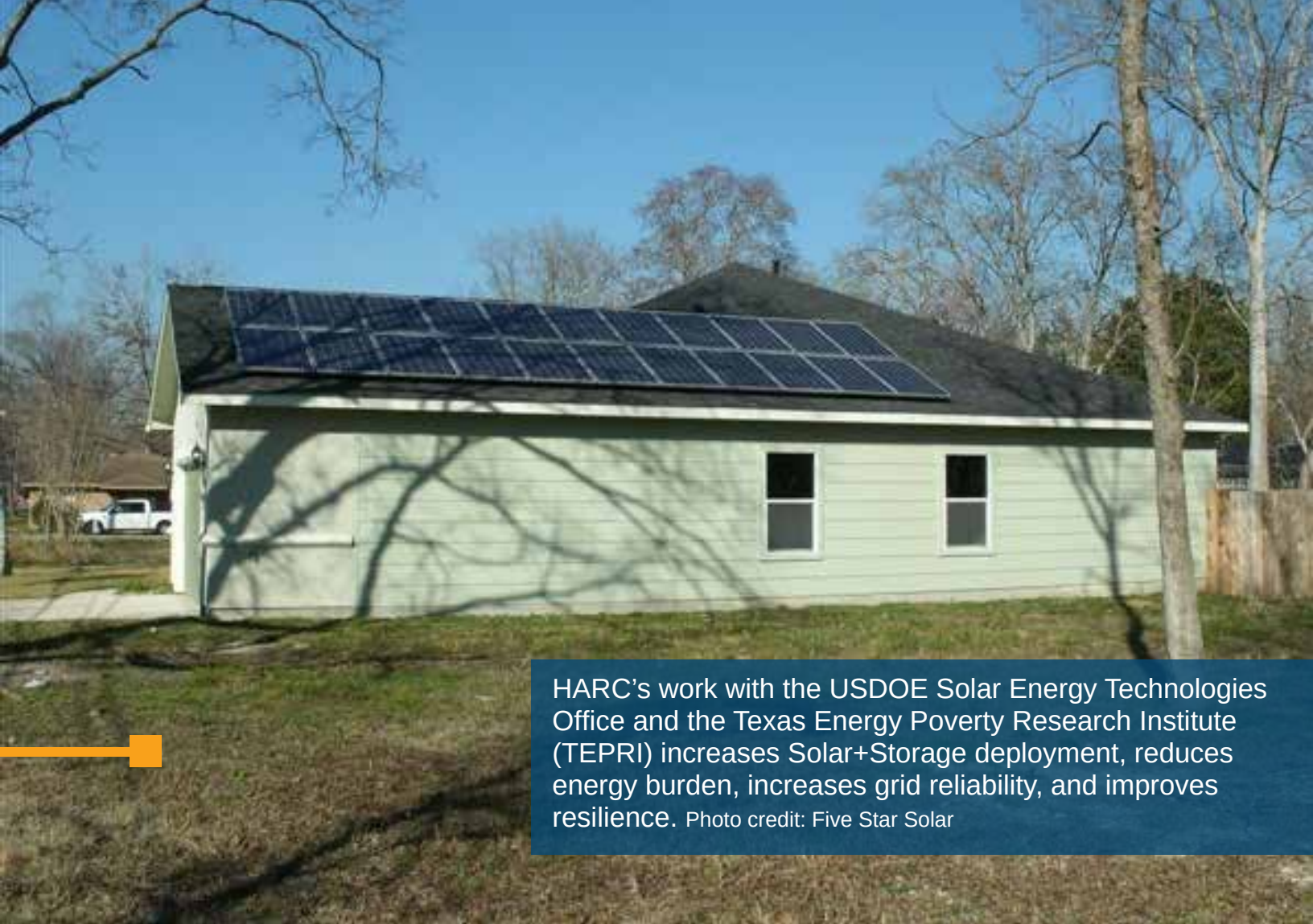
The U.S. Department of Energy (USDOE) funds the CHP TAP to provide technical assistance and outreach to end-users with the intent to promote the development of more resilient energy systems with CHP and microgrids. HARC researchers manage Southcentral and Upper-West program activities in 11 states from Texas to Montana. Key partners include public and private sector entities working in the industrial and manufacturing sector, critical infrastructure, institutions, commercial facilities, and utilities.

Activating Opportunity Zones for Accelerated Solar+Storage Deployment in Low- and Moderate-Income Communities

HARC works with the USDOE Solar Energy Technologies Office and the Texas Energy Poverty Research Institute (TEPRI) bring solar and battery storage to low- and moderate-income communities in Texas through innovative technology and financing programs.



CLEAN ENERGY



HARC's work with the USDOE Solar Energy Technologies Office and the Texas Energy Poverty Research Institute (TEPRI) increases Solar+Storage deployment, reduces energy burden, increases grid reliability, and improves resilience. Photo credit: Five Star Solar

State Energy Conservation Office (SECO) Solar Decision Tool


HARC works to increase the deployment of energy efficiency technologies and develop decision tools to help commercial building owners and residential homeowners in Texas better understand solar energy options. The solar decision tool allows end-users to model available energy efficiency options and run capital investment scenarios.

Texas Property Assessed Clean Energy (PACE)

PACE is a voluntary financing tool that helps owners of commercial, non-profit, industrial, and multifamily properties invest in energy efficiency, water conservation, and distributed generation improvements with little or no upfront capital outlay. HARC educates policy makers on the development of PACE clean energy financing programs across Texas. We created the TX-PACE Energy and Emissions Tracker to show how PACE projects are reducing energy and water consumption, lowering emissions, and providing significant economic benefits across the state.

EXCELLENCE IN RESEARCH AND SCIENCE

Water research emphasizes water quality and quantity, watershed management, biodiversity and ecological function, and ecosystem informatics. Integration, analysis, and dissemination of information regarding important water issues is considered key to advancing more sustainable management of coastal watersheds, water supplies, and water quality.



The second phase of the Double Bayou Watershed Partnership program implements actions to improve the watershed's water quality.

Photo credit: Dr. Ryan Bare

Double Bayou Watershed Protection Plan

In partnership with the Texas State Soil and Water Conservation Board, HARC engages stakeholders to implement a Watershed Protection Plan for the Double Bayou Watershed on the east side of Galveston Bay. A watershed protection plan is a locally developed, voluntary watershed management plan that helps to restore and protect water quality. Plan development, which was led by HARC and the Double Bayou Watershed Partnership, engages stakeholders in a collaborative and participatory approach in watershed planning.



WATER



The Galveston Bay Report Card analyzes samples to provide information on the Bay's overall health. Photo credit: Galveston Bay

Galveston Bay Report Card

The Report Card is a citizen-driven, science-based grading system created in partnership with Galveston Bay Foundation and funded by Houston Endowment. In 2019, Galveston Bay was graded a "C" in overall health, which has remained consistent since the card's inception in 2015. Since announcing the 2019 results, the Report Card team has shared its findings regionwide to promote public engagement in conservation activities geared toward protecting and improving the health of Galveston Bay.



Water samples taken from Lake Livingston are evaluated by HARC to define ongoing changes in water quality. Photo credit: Dr. Ryan Bare

Assimilative Capacity of Lake Livingston

HARC works with the U.S. Geological Survey (USGS) to determine if Lake Livingston, a multi-purpose reservoir located northeast of Houston, traps sediments and nutrients as they move through the Trinity River system. As freshwater flows from upstream watersheds to Galveston Bay, it is vital to understand how sediments and nutrients move through the tributaries and reservoirs. With Phase I complete in 2019, in 2020, Phase II will determine the persistence of nutrient assimilation in the reservoir and detect whether nutrients and sediments are transported downstream during high flow conditions. Funders of this work include the Texas Water Development Board and Texas Commission on Environmental Quality's Galveston Bay Estuary Program.



The State of the Bay Report is about the nature and history of the Galveston Bay System, the findings of studies on Galveston Bay and its watershed, and the management actions based on those findings. Photo credit: HARC

State of the Bay

The State of the Bay Report is a resource for historical and up-to-date analysis of the conditions in and around Galveston Bay. The scientific information and analysis conducted for the State of the Bay is placed in the context of historical resource use and modern social and economic features of the Galveston Bay Watershed. HARC is currently producing the fourth edition of the State of the Bay Report as a web-based edition for the first time.



Marine debris and litter line the coast along Galveston Bay.

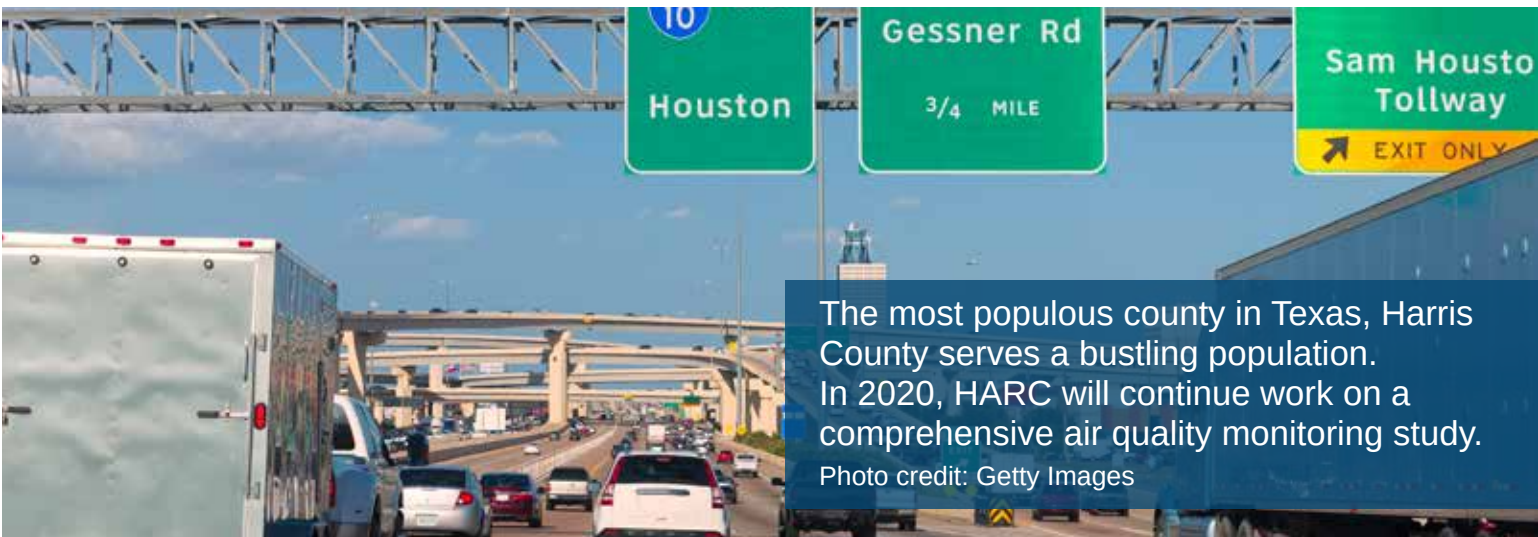
Photo credit: T'Noya Thompson.

Waterway Trash and Marine Debris

HARC researchers work with partners to lead the creation of a regional waterway trash and marine debris action plan. This grassroots coalition of organizations known as Partners in Litter Prevention created the Don't Trash a Good Thing planning initiative and hosted the 4th annual Trash Summit for the Greater Houston Region. With funding from the Garver Black Hilyard Family Foundation, HARC and partners are developing novel trash detection methods and data platforms to more effectively prevent waterway trash in Texas streams, bayous, lakes, and bays.

EXCELLENCE IN RESEARCH AND SCIENCE

HARC's work in air quality research and management includes air quality modeling, emission reduction technologies, emissions monitoring technology, and policy. In addition, researchers study regional impacts of and adaptations to climate change. The air research program is multi-disciplinary and multi-institutional; objective and non-partisan.



The most populous county in Texas, Harris County serves a bustling population. In 2020, HARC will continue work on a comprehensive air quality monitoring study.
Photo credit: Getty Images

Harris County Precinct 2 Air Quality Monitoring Assessment


Funded by Harris County, HARC's work included the collection and detailed analysis of ambient air quality data from the region's existing regulatory air quality monitors along with the identification of Harris County Precinct 2's major emissions sources, with a focus on large-scale industrial facilities. The next phase of the project will include significant community engagement efforts and supplemental air quality monitoring utilizing the HARC mobile lab.



AIR

EXCELLENCE IN RESEARCH AND SCIENCE

HARC's resilience research is driven by the importance of problem solving with a systems approach. We bring together HARC's multidisciplinary air, energy, and water expertise in a way that provides practical, science-based solutions for communities to identify and mitigate risk and increase the sustainability of the upper Texas Gulf Coast.



As part of the Galveston Bay Estuary Resilience Assessment, a companion report will be developed in coordination with subject matter experts.

Photo credit: HARC

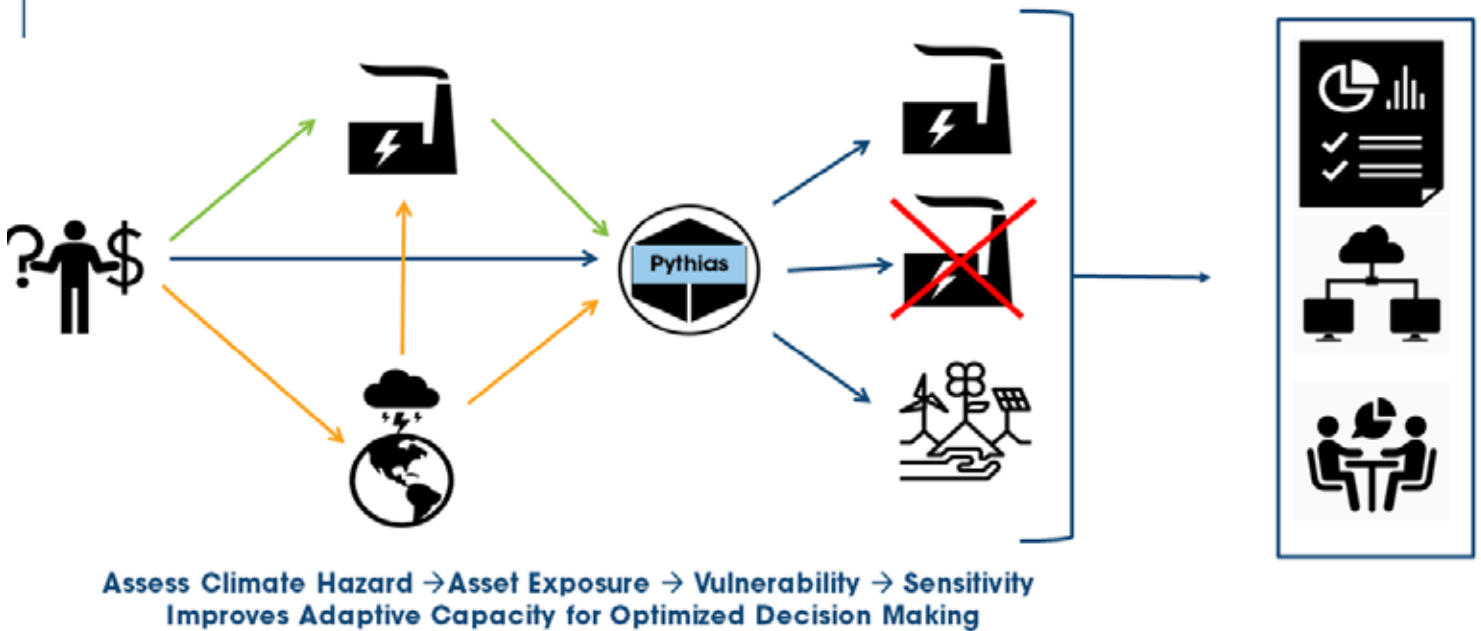
Galveston Bay Estuary Resilience Assessment

With funding from Texas Commission on Environmental Quality's Galveston Bay Estuary Program, HARC continued work on the Galveston Bay Estuary Resilience Assessment project. HARC works with Estuary Program stakeholders to create a companion document to the US Environmental Protection Agency-approved *Galveston Bay Plan* that will provide resiliency adaptation considerations for implementation of *The Plan* in the Lower Galveston Bay Watershed.



RESILIENCE

PYTHIAS' VISION - OPTIMIZE DECISION MAKING WITH CLIMATE RISK ANALYTICS



PYTHIAS

HARC launched the early-stage development of a physical climate vulnerability assessment software tool to assist utilities, planners, asset managers, and owners in the reduction of liability and costs associated with power plant development and operations. The software platform will help the energy sector assess how climate change could impact future power generation, grid performance, and investment.



RESIN

With support from Global Giving, HARC began developing the Resilience Information Network (RESIN). Through a collaborative partnership with scientists from universities, industry, and government, HARC began creating an online platform to access, analyze, and share existing resilience data sets and climate risk modeling results. The questions driving the analysis will include how the climate change assessment layers will impact critical systems, infrastructure, and vulnerable habitat in our region.

TECHNOLOGY & POLICY IMPACTS

HARC works with multiple partners in our region, across Texas, and the nation. While projects are complex, the outcome is simple – science-based solutions for a rapidly changing world. Our tools provide information for policymakers, decision makers, and organizations that require transparent, reliable, and transformative research.


Case Study 1: Air Quality Mobile Lab

The Houston region is known for having some of the highest concentrations of ozone and hazardous air pollutants in the nation. This pollution disproportionately impacts many culturally diverse and low- to moderate-income neighborhoods. Traditional ways of measuring ambient air quality have primarily relied on “fixed” monitors which lack resolution in both space and time. This limits their ability to provide air quality data and exposure information at other locations of interest or after emissions events and accidental releases. The HARC mobile lab, which deploys rapidly and remotely anywhere with vehicular access, measures multiple pollutants to a quantifiable standard while either stationary or in motion. The HARC mobile lab monitors for the most problematic of all air pollutants (air toxins like benzene) down to extremely low levels. In 2019, the mobile van was significantly upgraded to enhance its ability to monitor for criteria pollutants such as ozone, carbon monoxide, and PM_{2.5}.



In 2019, the HARC mobile lab received significant upgrades to aid in air quality monitoring programs.

Photo credit: HARC



Hurricane Harvey was the largest rain event in U.S. history and solidified the fact that climate change poses a major challenge for Houston. As a technical advisor, HARC worked with the City of Houston to develop the City's Climate Action Plan, which sets a goal of carbon neutrality by 2050.

Photo credit: HARC

Case Study 2: City of Houston's Climate Action

HARC worked throughout 2019 to support the City of Houston in the development of a climate action plan (CAP) and on April 22, 2020, the City released its first community-wide CAP. The CAP is meant to provide Houston residents a roadmap for the City, analyzing current emission sources and evaluating the health, safety, and economic benefits of various strategies that will bring Houston closer to a carbon-neutral future by 2050. HARC played a key role in the development of the plan. As the City's technical advisor for the CAP, HARC was responsible for developing the goals, strategies, and actions with a significant focus on cost-effective strategies to

decarbonize the energy sector, improve building performance, provide equitable, low carbon transportation options, and improve the City's resource management efforts. HARC also led much of the stakeholder engagement and outreach activity. When engaging community members, it was imperative that all interests had an opportunity to be heard. The result was an equitably focused plan that fit Houston ethos. HARC looks forward to working with the City of Houston and key stakeholders as the City moves forward with implementing the CAP over the next several years.

“ HARC matters because it's one of a few institutions in our region, if not the only one, that provides non-partisan, science-based solutions to support a sustainable future.

—
Cullen K. Geiselman, PhD, HARC Vice-Chair

Green Building and the Road to Net Zero

At HARC, we are fortunate in that we can work on research projects that help make our world more sustainable, and we undertake this work in a building that showcases green building design, efficient technology, and sustainable operations in action; a Living Lab. The building's energy use intensity, a measure of a building's annual energy use relative to its size, is just under 15.5 kilo-BTUs per square foot per year. Our building uses 76% less power than a typical office building and is more efficient than 99% of all office buildings in the United States.

This impressive energy efficiency is primarily due to the building's siting, high-performance envelope, high-efficiency geothermal heat exchange-based heating, ventilation and air conditioning systems, and abundant daylight and efficient lighting systems.

Just as important as the design and engineering of the building's systems, are the active monitoring of onsite systems and responsive building operations that continually optimize conditions and ensure efficiency standards are met and, as feasible, exceeded.

The HARC Living Lab reduces its carbon footprint by conserving the energy we use, and using only clean, renewable energy that is better for the environment and our bottom line. Since its opening, our building has sequestered carbon dioxide from the climate. This equates to over two thousand trees planted and a reduction from the roadways of nearly a quarter of a million miles traveled. Also, our building's Energy Star certification score increased to 99 (out of 100) - this means the facility is more efficient than 99% of all office buildings in the United States.

HARC LIVING LAB: BY-THE-NUMBERS





HARC's LEED Certified Living Lab welcomes guests daily to educate them on its energy-efficient design.

Photo credit: HARC

AWARDS & CERTIFICATIONS

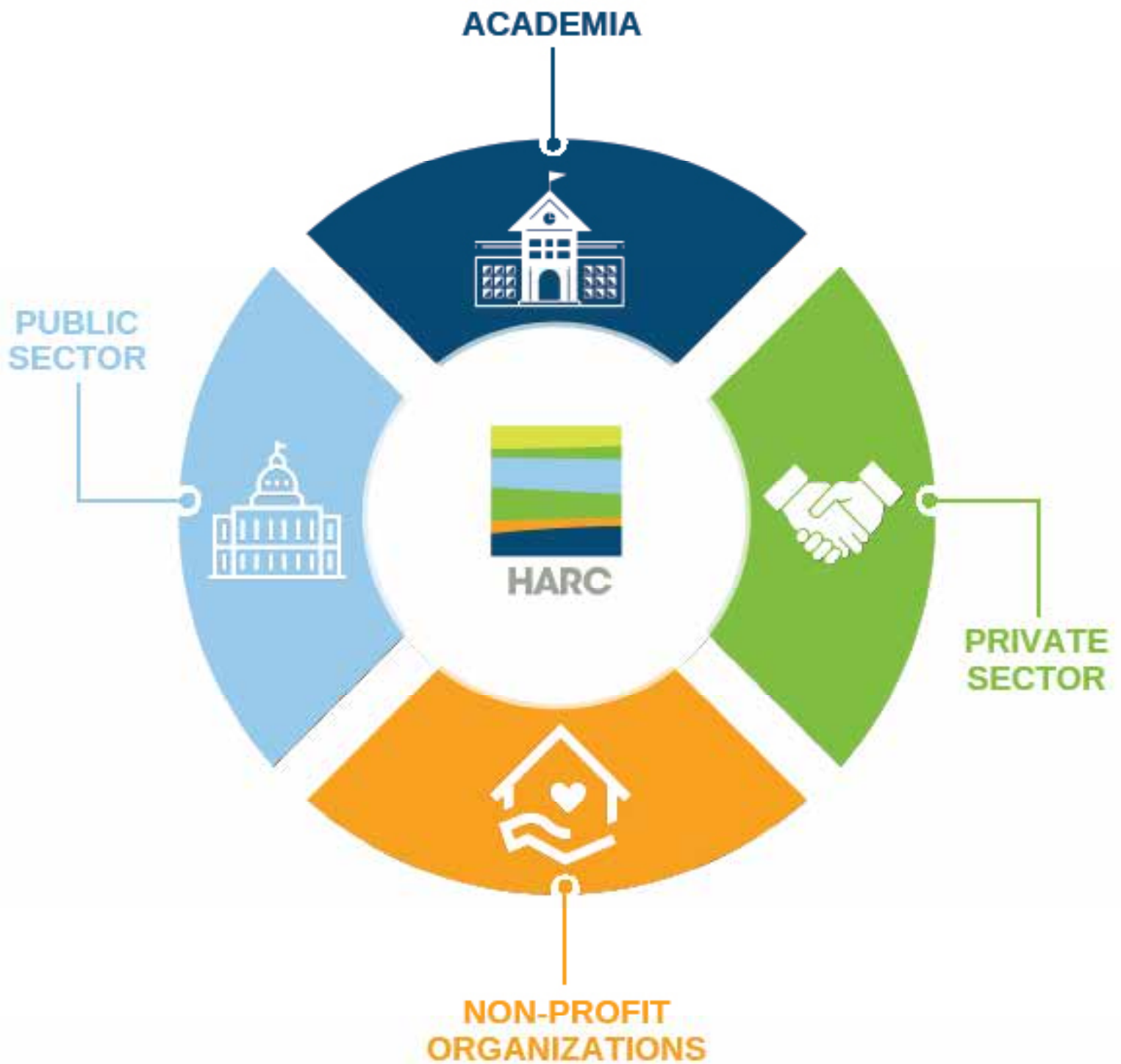


The HARC Living Lab is now officially a net-zero energy building. It is the first, and only, office building in Texas certified as Zero Energy by the International Living Future Institute. Being net-zero energy means that we have produced more renewable (solar) power on-site from our 88-kW rooftop mounted solar array than the power consumed by the building over the past 12 months; 25% more power to be exact. The HARC HQ building is a showcase, a living lab, and an educational and demonstration site.



At HARC, an innovative and collaborative culture is a vital component of our organization's SUCCESS. Photo credit: Gensler

COMMUNITY CONNECTIONS





HARC is a community resource; we bring scientific research to a wide range of organizations and help to inform the region about our changing environment. Photo credit: Galveston Bay Foundation

“

HARC has been an incredible partner, advancing societally beneficial research and thought leadership. The organization “walks the walk” and demonstrates the culture of sustainability. Their partnerships in research are groundbreaking and exemplify the collaboration with partners across the ecosystem.

Ramanan Krishnamoorti, PhD,
University of Houston, HARC Board

”

“

Sun Club is proud to work with HARC to support energy, air, and water research for Houston and the world. The HARC building and campus is a testament to what is possible when an organization puts their mission into practice and in doing so, leads the way for other organizations to take the same important steps towards sustainability and clean energy solutions.

Stacy Mehlhoff, Green Mountain Energy Sun
Club, Executive Director

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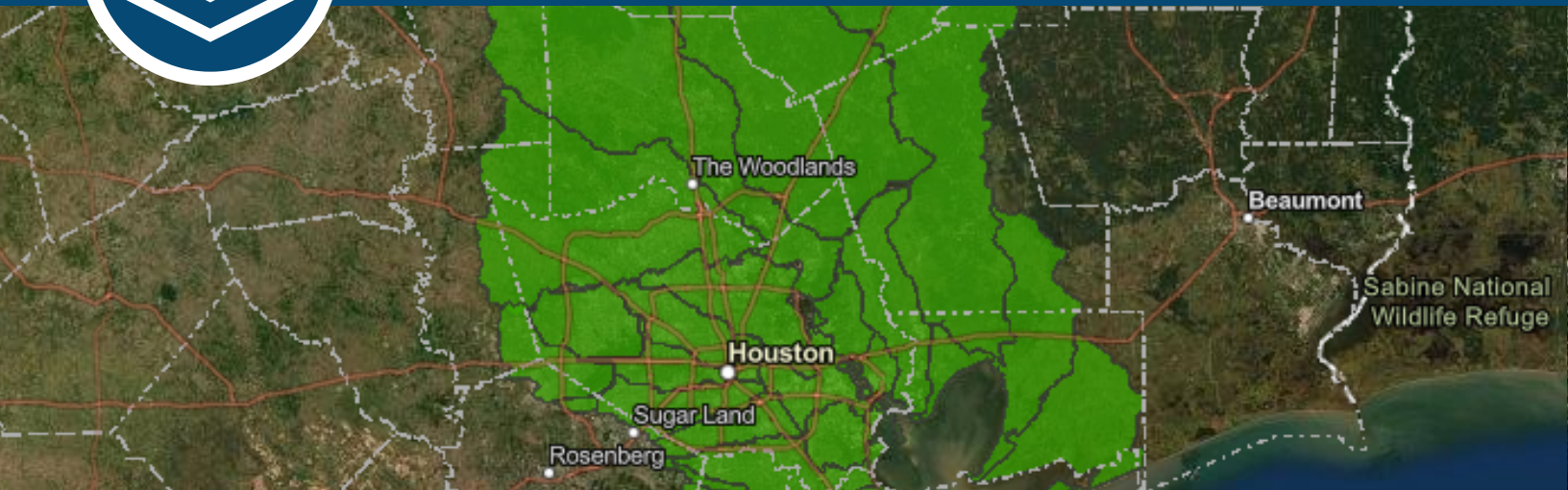
HARC researchers travel throughout our region, across Texas, and all over the U.S. to share their knowledge and expertise. Photo credit: HARC

HARC SOLUTIONS CENTER

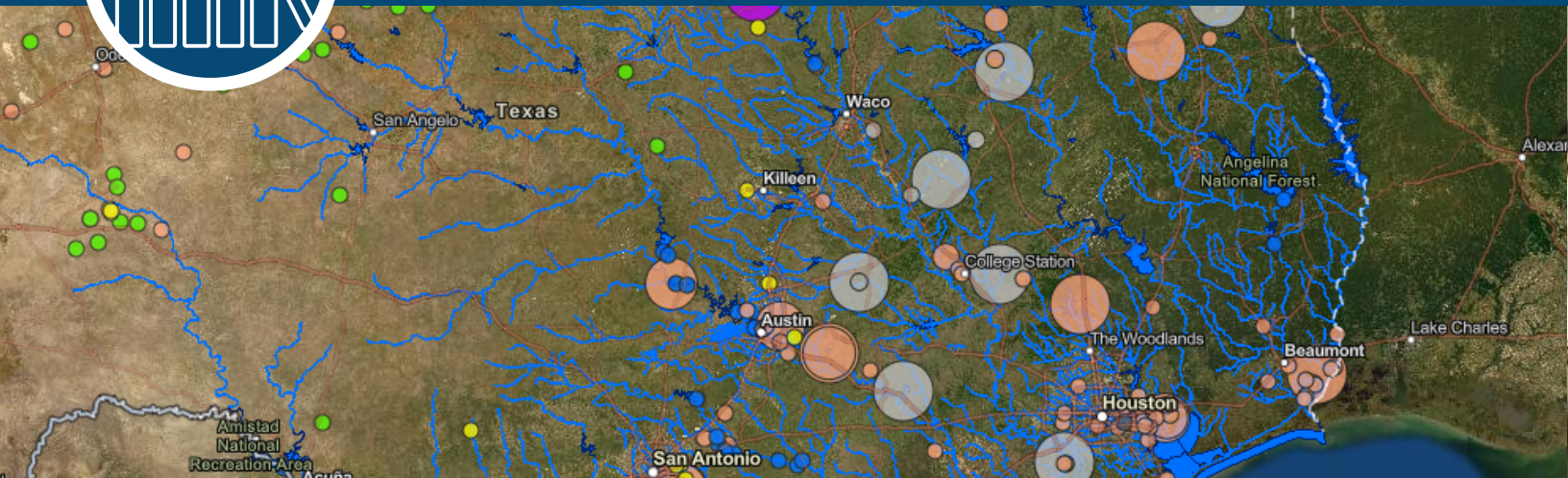
HARC provides the following technical services to government agencies, non-profit organizations, businesses, and community groups:



GIS services including data mapping, data visualization, and interactive Story Maps;



Data analyses and modeling with evidence-based information, to improve decision-making, to identify critical risks, and to implement best practices;



Energy audits and modeling for existing and new commercial development projects;



Low Impact Development (LID) practices for environmental design to be implemented in public and private spaces;



Community engagement programs and outreach campaigns for a wide variety of topics and concerns.



HARC's research supports the missions of many non-profit partners. A longstanding and successful partnership with the Galveston Bay Foundation created Galveston Bay Report Card—a citizen-driven scientific analysis of the health of Galveston Bay Photo credit: Galveston Bay Foundation

PUBLIC OUTREACH

22
Public
Events



1,375
Visitors to
HARC Campus




159
HARC
Conference
Presentations



4,050
Total People
Reached



2020 AND BEYOND



At HARC, we are focused on science-based solutions that provide a sustainable future for the Houston region and the world. Photo credit: Getty Images

In the coming year, HARC will initiate research projects on the topics of energy resilience and air quality analysis.

Clean energy efforts will focus on providing research, tools, and technical assistance to decarbonize the electric power sector and to mitigate physical climate risk with a focus on helping low- to moderate-income communities reduce their energy burden. Programs will focus on three key areas: power grid resilience, (keeping the lights on during and after major storm events), grid decarbonization efforts, and climate action with resilience plans and implementation efforts for local governments and key stakeholders.

HARC's water team will also initiate research projects focusing on clean water and healthy ecosystems. One focus for the water team will be to engage in projects for the benefit of the Galveston Bay ecosystem by supplying quality-assured data and information related to the conservation and management of Galveston Bay. The HARC team will also continue sampling and analysis to study assimilative capacity of reservoirs in the region. In addition, HARC will focus work on implementing and communicating the importance of low impact development features to improve water quality and water conservation.

HARC's air quality mobile lab, in collaboration with local governments and non-profit organizations, will collect samples to study air quality in the region. Stay informed about our research and progress by visiting www.HARCresearch.org.

“ HARC continues my father's vision of applying sustainability science to complex, regional issues in Texas. HARC's unique focus is perhaps more important today than when HARC was founded in 1982. A sustainable future is not only possible, it is necessary and organizations like HARC are essential if that future is to be realized by all.

J. Todd Mitchell, HARC Board Chair ”

8801 Gosling Rd. • The Woodlands, TX 77381
HARCresearch.org

HARC, a 501(c)(3) organization incorporated as Houston Advanced Research Center, was founded in 1982. HARC is a research hub providing independent analysis on energy, air, and water issues to people seeking scientific answers. We are focused on building a sustainable future that helps people thrive and nature flourish.

Lisa Gonzalez

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HARC