RESILIENT HOUSTON



RESILIENT HOUSTON

CHAPTER 1
PREPARED & THRIVING HOUSTONIANS

 GOAL 1 — We will support Houstonians to be prepared for an uncertain future. — page 46

 GOAL 2 — We will expand access to wealth-building and employment opportunities. — page 55

 GOAL 3 — We will improve safety and well-being for all Houstonians. — page 62

CHAPTER 2
SAFE & EQUITABLE NEIGHBORHOODS

 GOAL 4 — We will ensure that all neighborhoods have equitably resourced plans. — page 72

 GOAL 5 — We will invest in arts and culture to strengthen community resilience. — page 76

 GOAL 6 — We will ensure all neighborhoods are healthy, safe, and climate ready. — page 79

 GOAL 7 — We will build up, not out, to promote smart growth as Houston's population increases. — page 87

CHAPTER 3
HEALTHY & CONNECTED BAYOUS

 GOAL 8 — We will live safely with water. — page 96

 GOAL 9 — We will embrace the role of our bayous as Houston's front yard. — page 104

CHAPTER 4
ACCESSIBLE & ADAPTIVE CITY

 GOAL 10 — We will demonstrate leadership on climate change through action. — page 112

 GOAL 11 — We will modernize Houston's infrastructure to address the challenges of the future. — page 118

 GOAL 12 — We will advance equity and inclusion for all. — page 127

 GOAL 13 — We will transform city government to operationalize resilience and build trust. — page 133

CHAPTER 5
INNOVATIVE & INTEGRATED REGION

 GOAL 14 — We will continue to invest in the region's diverse economy. — page 140

 GOAL 15 — We will increase regional transportation choice. — page 145

 GOAL 16 — We will manage our land and water resources from prairie to bay. — page 150

 GOAL 17 — We will enhance regional emergency preparedness and response. — page 153

 GOAL 18 — We will leverage existing and new investments and partnerships. — page 159



In late August 2017, Hurricane Harvey ravaged the Houston area with one trillion gallons of rain, enough to run Niagara Falls for 15 days. No other big American city has withstood such a natural disaster in modern times. By and large, the nation's fourth most populous city has bounced back from the devastation of not just Hurricane Harvey but six federally-declared flooding disasters in five years—including Tropical Storm Imelda in September 2019—that have wreaked havoc on Houston's physical and fiscal infrastructure.

One year after Harvey, we were not only focused on our recovery, but on the transformative change that comes from thinking and acting holistically to build and grow our long-term resilience. Through the generous sponsorship of Shell, we joined 100 Resilient Cities—Pioneered by The Rockefeller Foundation. Houston is the only city to have the support of a local partner to hire a Chief Resilience Officer and develop a resilience strategy.

We took immediate action in the aftermath of Harvey by investing in ourselves and changing ordinances to rebuild into a smarter, more resilient city that is prepared to deal with chronic flooding. After extensive debates with various stakeholders, the City Council approved my proposal to require that new and substantially remodeled structures in floodplains be built higher. Voters approved a $2.5 billion, 15-year flood mitigation program for Harris County. Three months later, they reauthorized a 20-year, $6 billion urban drainage improvement program, renamed as Build Houston Forward.

Hurricanes, tropical storms, and flooding are not the only threats that we face. Houston is hot—and our heat is increasing due to climate change and the urban heat island effect. As vice chair of the Climate Mayors and a member of the C40 Cities Climate Leadership Group, I work with big city mayors around the world on limiting man-made global warming that is making hurricanes like Harvey bigger and slower than they would otherwise be and adapting to these extreme weather events that are increasing in frequency and intensity. Houston, as the energy capital of the world, must lead the global energy transition. If we do not, we will jeopardize our regional economy and prosperity for generations of Houstonians.

We are faced with a choice. Either we commit now to making the investments in our workforce and infrastructure that can prevent huge losses, or we become short-sighted and think we have plenty of time. By choosing the latter, we will be too late.

We are also focused on increasing the resilience of our neighborhoods, particularly in those that have been historically underinvested. Through my Complete Communities initiative, we have begun a neighborhood planning effort that works with community leaders to prioritize actions in our neighborhoods that will improve quality of life. Focusing on growing neighborhood resilience leverages the existing efforts to ensure that Houston is not a tale of two inequitable cities.

This is what *Resilient Houston* is all about. It is a framework for how to move forward to help our people, places, and systems be safer and stronger to support our dynamic and diverse city continue on a path to prosperity for all.

Sylvester Turner

Mayor



Houston is a city of doers, dreamers, and innovators. It is also one of the most welcoming communities around—call it southern hospitality, call it being a good neighbor, call it following the golden rule. Houston is the fourth largest city in the U.S. and the largest city in Texas but still maintains a small-town charm. It is from these roots that "Houston Strong" grew after Hurricane Harvey.

When I arrived in Houston at the beginning of 2019 to join Mayor Sylvester Turner's team as the Chief Resilience Officer for Houston—a role I knew well, but with a new landscape, new partners, and a different set of shocks and stresses to prioritize—I took on the challenge with the same determination as my new hometown.

Houstonians see a challenge and use their determination and ingenuity to solve it. But I have observed that sometimes efforts are not aligned and partnerships for problem solving are not leveraged. In many cases, an opportunity to partner could be missed. I'm sure over the past year, as *Resilient Houston* was developed, we didn't reach every potential partner. Making Greater Houston more resilient is going to take all of us, so this is an official invitation for all to join the hundreds of Houstonians who have already contributed to the *Resilient Houston* framework as we focus on implementation.

I want to thank the *Resilient Houston* working group comprised of representatives from as many groups as we could fit in one room as well as the City of Houston staff, regional and neighborhood partners, and subject-matter experts for their expertise and guidance over the past year.

Resilient Houston is designed to be a patchwork quilt that stitches together each aspect of resilience and integrates every partner into the framework, so we can all work toward common goals and targets. We hope it will inspire coordinated and collective action with and among our many local and regional partners. Houstonians like to get stuff done, and we look forward to getting stuff done with you!

Marissa Aho, AICP

Chief Resilience Officer



As the 101st city to join the original 100 Resilient Cities (100RC) Network and the first to release their strategy in partnership with our renamed and revived network, I want to congratulate Mayor Sylvester Turner and the City of Houston on the release of *Resilient Houston*. On behalf of the Global Resilient Cities Network, we applaud the continued hard work and focus and we know that this resilience strategy is a major milestone for the city.

When Hurricane Harvey hit Houston in August 2017, Houstonians' response to the storm was remarkable. The heroic rescues, extraordinary show of community support, tireless public leadership, and overnight mobilization of critical resources all showcased an inherent sense of resilience in the face of adversity. One year later, Houston joined the 100RC Network to harness those attributes, to address future shock events in addition to more chronic stresses that affect Houstonians on a daily basis.

Now, what follows in *Resilient Houston* represents an integrated, forward-looking, and coordinated approach that puts forth a vision for a city that is "building forward"—where ongoing recovery and major planning efforts are aligned with holistic initiatives to foster more equity and connectedness among all residents.

This work would not have been possible without the dedication of Chief Resilience Officer Marissa Aho, who, in utilizing her resilience expertise, tirelessly engaged stakeholders across Houston and Harris County to deliver this bold and actionable strategy. Local funding from Shell likewise played an integral role in supporting Houston's long-term resilience as the first-ever "sponsored city" and continuing as an implementation partner moving forward. Under the vision of Mayor Sylvester Turner, Houston is well-poised to confront some of its most intractable resilience challenges.

While the release of *Resilient Houston* marks a critical milestone in the city's resilience journey, greater commitment is required to implement these actions. The partnerships laid out in this document are key to its success. We look forward to working with the city as this strategy rolls out, creating a stronger and more equitable Houston for all.

Stewart Sarkozy-Banoczy

Managing Director, North America
Global Strategic Partnerships Lead
Global Resilient Cities Network


LYNX
768B
EXIT

EXECUTIVE SUMMARY

Houstonians reach for the stars, work hard, innovate, look out for their neighbors, and when challenged by adversity are inherently resilient. But the challenges that Houstonians face are increasing in size, frequency, and complexity—compounded by exponential population growth, an uncertain and changing climate, economic reliance on the energy sector, and inequitable outcomes in health, wealth, and access to services depending on one's neighborhood. Hurricane Harvey's devastating impact on the region in 2017 was a stark reminder of our vulnerability and a call for transformative change. Houston's future will not be a "tale of two cities"—of have and have-nots. Rather, we will work to ensure that all Houstonians can thrive in the face of challenges.

Resilient Houston provides a framework for collective action for every Houstonian; our diverse neighborhoods and watersheds; City departments; and local, regional, and global partners. The strategy links existing efforts with new ones that will collectively work to protect Houston against future disasters—from hurricanes to extreme heat waves—and chronic stresses such as aging infrastructure, poor air quality, and flooding. *Resilient Houston* was developed in partnership with hundreds of diverse stakeholders who determined goals and targets over the past year. It provides detailed actions and a framework for achieving them. While *Resilient Houston* is a City of Houston plan, its scope far exceeds what can be achieved by the city government alone. Every Houstonian has a role to play in building resilience. Only by leveraging present and future partnerships at the individual, neighborhood, bayou, city, and regional scale will we be successful. The City will lead by example and hold itself and its partners accountable by measuring progress toward the goals and targets during and beyond Mayor Sylvester Turner's second term in office.

Houston became a member of 100 Resilient Cities—Pioneered by The Rockefeller Foundation in August 2018, the one-year anniversary of Hurricane Harvey. This membership was made possible through a $1.8 million sponsorship by Shell. In February 2019, a Chief Resilience Officer, Marissa Aho, was hired to lead the development and implementation of a resilience strategy for Houston. When the 100 Resilient Cities program formally ended in July 2019, Houston—the final city to join the 100 Resilient Cities Network—helped lead the creation of the new Global Resilient Cities Network to continue global collaboration between cities, Mayors, and Chief Resilience Officers.



Houstonians have experienced the devastation and loss from six federally declared flooding disasters in the past five years, most notably Hurricane Harvey. We understand from experience what experts have quantified: $1 invested before a disaster saves more than $5 after—and sometimes much more than that. Yet most federal funding is not available for months, or even years, after a disaster. Investing in resilience, for now, is up to every Houstonian. We must use our entrepreneurial spirit and can-do attitude to address the challenges of today to prepare for and mitigate the impacts of acute shocks and chronic stresses that affect our families, our neighborhoods, our watersheds, our city, and our region.

Houston is nicknamed the Space City, Bayou City, and if you follow sports, Clutch City. Houston is the energy capital of the world, the most diverse city in the U.S., the capital of the Sunbelt, the cultural and culinary capital of the South, and even the new capital of southern cool. We are calling on every Houstonian to play a role in building our resilience. Together, using *Resilient Houston* as our framework, we can ensure that Houston is also the capital of resilience.

HOW TO READ *RESILIENT HOUSTON*

Resilient Houston frames five key Visions for Houston's future and organizes Actions to achieve them at five scales. The comprehensive nature of resilience requires collaboration and "de-siloing" of all of the components that contribute to the resilience of each scale.

RESILIENT HOUSTON'S FIVE THEMATIC VISIONS ILLUSTRATE HOUSTON AS:

+ a healthy place to live
+ an equitable, inclusive, and affordable city
+ a leader in climate adaptation
+ a city that grows up, not out
+ and a transformative economy that builds forward.

These themes are reflected in *Resilient Houston*'s five Chapters, 18 Goals and Targets, and 62 Actions. Each Action is intended to address multiple unexpected catastrophic events and/or chronic underlying stresses that are typically exacerbated during catastrophic events. Each Action identifies the partners, timeframe, implementation themes, and steps needed to successfully achieve the larger goal.

RESILIENT HOUSTON'S ACTIONS ARE ORGANIZED INTO THE FOLLOWING CHAPTERS, EACH REPRESENTING A DIFFERENT SCALE OF IMPACT:

PREPARED & THRIVING HOUSTONIANS

Individuals will make Houston more resilient by preparing for and adapting to an increasingly uncertain future and through improved access to employment and wealth-building opportunities. Young Houstonians have an important role to play to prepare for the jobs of the future while being leaders and stewards of their communities now. A resilient Houston is also a welcoming and safe place for all Houstonians, no matter their age, income, background, nationality, gender, or physical or mental abilities.

SAFE & EQUITABLE NEIGHBORHOODS

Each of Houston's 88 neighborhoods has different resilience priorities, including flooding, air quality, displacement, mobility, and more. One-size-fits-all solutions do not work to build resilience. Rather, we must strengthen community cohesion and develop and implement place-based solutions at the neighborhood scale. We will invest in historically under-resourced neighborhoods. We want to ensure that all neighborhoods are healthy, safe, and climate ready and provide housing and mobility options for more Houstonians. We will also support local arts and culture to grow economic development opportunities while increasing risk awareness.

HEALTHY & CONNECTED BAYOUS

Houston's 22 watersheds and corresponding bayous are central to Houston's identity as the Bayou City. They are a source of great joy as recreational amenities and green spaces, but also a source of great fear when floodwaters exceed their banks and chronically flood Houstonians who live in the floodway or floodplain. Living safely with water and embracing the role of bayous as Houston's front yard are essential to improving physical, environmental, and economic resilience.

ACCESSIBLE & ADAPTIVE CITY

As the fourth largest city in the U.S. at the beginning of a new decade, Houston will increase its climate leadership, while modernizing our infrastructure to be ready for the known and unknown challenges. We will lead by example to further embed equity, inclusion, and resilience into all City policies and practices.

INNOVATIVE AND INTEGRATED REGION

The resilience challenges of today and tomorrow are not bound by jurisdictional boundaries and affect the people, places, and systems beyond Houston's city limits. By taking a regional approach, we can extend the benefits of resilience planning to more communities while including additional partners who increase our capacity to meet these goals. More than 650,000 people enter the city daily. Our economy; our transportation systems; our environment; and our ability to respond, recover, and thrive in a disruption or catastrophic event are all dependent on our ability to coordinate and collaborate regionally. Greater Houston has a once-in-a-generation opportunity to course-correct and address resilience challenges that have been growing for generations. With great opportunity comes even greater responsibility.

RESILIENT HOUSTON HAS IDENTIFIED SIX COMMON THEMES TO ADVANCE IMPLEMENTATION:

ENGAGEMENT: Many of the steps we take to be more resilient will ensure that more people have access to accurate and timely information and through participation and collaboration we will build trust and transparency.

FINANCE: We will need to develop new funding and financing tools that enhance our current funding processes to achieve the primary and co-benefits of building resilience.

METRICS: Resilience can be challenging to measure, as is the case with other preventative or proactive efforts; however, in many cases, additional research and evaluation can show measurable impact.

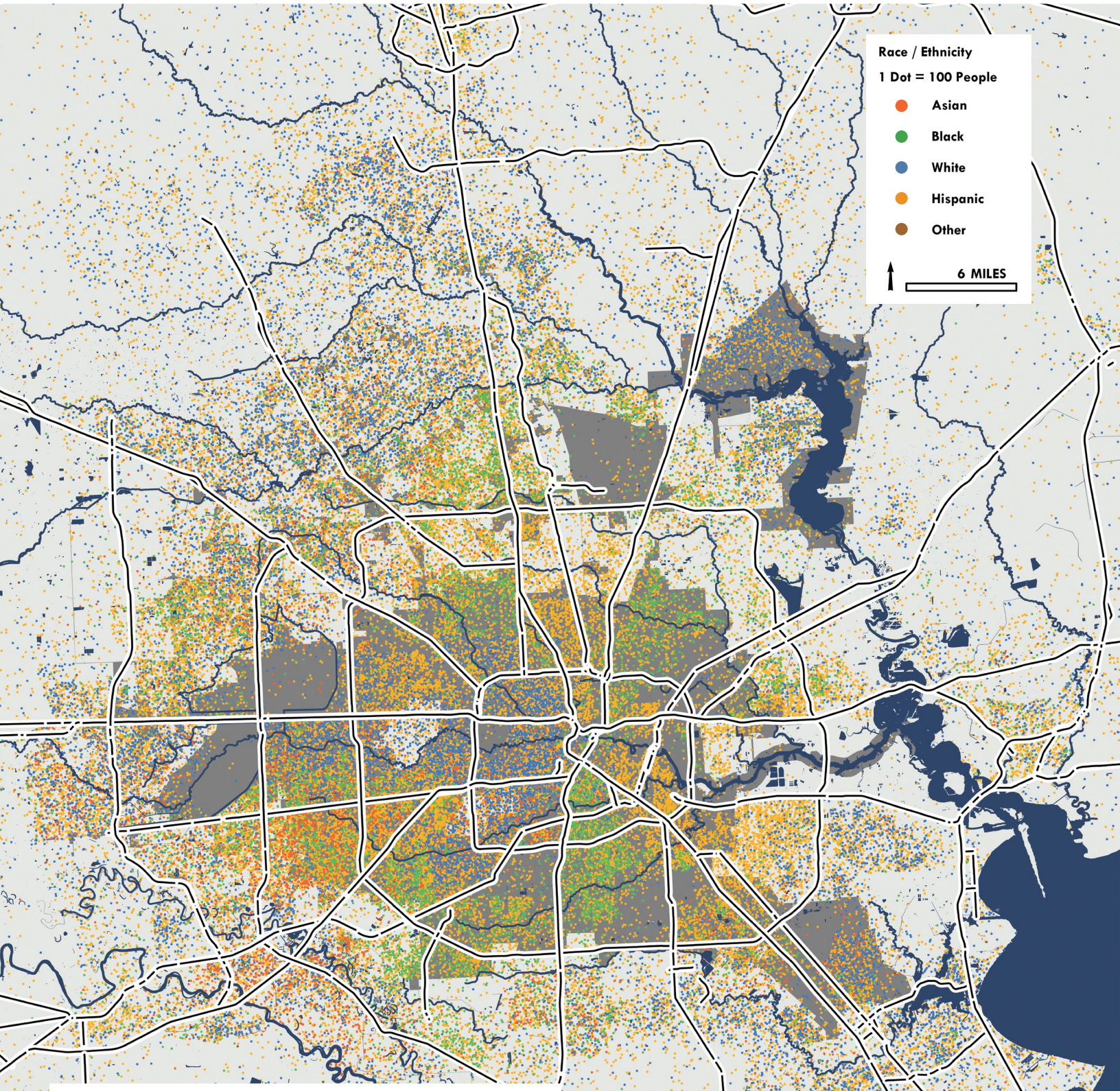
PARTNERSHIP: Advancing collaboration and working across sectoral or jurisdictional boundaries are at the core of building resilience.

POLICY: Updates to local, state, or federal policies will help facilitate additional resilience building and create additional opportunities.

SMART CITIES: Technological advances and innovation at the heart of advancing smart city initiatives will be harnessed and prioritized to address our most urgent acute and chronic resilience challenges.

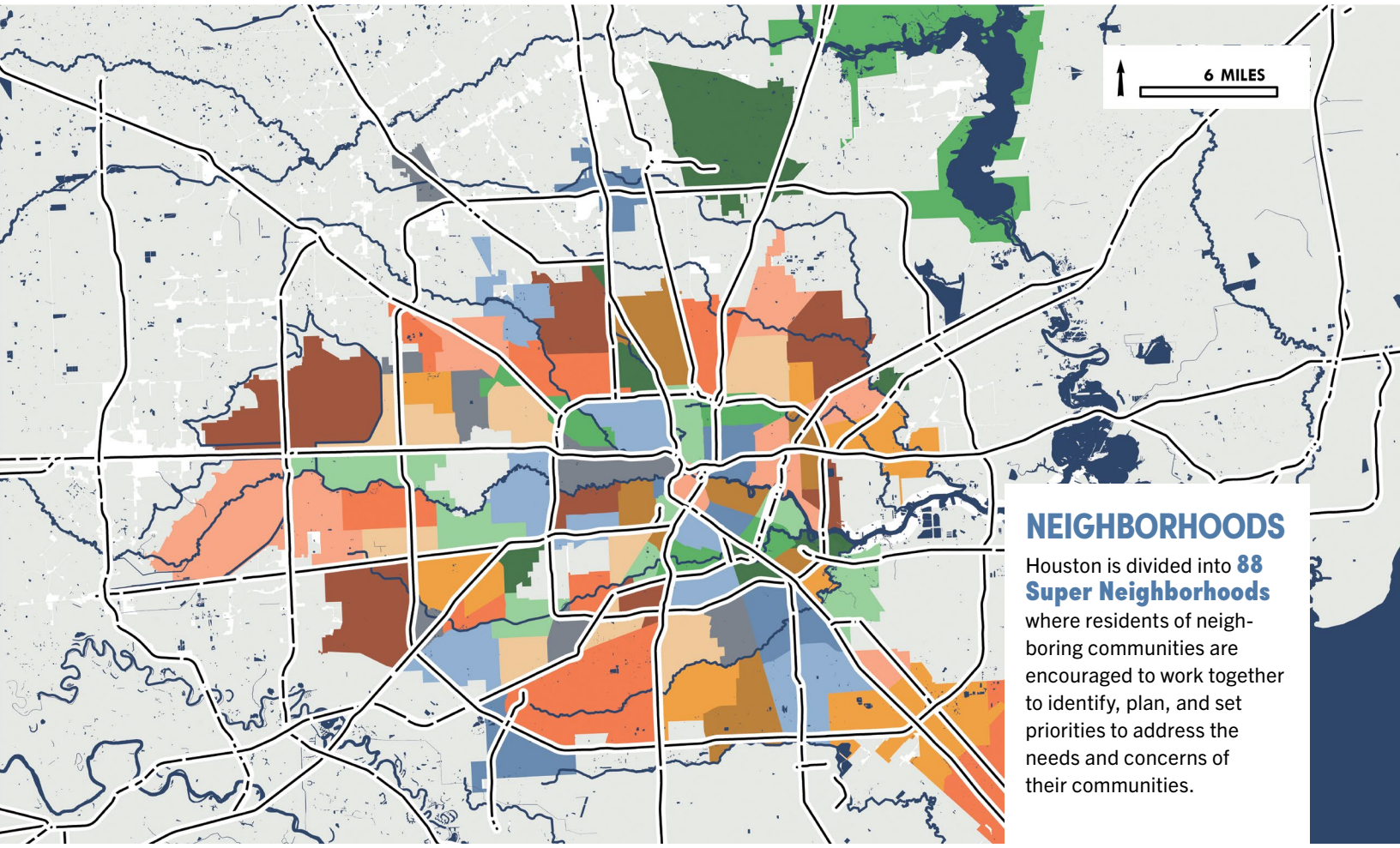
Visit our website for updates, events, and opportunities related to *Resilient Houston*:
houstontx.gov/mayor/chief-resilience-officer.html

HOUSTON SNAPSHOT



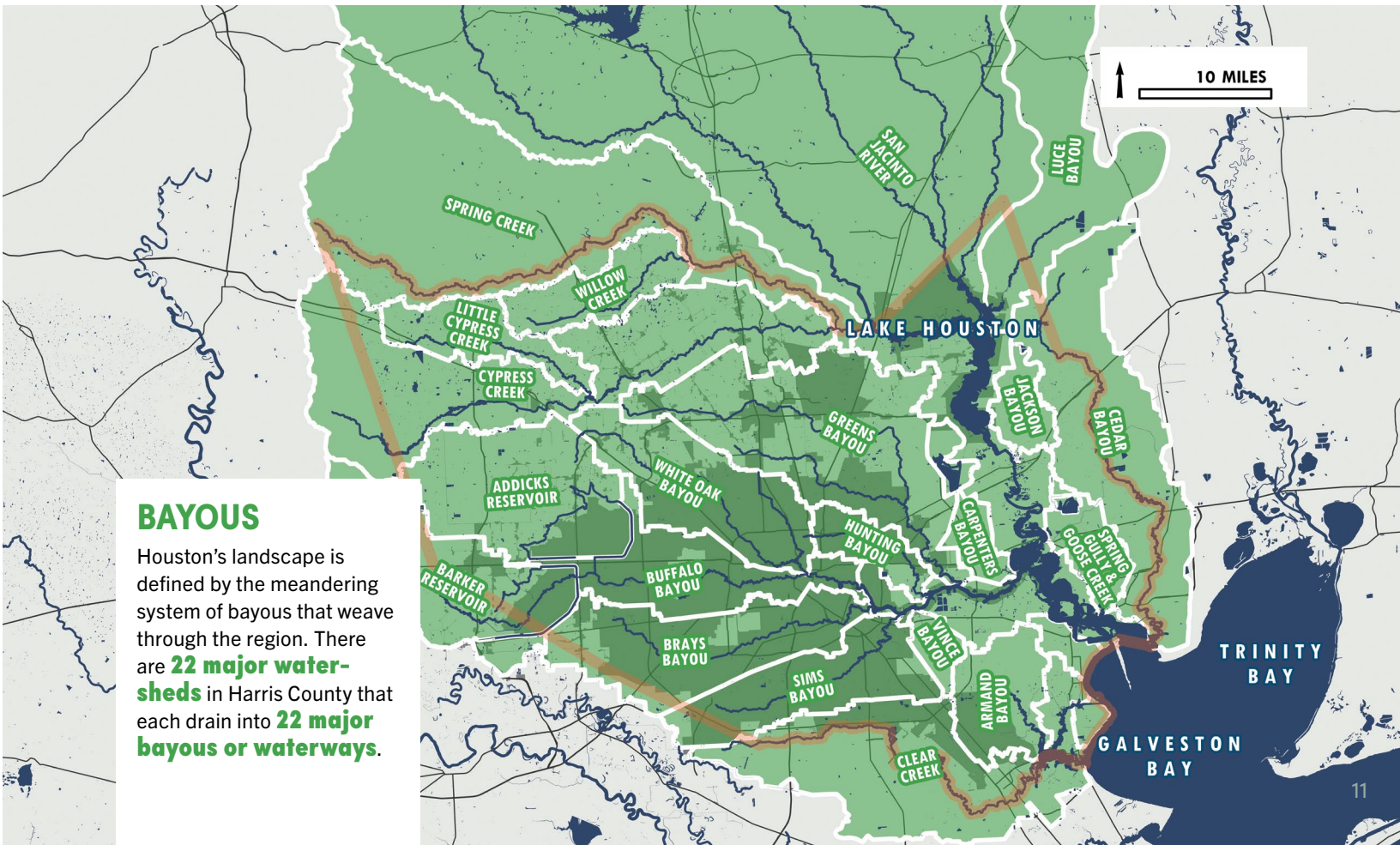
HOUSTONIANS

Houston is currently the **fourth largest** city in the country with a population of **2,325,502** and growing. The nine-county metropolitan area is home to **6,997,384** people. Houston is one of the most **racially diverse** places in the country: the city is 44% Hispanic, 25% Non-Hispanic White, 23% Black, and 7% Asian. However, large parts of the city remain racially segregated.



NEIGHBORHOODS

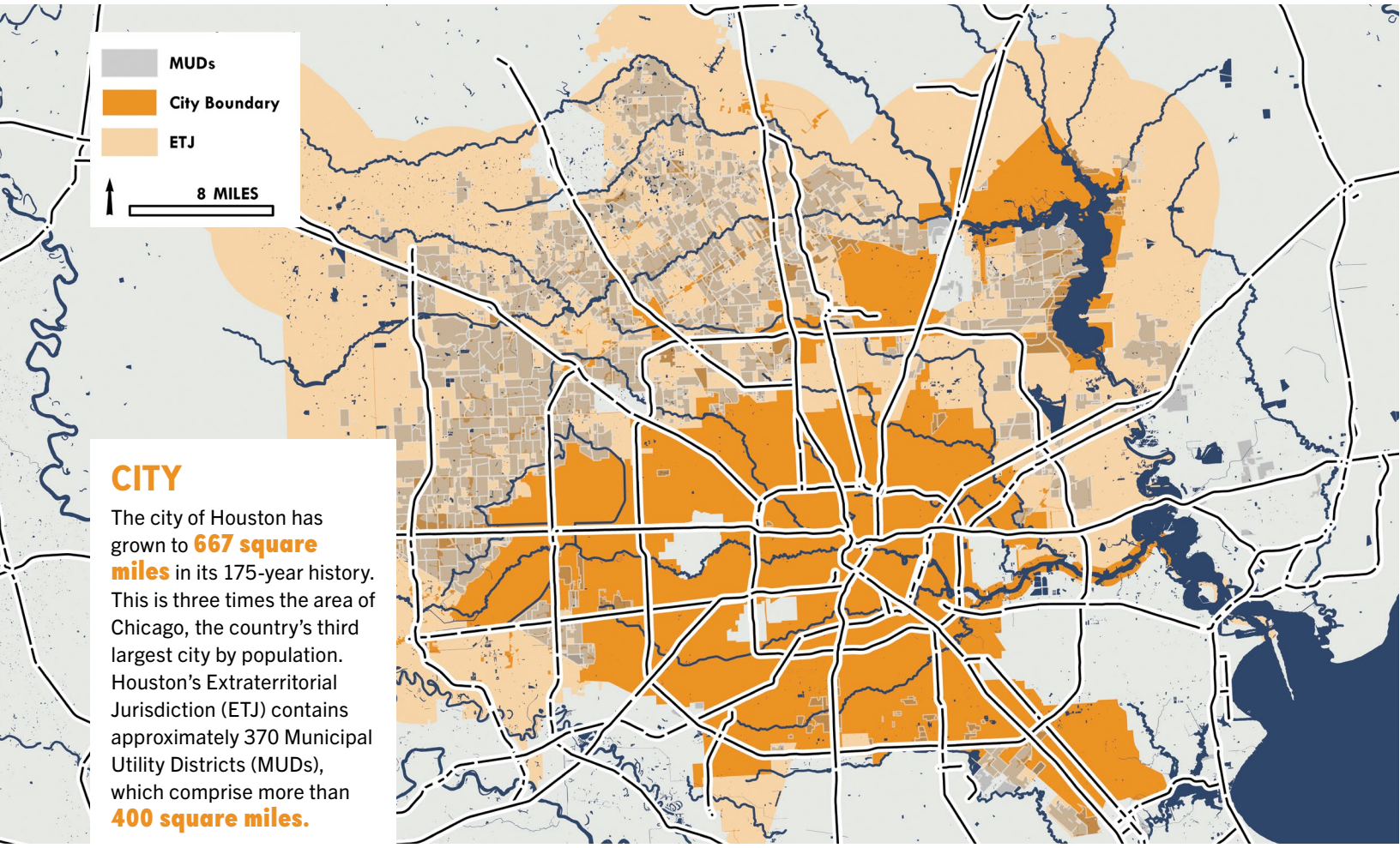
Houston is divided into **88 Super Neighborhoods** where residents of neighboring communities are encouraged to work together to identify, plan, and set priorities to address the needs and concerns of their communities.



BAYOUS

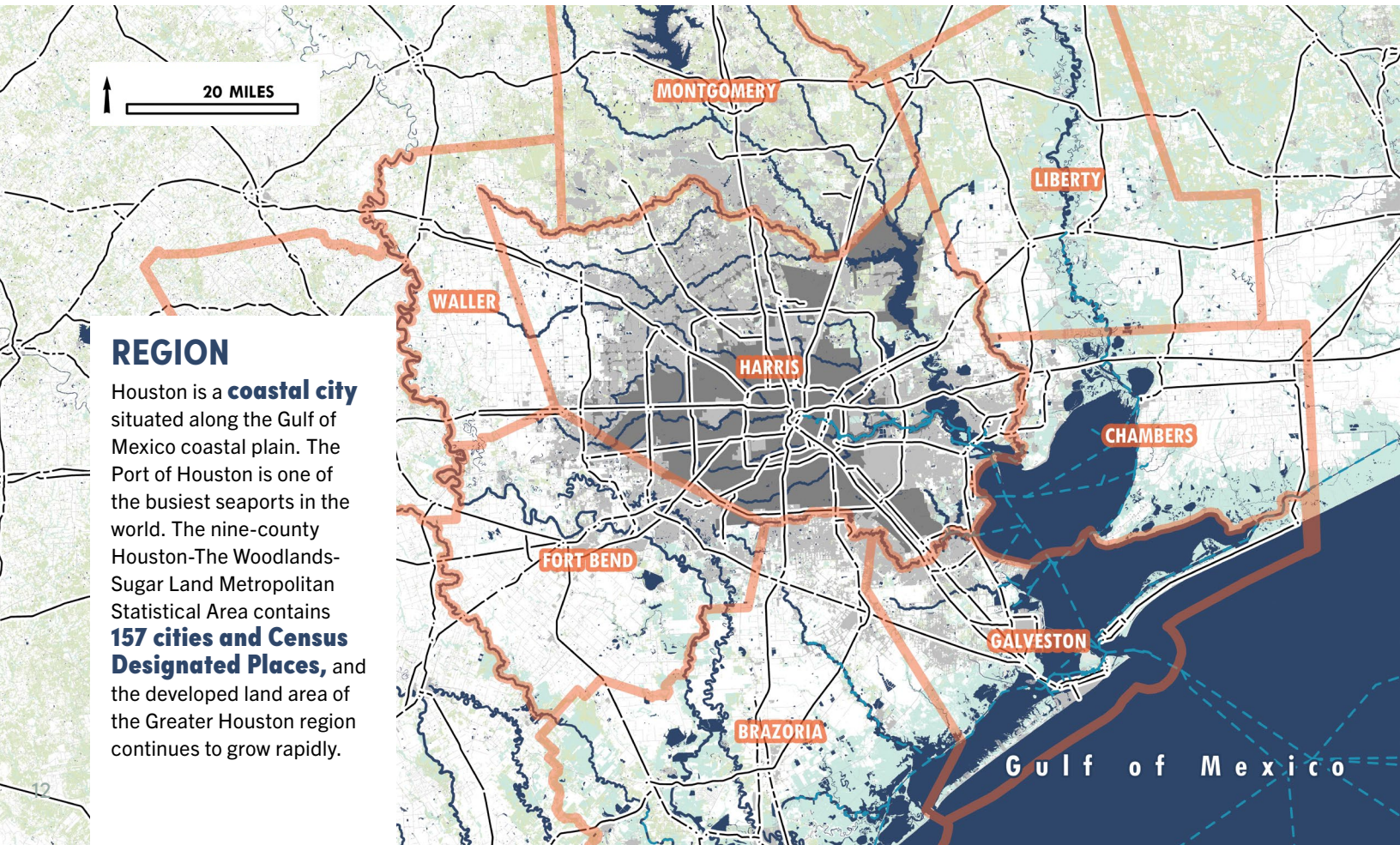
Houston's landscape is defined by the meandering system of bayous that weave through the region. There are **22 major watersheds** in Harris County that each drain into **22 major bayous or waterways**.

HOUSTON SNAPSHOT



CITY

The city of Houston has grown to **667 square miles** in its 175-year history. This is three times the area of Chicago, the country's third largest city by population. Houston's Extraterritorial Jurisdiction (ETJ) contains approximately 370 Municipal Utility Districts (MUDs), which comprise more than **400 square miles.**



REGION

Houston is a **coastal city** situated along the Gulf of Mexico coastal plain. The Port of Houston is one of the busiest seaports in the world. The nine-county Houston-The Woodlands-Sugar Land Metropolitan Statistical Area contains **157 cities and Census Designated Places,** and the developed land area of the Greater Houston region continues to grow rapidly.



THE NEW NORMAL— NOT THE EXCEPTION

After six major flooding events with federal disaster declarations in five years, the Bayou City is becoming better known as the Flood City. In May 2015, Houstonians experienced the Memorial Day flood. In October 2015, Houstonians experienced the Halloween flood. In April 2016, Houstonians experienced the Tax Day flood. In August 2017, Hurricane Harvey made landfall as a Category 4 hurricane and produced a flood event that became one of the most damaging natural disasters in U.S. history. In September 2019, Houstonians experienced Tropical Storm Imelda.

Flood events that were believed to have a less than 2% chance of occurring have occurred annually. These events were made worse by the region's rapid urbanization[1] and, in at least some measured cases, the effects of climate change.[2,3] Most Houstonians are beginning to understand that it is not a matter of if, but when another damaging flooding event will occur. A year without such an event would now be the exception to what is quickly becoming the new normal for Houstonians. As we look to the future, we can expect only more extreme weather events. Our resilience will depend on how we prepare for and adapt to this new normal.

PREPARING FOR THE NEXT MILLION

Houston's growth has been exponential. With a population of 2.3 Million people, Houston's population is 17 times what it was 100 years ago. For comparison, in the same 100 years, Los Angeles's population grew by seven times and New York City's by 1.4 times.

By 2050, there may be one million more Houstonians, and four million more residents in the region. As we set a vision for a more resilient Houston, we must do so with change in mind—addressing the challenges of the future while making space for new neighbors in a way that enables all Houstonians to thrive.

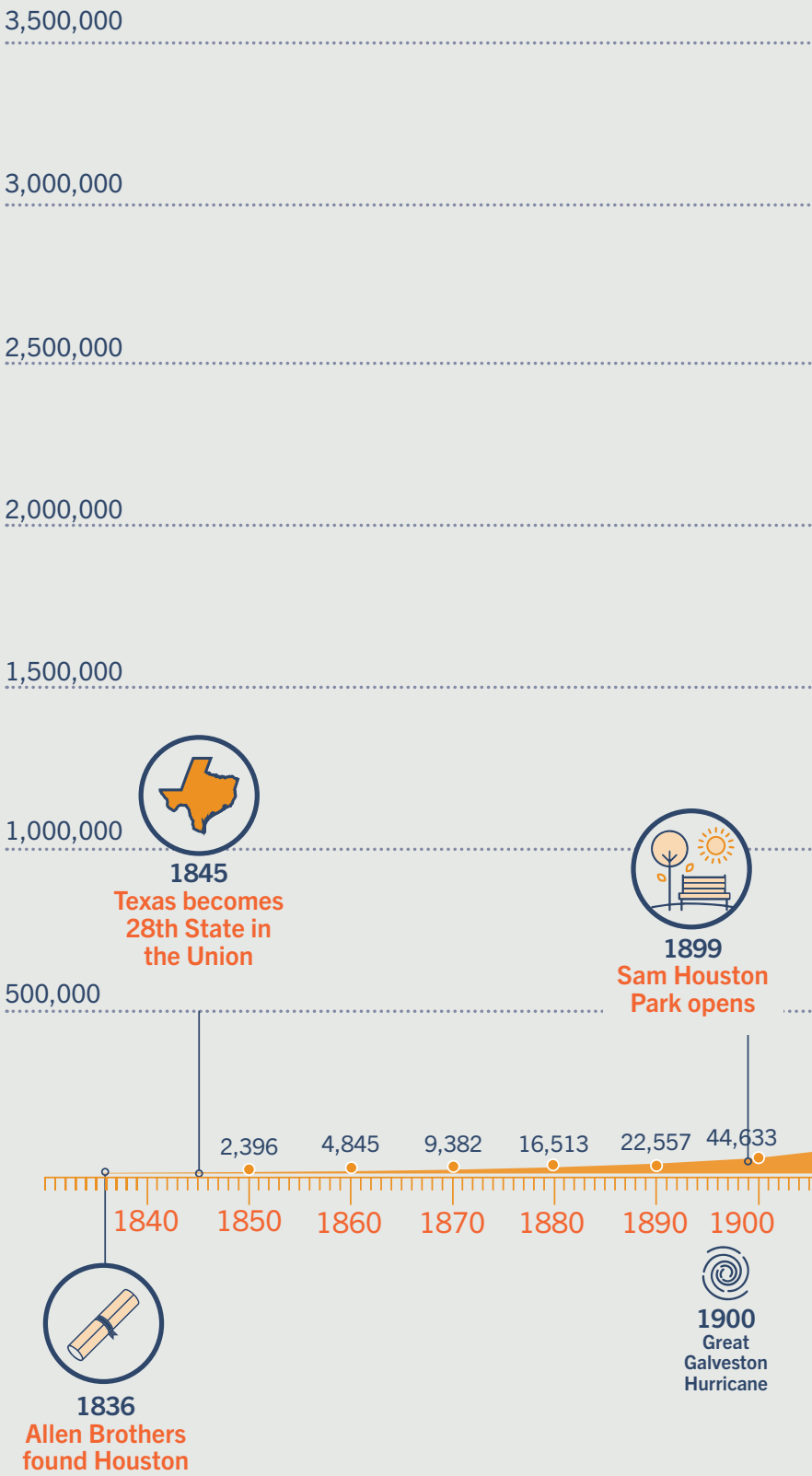


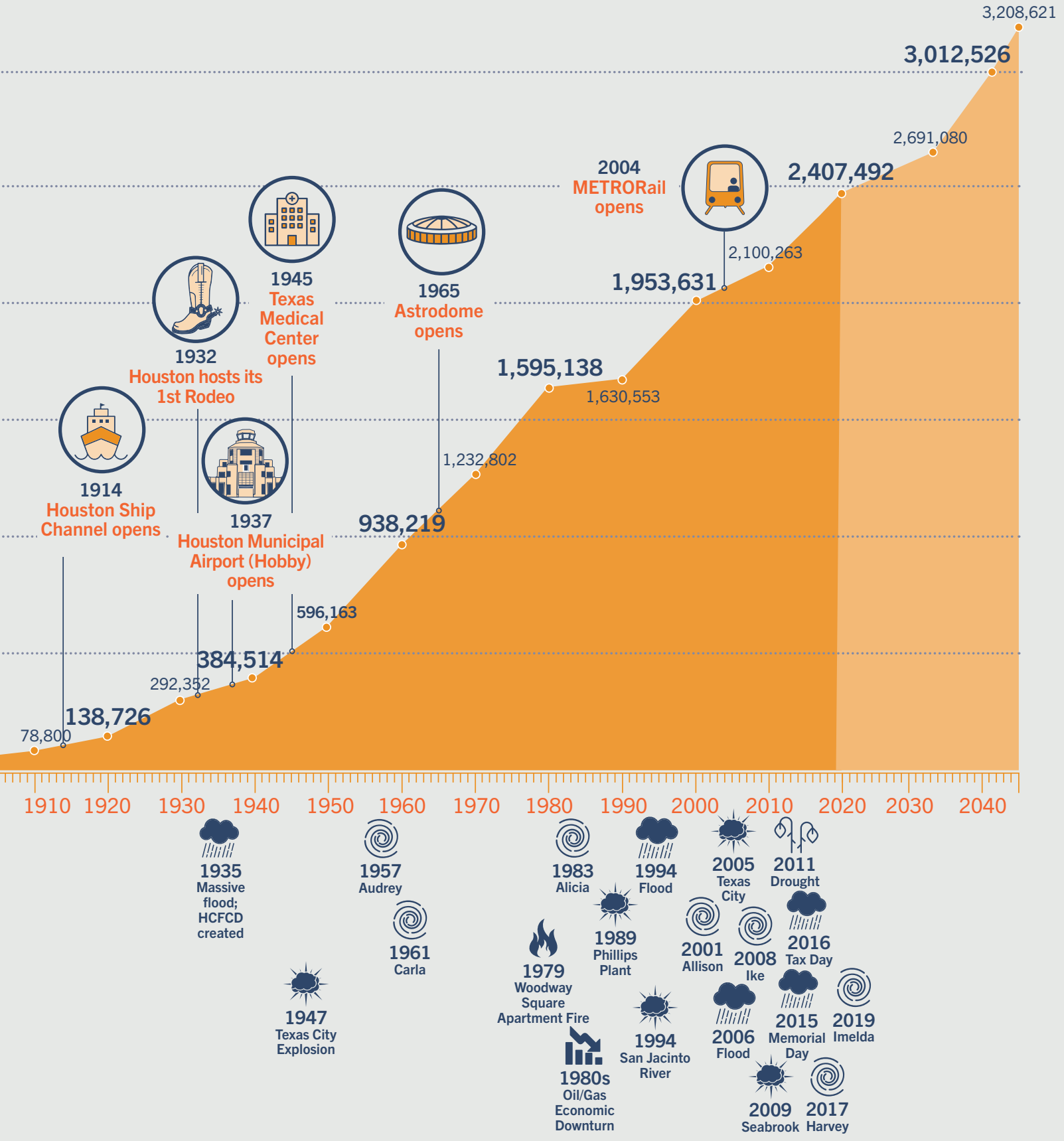
HOUSTON'S HISTORY OF BUILDING FORWARD

Over its relatively short history, Houston has faced numerous shocks—including hurricanes, floods, chemical disasters, and fires—and stresses, such as economic downturns, extreme heat and drought, pollution, urban sprawl, and inequality.

In spite of these events, Houston has continued to grow. Several times throughout the city's history, the experience of a shock or stress has propelled Houstonians to build forward, innovate, and transform—enabling Houston to thrive. The Galveston Hurricane of 1900 accelerated the dredging of the Houston Ship Channel in order to bring commerce inland. In response to the destructive 1929 and 1935 floods, the Harris County Flood Control District (HCFCD) was established to construct major drainage projects. In the wake of the 1980s oil and gas downturn, Houston significantly diversified the economy beyond oil and gas while retaining the energy capital crown.

Hurricane Harvey again showcased Houston's ability to respond and bounce back from a major shock. But it also highlighted the new ways we need to transform in order to meet the modern challenges of climate change and urbanization and to ensure that all Houstonians are included in how we continue to build forward.




78,800
138,726
292,352
384,514
596,163
938,219
1,232,802
1,595,138
1,630,553
1,953,631
2,100,263
2,407,492
2,691,080
3,012,526
3,208,621
1914
Houston Ship Channel opens
1932
Houston hosts its 1st Rodeo
1937
Houston Municipal Airport (Hobby) opens
1945
Texas Medical Center opens
1965
Astrodome opens
2004
METRORail opens
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
1935
Massive flood; HCFCD created
1947
Texas City Explosion
1957
Audrey
1961
Carla
1979
Woodway Square Apartment Fire
1980s
Oil/Gas Economic Downturn
1983
Alicia
1989
Phillips Plant
1994
Flood
1994
San Jacinto River
2001
Allison
2005
Texas City
2006
Flood
2008
Ike
2009
Seabrook
2011
Drought
2015
Memorial Day
2016
Tax Day
2017
Harvey
2019
Imelda

WHAT IS URBAN RESILIENCE?

The capacity of individuals, communities, institutions, businesses, and systems within an urban area to survive, adapt, and thrive no matter what kinds of chronic stresses and acute shocks they experience.



VISION FOR A RESILIENT HOUSTON

While the future is uncertain, we can expect that Houston will only face increasing challenges over the next 30 years. But we can create opportunity for all Houstonians in how we tackle these challenges—at the individual, neighborhood, bayou, city, and regional scale. The steps we take today can begin to shape the future for the next generation of Houstonians. What kind of city will Houston be in 2050?

Resilient Houston **sets an aspirational vision for the future of our city. As we look toward the Houston we want to be in 2050, we see:**

+ **A HEALTHY PLACE TO LIVE**
+ **AN EQUITABLE, INCLUSIVE, AND AFFORDABLE CITY**
+ **A LEADER IN CLIMATE ADAPTATION**
+ **A CITY THAT GROWS UP, NOT OUT**
+ **A TRANSFORMATIVE ECONOMY THAT BUILDS FORWARD**

A HEALTHY PLACE TO LIVE

A resilient city promotes the health and well-being of all residents. Health will be a central driver in how we grow our economy, build infrastructure, protect our environment, invest in neighborhoods, and deliver services. We envision a Houston in 2050 where all Houstonians breathe clean air; live near clean water bodies; eat healthy foods; spend time on recreation; safely and securely get where they need to go; and receive quality physical, mental, and behavioral health services.

BUILDING ON ASSETS

Houston is at the forefront of innovation in health care and life sciences. The Texas Medical Center is the world's largest medical complex and its 61 member institutions are consistently recognized as some of the best hospitals and universities in the nation by U.S. News and World Report, making Houston a top destination for clinical health care and medical research. The health sector is a major driver of Houston's economy and accounts for more than 360,000 jobs, with nearly one in eight Houstonians working in health care.[4]

Recent years have seen a new focus on efforts to adapt Houston's built environment to a changing climate in ways that promote safer, healthier communities. Investments in infrastructure and improvements to public spaces are making it easier and safer for Houstonians to incorporate physical activities like walking, biking, and playing into their everyday lives. Recent planning efforts, such as the Houston Active Living Plan, the Houston-Galveston Area Council (HGAC) Livable Centers Program, and the Houston Bike Plan, are guiding the region toward more mobility choices, active living opportunities, and ultimately improving health outcomes for Houstonians. The Bayou Greenways 2020 initiative will significantly enhance Houston's park system by creating a 150-mile network of parks and trails, giving Houstonians access to approximately 3,000 acres of green space.

While there remain many barriers to Houston being a healthy place to live for all Houstonians, local leaders have worked for years to increase health care access, address health inequities, and combat environmental racism. Houston's Federally Qualified Health Centers (FQHCs) help address the unmet needs of those who find themselves lacking certain health care services. Houston has also been central in the history of the nation's environmental justice movement. One of the first protests on the issue took place in Houston in 1967, when Texas Southern University students and local residents staged a sit-in against a city dump located in a majority black neighborhood. Another local fight to keep a garbage dump out of a majority-Black Houston neighborhood led to a 1979 lawsuit that was the first to challenge the siting of a waste facility on the grounds of civil rights law. Local organizations have been working with communities of color and low-income communities in Houston for decades to advocate for clean environments. Continuing to support and amplify the work of these grassroots organizations will be critical if Houston is to become a healthier place to live.

FRAMING THE CHALLENGE

Despite Houston's global leadership in health services and recent efforts to prioritize health in the built environment, Houston remains an unhealthy place to live for many residents.

Many Houstonians continue to lack access to basic care. Approximately a quarter of all Harris County adults aged 19–64 cannot afford to see a doctor, and more than 27% do not have health insurance. The rate of uninsured adults is more than twice the national average of 12% and greater than the Texas average of 24%. For Hispanic or Latino adults in Harris County, the uninsured rate is 44%.[5]

Approximately a quarter of all Harris County adults aged 19–64 cannot afford to see a doctor, and more than 27% do not have health insurance.

While there has been a shift in recent years, our region's industry and car-centric pattern of growth has not historically considered the health of Houstonians or our environment. The effects of our urban development on air quality, traffic safety, extreme heat, and industrial pollution negatively impact the health of Houstonians. The Houston metro area ranks worst among the top metro areas in the country for roadway fatalities, based on per capita deaths from 2001–2016. An average of 640 people per year die on Houston metro area roads and an average of 2,850 more are seriously injured.[6] Manufacturing and energy jobs are important to our economy, but the many chemical plants in the region present a pervasive threat to public health. A 2016 in-depth Houston Chronicle investigation found that our region experiences a chemical fire or explosion every six weeks on average.[7] Environmentally hazardous facilities and infrastructure are much more likely to be placed in close proximity to communities of color or low-income communities, while higher-income communities with more White residents are more likely to have more trees and greater access to parks and open spaces. Environmental injustice is further amplified as property values in White neighborhoods increase relative to those of polluted communities of color.

Health inequities remain stark in Houston, often with extreme disparities in health outcomes across race, income, and geography. This is most apparent when looking at overall life expectancy, which varies by as many as 20 years across ZIP codes in Houston.[8]

The experience of shocks and ongoing stresses only further impact community health and well-being. Mental health distress and community trauma can affect all aspects of our lives. According to the Houston State of Health index, 80% of Harris County residents have five or more poor mental health days in a given month. The trauma felt by all Houstonians as a result of Hurricane Harvey exposed gaps in mental health services, especially for our children. A UTHealth study found that four months after Harvey, 48% of residents with significant damage to their homes showed signs of serious psychological distress.[9] Climate change will only further exacerbate our public health challenges by increasing exposure to extreme events like heat waves, floods, and droughts as well as vector-borne and waterborne diseases: impacting air, food, and water quality and adding further stress to mental health and well-being.

SHOCKS AND STRESSES IMPACTING HEALTH

In resilience terms, shocks are sudden or acute events that threaten or impact Houstonians' immediate safety and well-being. Stresses are daily or chronic challenges that weaken natural, built, or human resources. Stresses can amplify the effects of shocks when they occur, particularly for vulnerable populations and neighborhoods.



AN EQUITABLE, INCLUSIVE, AND AFFORDABLE CITY

In a resilient Houston, all Houstonians will have equal opportunities to thrive. We envision a Houston in 2050 where a child's ZIP code will not be a predictor of the length of their life. Families everywhere will be able to work at jobs that pay a family-sustaining wage; send their children to good schools; live in neighborhoods with affordable housing options for different stages of life; easily access transportation choices that are affordable; safely walk to parks, trails, and bayous; and grow or buy healthy food in their neighborhood. Houston's continued economic growth will benefit all residents, produce quality jobs, and enable everyone to build wealth and save for their futures and any emergencies they may face.

BUILDING ON ASSETS

Houston is a multicultural metropolis that has consistently attracted and welcomed a diversity of people seeking opportunity. On average, Greater Houston gains more than 100,000 new residents each year. Our region's continued population growth is aided by its relative affordability and strong job market. The Houston region ranks as one of the most affordable major metro areas in the country, with living costs 26% below the average of the nation's 20 largest metro areas.[10] Two-thirds of Houstonians rate job opportunities as "excellent" or "good."[11]

Houston's population has become increasingly diverse since the 1960s. Today, communities of color, including Hispanic, Black, and Asian communities, represent nearly three-quarters of Houston's population. Hispanic residents are a plurality of the population at 44%. One in four Houstonians was born outside the United States, and more than one-third of Houstonians speak a language other than English at home. The five most frequently spoken languages after English are Spanish, Vietnamese, Chinese, Arabic, and French. Houston also has the largest LGBTQ+ population in Texas and hosts the fourth-largest Pride celebration in the nation. Greater Houston is also home to more than 300,000 veterans and their families.

Houston is a comparatively young city, with only 10% of residents aged 65 or above and 25% of residents under 18.[12] Houston is also attracting more young adults than any other U.S. metro area, experiencing the greatest net migration of people aged 25–34 from 2012–2017.[13] But like the rest of the nation, our population is aging. By 2050, the population of the entire United States will be much more age diverse than it is today. It is projected that older adults (aged 65 and older) will outnumber children in the U.S. by 2035.[14]

Our city's diversity is our strength and it contributes to the success of our economy. National research has shown that companies with a diverse workforce capture more market share and that Latina-owned businesses are the fastest-growing business demographic in the country.[15] Businesses with highly diverse employees are 35% more likely to perform above the average for their industry sector[16] and venture capital firms with diverse partners are more likely to see their investments succeed.[17]

Fundamentally, diversity is essential to Houston's culture and character. It is who we are as Houstonians and it means Houston is ahead of the curve in its demographic evolution. By 2050, the rest of the country will look far more like Houston looks today. *Houston is the future.*

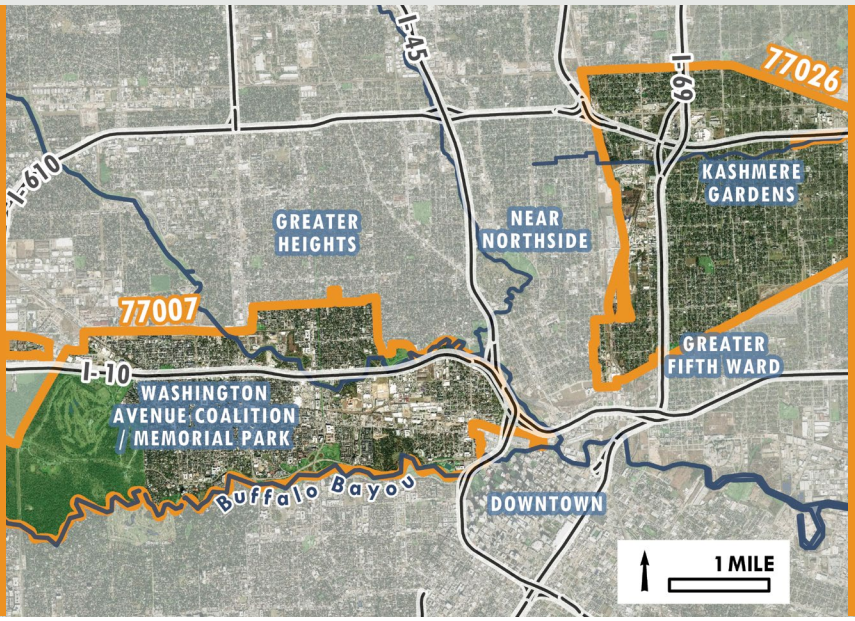
77007

89.1 YEARS
Average Life Expectancy

$121,458
Median Household Income

95.5%
High School Graduate

62% White



77026

69.8 YEARS
Average Life Expectancy

$26,664
Median Household Income

62%
High School Graduate

52% Black

44% Hispanic

FRAMING THE CHALLENGE

Diversity and relative affordability are assets, but they do not translate into equity for all Houstonians. How long the average Houstonian lives varies greatly based on where they live. For example, residents in the 77007 ZIP code (which includes Memorial Park and Washington Avenue Corridor) will live on average 20 years longer than their neighbors in the 77026 ZIP code (Kashmere Gardens and parts of the Greater Fifth Ward).[18] Where Houstonians live is not random—the city is highly segregated by race. 62% percent of 77007 ZIP code residents are non-Hispanic White, while 52% of 77026 ZIP code residents are Black (and 44% are Hispanic).

Houstonians also face deep segregation by income levels, and job growth is not fixing the problem of income inequality. While Houston's job market grew by 19% between 2008 and 2017,[19] income inequality grew by 16% during the same time period.[20] These disparities affect the future outcomes of our children and Houstonians of color are the most affected. According to Mayor Turner's 2017 Task Force on Equity report, poverty rates among Black and Hispanic children are nearly five times higher than poverty rates among White children in Houston.[21]

Educational attainment, which helps to determine long-term economic opportunity, shows wide racial and ethnic gaps. 60% of Houston's White residents have bachelor's degrees, while just 23% of Black residents and 13% of Hispanic residents have a bachelor's degree.[22]

Environmental risks also break down along racial and ethnic lines: Houston-specific research shows that polluting land uses like landfills, emission-producing factories, and waste transfer stations are far more likely to be located in Houston's communities of color than in predominantly White neighborhoods.[23]

Mobility is a shared challenge for Houstonians and it is exacerbated for people with disabilities and our growing senior population. All Houstonians need to be able to navigate our streets and transit systems to get to work, school, services, and to enjoy a good quality of life. Houstonians also need accessible, attainable housing that meets their needs. All Houstonians would benefit from continued incorporation of universal design principles for all public spaces.

Being an equitable, inclusive, and affordable city will deeply improve Houston's ability to bounce back from both sudden shocks and long-term stresses. When all Houstonians can earn enough to save for the future, when everyone can safely get around Houston regardless of physical ability, when all of our families can receive the health care and services they need, and when all of our children can earn a high-quality education that prepares them for the workforce, we will be a safer and stronger community.

By 2050, the rest of the country will look far more like Houston looks today. *Houston is the future.*

SHOCKS AND STRESSES IMPACTING EQUITY

In resilience terms, shocks are sudden or acute events that threaten or impact Houstonians' immediate safety and well-being. Stresses are daily or chronic challenges that weaken natural, built, or human resources. Stresses can amplify the effects of shocks when they occur, particularly for vulnerable populations and neighborhoods.

While Houston's job market grew by 19% between 2008 and 2017, income inequality grew by 16% during the same time period.

- Inequity
- Disparities in Health
- Education Access
- Economic Inequality
- Environmental Injustice
- Food Access
- Linguistic Isolation

Stresses



HOUSTON'S EQUITY CHARGE

When we talk about equity and inclusion throughout *Resilient Houston*, we want to be clear about not projecting a victimhood label on any Houstonian or neighborhood. The diversity of Houstonians and our communities is a source of pride for our city and contributes to our celebrated cultures and traditions. An individual's ZIP code, race, ethnicity, gender identity, sexual orientation, age, social class, physical abilities or attributes, religious or ethical values system, national origin, linguistic ability, or immigrant status should not limit their choices, opportunity, and freedom in our city. But there are disparities in health, wealth, access, and privilege that impact Houstonians and challenge our collective resilience. While every Houstonian is needed to build a more resilient Houston, the actions we take to make Houston safer and stronger will need to prioritize identifying and addressing barriers to equity and inclusion for all.

A LEADER IN CLIMATE ADAPTATION

Our climate is changing in an unpredictable way. What we know is that all the issues Houston faces will become more severe—whether this means heavier rainfall, larger and slower hurricanes, increased heat, or prolonged periods of drought. By 2050, Houston will be known as a world-class city for climate change adaptation and will share and export its best practices to other cities. Our efforts to adapt will not only make us safer but will also further benefit our region and neighborhoods by spurring economic growth, creating good jobs, and improving our environment.

BUILDING ON ASSETS

Houston is an engineering city. The past century has marked structural innovations, from the dredging of the Houston Ship Channel and extensive drainage infrastructure and flood control measures, to residential air conditioning and the expansion of thousands of miles of freeways. These engineering feats have enabled Houstonians to live in our swampy coastal plain environment and have rocketed Houston's growth from a small port town to a 667-square-mile city of 2.3 million people.

Our historic approach to flood control has been to push water downstream as quickly as possible through channelized bayous or to build large single-purpose detention basins to store water. More recently, Houston has started to embrace a more holistic approach. This includes the implementation of new practices, such as green stormwater infrastructure and low impact development, which use vegetation and natural functions to reduce flooding and cool the environment. Houston, in coordination with the Houston Parks Board (HPB) and HCFCD, is investing in its bayous, waterways, and detention basins as assets that not only serve flood control purposes but also as parks and trails that provide healthy and fun ways for residents to get around the city. Efforts in recent decades have also aimed to get more Houstonians out of harm's way—through floodplain management, buyouts, flood insurance, and better data and information. Local residents see the region's flooding issues as an urgent priority worthy of investment, evidenced by the passage of a $2.5 billion Harris County bond measure following Hurricane Harvey.

Houston's engineering ingenuity positions us well to be a leader in resilient infrastructure practices. But we cannot continue to simply build our way out of this challenge. Adapting to a changing climate will require a continued paradigm shift away from trying to control nature, and toward using nature to our benefit: to clean our air, cool our sidewalks, absorb water, reduce our energy costs, and keep us safer and healthier. As we develop new ways of living safely with water and engineering with nature, we can share that expertise with other cities and communities.

FRAMING THE CHALLENGE

The growth pattern of Houston and the region has challenged our ability to live within our environment. Decades of development on greenfields and in floodplains have magnified flood risk and vulnerabilities. More paved surfaces in Greater Houston have caused more stormwater runoff, leading to more flooding in our neighborhoods as well as more pollutants in our waterways. Paved surfaces also make parts of the city significantly hotter through the urban heat island effect. Urbanization alters our local experience of weather and climate.

Houston is on the front lines of climate change and is already experiencing its impacts. The last decade saw record-breaking heat and drought followed by record-breaking rainfall and flooding events. Since 2005, we have seen Hurricanes Rita, Ike, and Harvey. Initial studies have found that many of these events were made worse in part because of climate change. One study estimated that climate change increased the total rainfall from Harvey by 19–38%,[24] and another study found climate change made the event three times more likely and approximately 15% more intense.[25]

Houston will go from experiencing 10 days a year with a heat index of 105 or more during our hot summers today to 74 days a year by 2050.

Scientists say that we can expect more extreme weather events like the ones of the past decade as climate change worsens. Scientists estimate that without taking global action, Houston will go from experiencing 10 days per year with a heat index of 105 degrees or more during our hot summers today to 74 days (10.5 weeks) per year in 2050.[26] This extreme heat can have dangerous impacts not only for vulnerable populations like children, the elderly, and people who work outside, but it is also severe enough to be a worrisome public health risk for everyone. Urbanization and population growth will continue to intensify the impacts of longer and hotter summers. The urban heat island effect will continue to make highly paved urbanized areas hotter, and the demands on energy for cooling and on the regional water supply will continue to increase.

We are already experiencing rains that are heavier than they were in the past and this trend is expected to continue. NOAA recently updated the rainfall values used to define what qualifies as a 100-year or 1000-year event in Texas, with Greater Houston seeing some of the greatest increases. This update shows that the rainfall amount that we had previously considered as a 100-year storm event (an event with a 1% chance of happening in a given year, or a 26% likelihood of happening within the timeframe of a 30-year mortgage) is now a 25-year storm event (with a 4% chance of happening within a given year and a 71% likelihood of happening within the timeframe of a 30-year mortgage). These updates also mean an expanded boundary of areas that are now included in the 100-year floodplain and potential increases in flood insurance rates for households that may find themselves within those boundaries as floodplain maps are redrawn.[27] With climate change, average annual precipitation amounts are predicted to stay relatively stable, but the frequency and intensity of heavy rainfall events are anticipated to continue to increase.[28] We can expect to continue to see changes in what qualifies as a 100-year storm.

Houston is a coastal city vulnerable to sea level rise and storm surge from hurricanes. The rate of relative sea level rise along the Texas Gulf Coast is two times the global average, presenting risks to coastal infrastructure. Power plants and oil refineries are particularly vulnerable. An extreme storm surge event in Galveston Bay could have catastrophic effects on the national economy as well as the health and safety of local residents. Sea level rise amplifies this risk. Rising seas may also impact natural coastal habitats along the Texas Gulf Coast that provide a critical first line of defense against storms.[29]

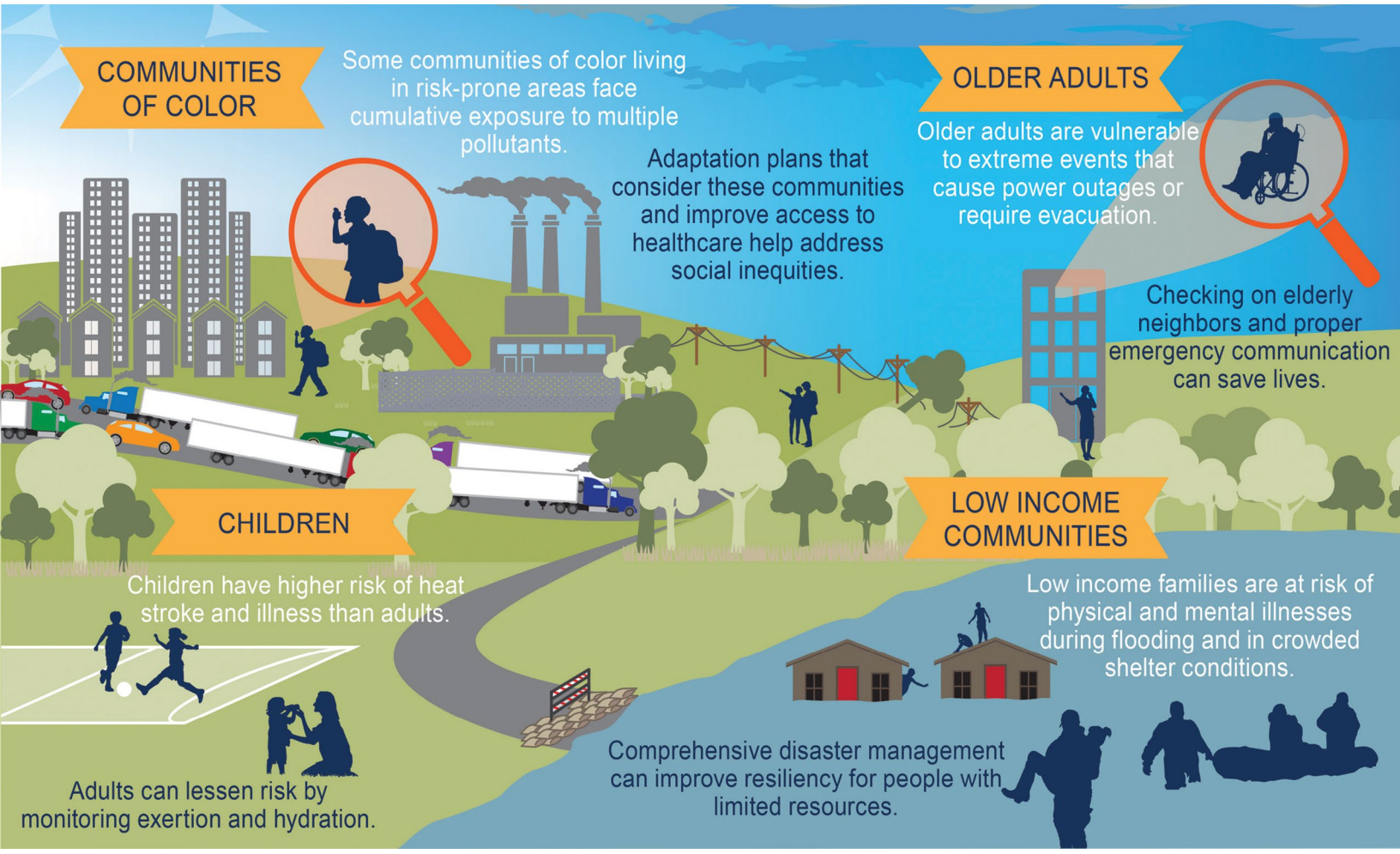
Exposure and vulnerability to climate change and its impacts vary across populations and communities in our region. Climate change disproportionately affects children, older adults, low-income communities, and some communities of color. Vulnerability to heat related illnesses, for example, is higher for people who work outside, households who cannot afford the higher monthly utility bill costs of turning on an air conditioner, older adults, and children. The economic losses associated with extreme weather events—for example, flood damages to properties and loss of agricultural production in a drought—are felt more acutely by lower-income households and small businesses.

Efforts to adapt to climate change can reduce the risks to public health while also creating additional positive health, community, and economic



CLIMATE VULNERABLE POPULATIONS: HEALTH IMPACTS

Populations vulnerable to adverse climate-related health threats (in white text) and adaptation measures that can help address disproportionate impacts (in blue text). Source: U.S. Environmental Protection Agency



A DECADE OF CLIMATE CHANGE IMPACTS

Greater Houston saw record-breaking heat and drought in 2011, with temperatures topping 100 degrees Fahrenheit for 24 days in a row. A survey of residents during the summer of 2011 found that more than one third of responding Houstonians could not keep their houses cool enough, citing unaffordable electricity bills or a lack of air conditioning.[30] The drought killed 301 million trees across the state,[31] including many in Houston's Memorial Park. The drought also caused damage to infrastructure—for example, 1,000 water mains broke within a month in Houston due in part to increased aridity and shrinking clay soils. Limited water availability also constrained energy production in the region and an estimated $5.2 billion in direct agricultural losses resulted from the 2011 drought.[32]

This period of record-breaking heat and drought was followed by a period of record-breaking rainfall and flooding events. With the Memorial Day and Halloween Floods in 2015, the Tax Day Flood in 2016, Hurricane Harvey in 2017, and Tropical Storm Imelda in 2019, Houston experienced six major flood events in five years. The slow-moving Hurricane Harvey stalled over Houston and dumped more than 50 inches of rain over several days in some areas resulting in the largest rainfall event in North American history. Widespread flooding inundated hundreds of thousands of homes, and more than 300,000 customers were without power for days.[33] These impacts had numerous cascading effects on critical infrastructure, economic production, and health.[34] Harvey caused an estimated $125 billion in damages, tying with Katrina as the costliest disaster in U.S. history.[35]



co-benefits for Houstonians. Households and communities that have the means to save for a potential emergency, reduce risks to their homes and businesses, and adapt to climate change will find a way. We must make sure that our adaptation prioritizes supporting those of us who need it most.

SHOCKS AND STRESSES IMPACTING CLIMATE ADAPTATION

In resilience terms, shocks are sudden or acute events that threaten or impact Houstonians' immediate safety and well-being. Stresses are daily or chronic challenges that weaken natural, built, or human resources. Stresses can amplify the effects of shocks when they occur, particularly for vulnerable populations and neighborhoods.

- Climate Change
- Drought
- Extreme Heat
- Flooding
- Hurricane
- Sea Level Rise
- Severe Weather
- Subsidence
- Urban Heat Island Effect

Shocks Stresses

A CITY THAT GROWS UP, NOT OUT

By 2050, there will be one million more Houstonians, and four million more residents in the region. We need to make room for our next generation of Houstonians in a way that improves our collective health, safety, access, and opportunity. This means we must build "up, not out." Rather than encouraging urban sprawl, we must find ways to integrate new development into our existing neighborhoods and urban footprint. We can do this by providing better choices for how we move around the city and more housing choices that are multi-generational and close to jobs and services.

BUILDING ON ASSETS

From its start, Houston has been a growing city that welcomes new residents—a place of opportunity and entrepreneurship. Houston has historically been one of the most affordable residential markets in the nation for renters and home buyers. Access to abundant affordable housing has helped to fuel an era of population growth and economic prosperity. Today, housing costs in Houston are rising, but remain relatively attainable for many low- to moderate-income home buyers and renters. Measuring by median home price, Houston is the 37th most affordable metro area for home purchase in the country. Home sales in the metro area hit a record number in July 2019, with nearly 9,000 homes sold in the first six months of the year.

The Houston region also has a growing system of public transit and alternative transportation. The recently approved MetroNEXT plan will bring an additional $3.5 billion in transit investment that can help shape and attract new development in the region, including new park-and-ride systems and bus rapid transit that provide regional connectivity.

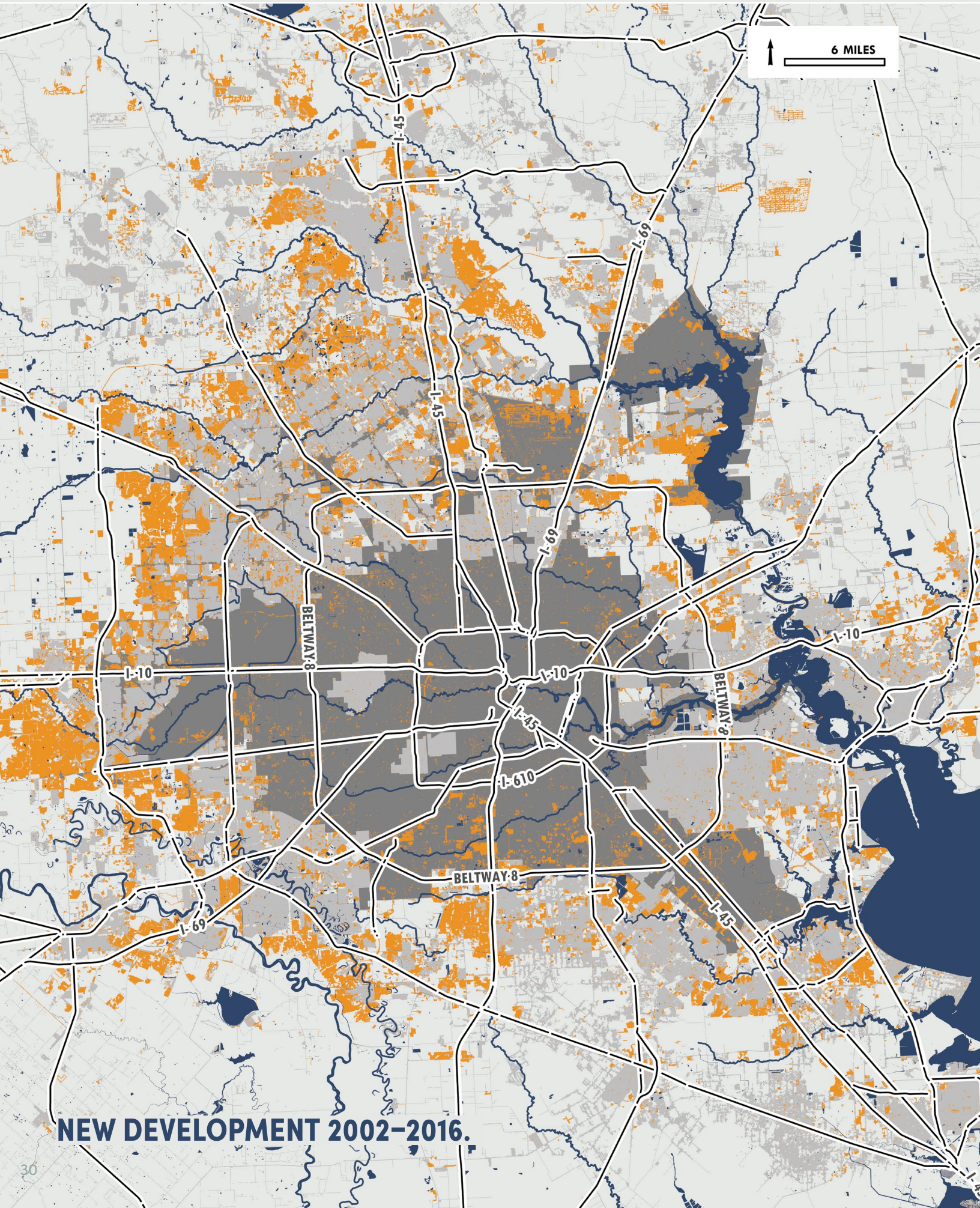
Walkable and compact neighborhoods are increasingly in demand. Research shows that walkable areas of Houston command higher rents for retail, office, and residential property, and that owner-occupied homes in these areas command higher prices in part because of their proximity to amenities. By increasing the number of walkable places in Houston in combination with targeted investments in affordable housing options, we can help ensure that Houston remains a top choice for people of all income levels seeking to build their careers and grow their families.

FRAMING THE CHALLENGE

Houston's current growth is shaped more by the availability of inexpensive land on the edges of urban development than by transit availability or proximity to job centers. Development is sprawling ever further outside Houston's boundaries. The City of Houston Planning and Development Department estimates that for every single-family building permit issued within the city limits, there are four more issued in the city's "extra-territorial jurisdiction" or ETJ, which spans a five-county area. Fifty thousand new acres were platted for development within three miles of the region's third ring road, Grand Parkway, between 2013 and 2018.

Sprawling land use and development patterns are more expensive to build and more expensive to maintain than more compact development. The annual cost of sprawl in America adds up to and estimated $4,500 per person,[36] which is approximately $10.3 billion annually in Houston and even more across Greater Houston. These costs include transportation infrastructure, less efficient city services, increased pollution, more spending on vehicle ownership, more traffic collisions, and worse health outcomes. More than half of these expenses are borne directly by consumers; the other 40% are societal costs. Research from Sam Brody at Texas A&M University further estimates that each square meter of new pavement in Houston adds, on average, $4,000 in flood damage.

This development pattern means that our already aging infrastructure must adapt to serve larger areas and additional families who will share our limited water, energy, land, and transportation resources. Sprawling development strains our



NEW DEVELOPMENT 2002–2016.



roadway infrastructure and paves over the green spaces that have historically absorbed water in our region. Increased runoff from development fills our bayous and storm water systems, making it difficult to move runoff to the Gulf before it floods our neighborhoods.

The growing regional footprint also produces hidden challenges related to housing affordability. In much of the Houston area, the median resident can pay less than 30% of their income for housing—a key measure of affordability. However, another measure of affordability is whether residents spend less than 45% of income on housing and transportation costs combined. Using this combined housing and transportation metric, much of the Houston area becomes unaffordable to residents, because affordable housing is located in far-flung areas where transportation to jobs and services is costly.

SHOCKS AND STRESSES IMPACTING GROWTH AND DEVELOPMENT

In resilience terms, shocks are sudden or acute events that threaten or impact Houstonians' immediate safety and well-being. Stresses are daily or chronic challenges that weaken natural, built, or human resources. Stresses can amplify the effects of shocks when they occur, particularly for vulnerable populations and neighborhoods.

- Housing Affordability
- Displacement
- Homelessness
- Pedestrian Safety
- Public Transportation Access
- Urban Sprawl
- Population Growth

● Stresses

A TRANSFORMATIVE ECONOMY THAT BUILDS FORWARD

Houston is already a thriving and successful destination for business. As our city's economy continues to grow, we can maintain our global energy, medical, and innovation prominence while cornering new markets, expanding industry in new ways, and supporting local small business growth. By 2050, Houston will be a leader in responding to global demand for water management, climate mitigation and adaptation, green infrastructure, renewable energy, and regenerative and green technology. The economic and climate-related challenges that Houstonians face will be met and overcome by local expertise and by our collective will to innovate and evolve.

BUILDING ON ASSETS

Today, Houston is a global leader in the energy, health care, and higher education industries. As the premiere job center and economic engine for our region, Houston attracts a large and high-quality population of workers each day. Every weekday, Houston's population increases by more than 650,000 people (equivalent to the total population of Memphis, Tennessee) due to the massive influx of commuters who come to work in our city's industries.

According to the Greater Houston Partnership, Houston's energy sector includes 4,600 companies and provides more than 237,000 jobs for the region's workforce.[37] These jobs come from companies across the oil and gas supply chain, including exploration, refining, and production.[38] The local energy sector also includes a small but growing segment of companies focused on renewable energy and technology innovation for the energy industry.

Houston's health care industry has garnered an international reputation for high-quality and innovative care and it continues to expand. The Texas Medical Center alone employs more than 100,000 people and provides more than 10 million patient visits per year.[39] A medical real estate boom is underway in outlying areas of Houston and its suburbs, with more than 600,000 square feet of new real estate development in the pipeline during the first half of 2019.[40]

The increasingly diversified economy in Houston and a strong national economy overall have helped to minimize the effects of local economic crises in recent years. The oil price downturn of 2015–2016 did have a large impact on employment in the energy sector: 74,000 jobs were lost, and Houston's economy experienced a 1.6% contraction between 2015 and 2017 based on Houston's local Business Cycle Index (BCI), which measures payroll employment, the unemployment rate, real sales taxes, and real income. Despite increasing oil prices in 2018 and 2019, most companies have not replaced the oil and gas-related jobs that were lost during this industry contraction. However, University of Houston researchers point out that this downturn and its associated job losses were limited in comparison to the Great Recession of 2008–2010, which cost Houston 8.3% of its economy as measured by the BCI. Retail and service jobs remained strong during this time period, indicating that consumer spending continued to support new business.[41]

Every weekday, Houston's population increases by over 650,000 people, due to regional commuters.

FRAMING THE CHALLENGE

An analysis by KPMG and the Center for Houston's Future (CHF) shows that the success of the Houston metropolitan economy is based on three primary factors: overall U.S. economic growth; high-paying oil and gas jobs generated by energy industry growth; and expansive infrastructure, low housing costs, and immigration fueling a large base of available workers.

Today, all three of these factors are threatened. The CHF analysis shows that increasing automation may be making many high-paying oil and gas jobs obsolete. The region may never recapture as many jobs in this sector as it had before 2015. Rising housing prices and transportation challenges are also whittling away Houston's competitive edge in attracting workers and growth while low educational attainment means most Houstonians cannot be easily hired into high-paying jobs in the service industry.[42] A broader economic slowdown across the country, coupled with slowing growth in energy industry hiring, could result in more severe employment impacts than Houston experienced in 2015.

Houston has opportunities to overcome these issues, and in many cases partners have already begun to act. However, large gaps remain in Houston's economy. Demand for renewable energy, including wind and solar energy, is projected to continue growing as the cost of building new renewable energy installations decreases. The City of Houston is leading by example by sourcing 92% of its power from wind and solar energy. Greater Houston has started to develop a presence in the renewables field, but renewables-focused companies represent just 3% of the total number of businesses in Houston's energy sector overall.

Many separate organizations are tackling challenges of workforce training and education, but a more comprehensive and coordinated approach is needed to enhance Houston's competitiveness in key target sectors, especially considering the educational attainment gaps that currently exist for communities of color. Houston currently lacks a citywide or regional coordination effort for workforce development that brings the public and private sectors together. More work is also needed to ensure that Hurricane Harvey recovery resources, including federal dollars and local bond funding, can be directed to support local businesses and workers. This will be the largest investment boom in storm water management and flood reduction in Houston's history; we need systems that enable this investment to become the basis for a thriving local industry for climate-adaptive infrastructure.

A TRANSFORMATIVE ECONOMY THAT BUILDS FORWARD: PRIORITY SHOCKS AND STRESSES

In resilience terms, shocks are sudden or acute events that threaten or impact Houstonians' immediate safety and well-being. Stresses are daily or chronic challenges that weaken natural, built, or human resources. Stresses can amplify the effects of shocks when they occur, particularly for vulnerable populations and neighborhoods.



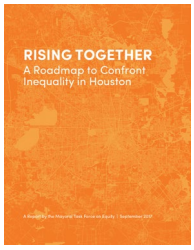
HOUSTON'S RESILIENCE EFFORTS

Resilient Houston strives to build upon and connect existing and concurrent efforts represented here as well as dozens of aligned partner efforts highlighted throughout the strategy.



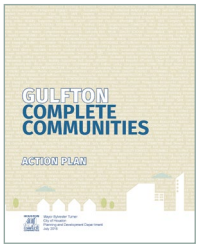
PLAN HOUSTON
(2015)

The city's first general plan, *Plan Houston*, was developed to create a common platform with coordinated implementation strategies to guide future development and City investments. *Plan Houston* has 32 goals for Houston's community, broken down into nine topics including people, places, culture, economy, environment, public services, education, housing, and transportation.



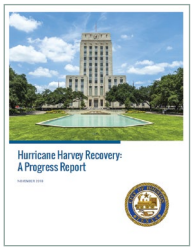
RISING TOGETHER: A ROADMAP TO CONFRONT INEQUITY
(2017)

The Mayoral Task Force on Equity developed actionable policy recommendations to make Houston a more equitable city. The recommendations included improving economic outcomes and quality of life for traditionally marginalized populations, increasing civic participation among these communities, and maximizing the revenue available for critical city services and programming.



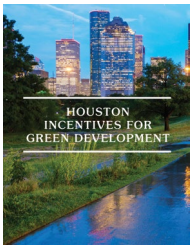
COMPLETE COMMUNITIES
(2017, 2019)

In early 2017, Mayor Turner identified Acres Home, Gulfton, Near Northside, Second Ward, and Third Ward neighborhoods as the pilot neighborhoods to develop action plans as part of the Complete Communities program. This process is intended to improve neighborhoods that have not reached their full potential due to historical disinvestment but have great strengths, opportunities, and partners that are working to improve these communities and to ensure that existing residents can stay in homes that remain affordable as improvements are made. In 2019, Alief, Fort Bend Houston, Kashmere Gardens, Magnolia Park-Manchester, and Sunnyside were selected to develop Complete Community Action Plans, expected to be complete in 2020.



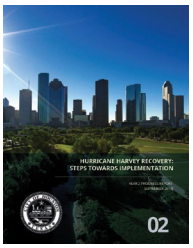
HURRICANE HARVEY RECOVERY: A PROGRESS REPORT
(2018)

By leveraging partnerships and additional funding opportunities, Houston has been able to make great strides since Hurricane Harvey, establishing programs to rebuild and strengthen neighborhoods so families can return home. Beginning in 2017, Houston's Recovery Team established a roadmap for successful recovery programs. This effort was marked by advocacy and coalition building dedicated to restoring the city and building Houston forward. The Recovery Team was successful in securing more than $1 billion in Community Development Block Grant-Disaster Recovery (CDBG-DR) funding and additional FEMA Hazard Mitigation Grant Program (HMGP) funding. The Recovery Office continued to advocate for billions more for infrastructure repairs and individual assistance in 2018.



HOUSTON INCENTIVES FOR GREEN DEVELOPMENT
(2019)

As the first step toward advancing green storm water infrastructure (GSI) programs and projects in Houston, a 10-month assessment and recommendation process determined four top incentives, including integrating GSI development rules, property tax abatements, an awards and recognition program, and increased permitting process certainty and speed.



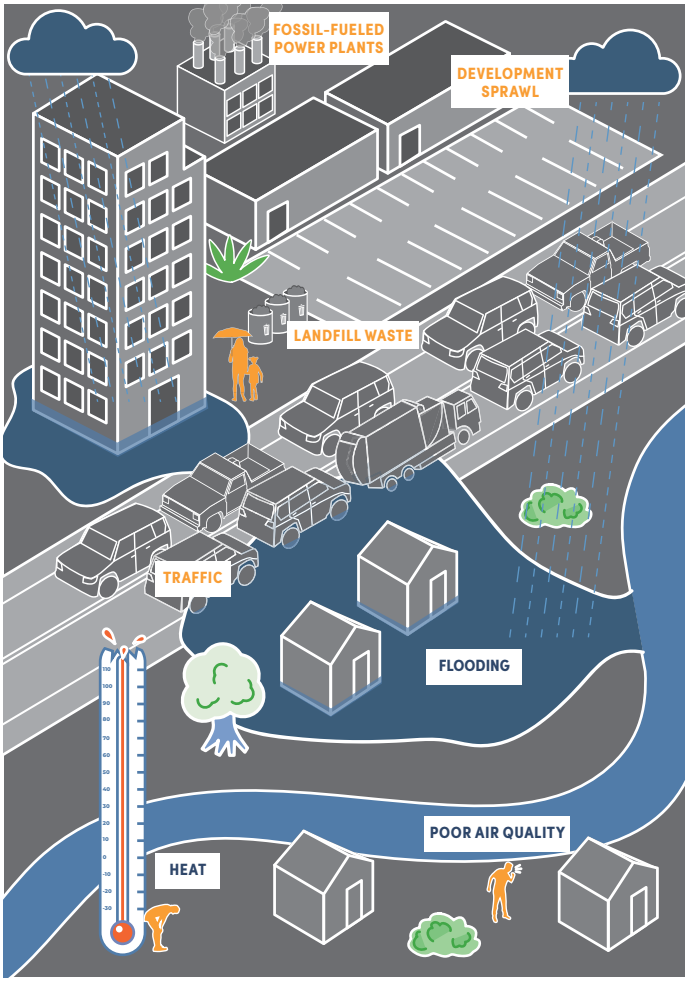
HURRICANE HARVEY RECOVERY: STEPS TOWARD IMPLEMENTATION
(2020)

While recovery is a long-term process that will take up to 10 years, Houston has made great strides in 2018–2019, shifting focus towards implementation and expediting project delivery to provide relief to those in need. By leveraging partnerships and additional funding opportunities, we have initiated efforts to rebuild countless homes and neighborhoods and helped families return to the properties they thought were lost. The *Steps Towards Implementation* report provides an update on implementation and highlights the successes, challenges, and lessons learned related to infrastructure and housing over 2018–2019. It identifies a unique set of opportunities to enhance and expedite the delivery of recovery programs. within public right-of-way and assets, and encourage neighborhood demonstration projects.

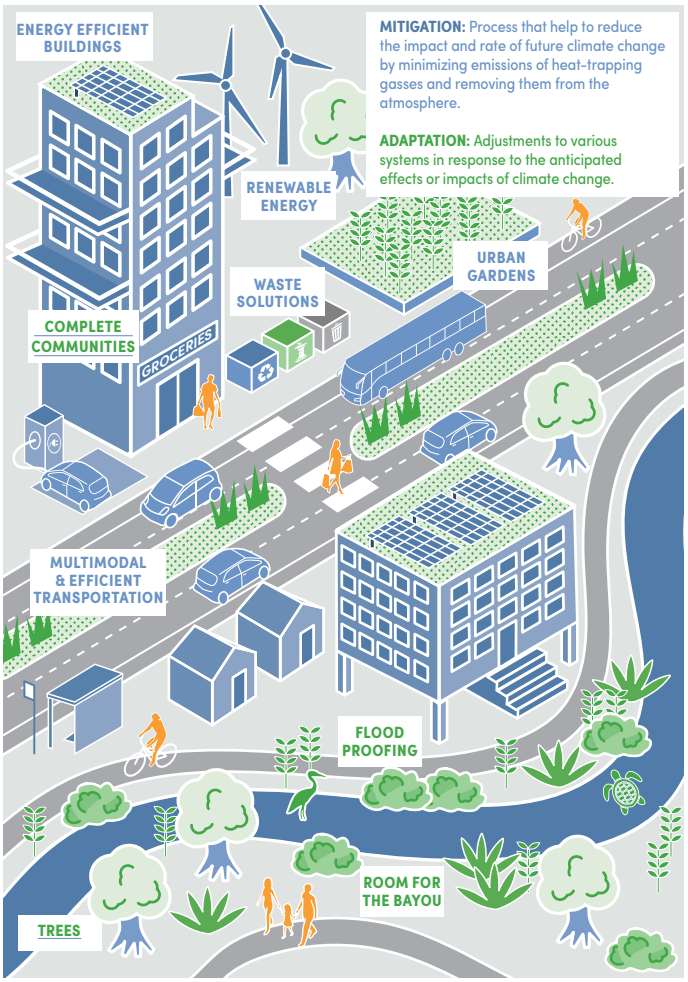
TAKING ACTION ON CLIMATE CHANGE: MITIGATION AND ADAPTATION

Climate change is a global challenge, but its impacts are felt locally in the communities where we live. Cities around the world are leading the way on climate action. Houston, as a global energy capital and as a coastal city already experiencing multiple impacts of climate change, is uniquely poised to develop innovative solutions to our climate crisis.

CLIMATE CHANGE CAUSES & IMPACTS



SOLUTIONS: MITIGATION & ADAPTATION



HOUSTON CLIMATE ACTION PLAN

HOUSTON'S *CLIMATE ACTION PLAN* (2020)

As Houston embarked on developing *Resilient Houston*, the City and its partners were simultaneously developing Houston's *Climate Action Plan*. These plans are intended to be complementary and consistent, therefore the *Climate Action Plan* goals, featured in Action 31 support *Resilient Houston* even if not reiterated in full. Similarly, the goals of *Resilient Houston* will support the *Climate Action Plan* goals. Coordinating efforts strengthens the relationship between climate mitigation, through greenhouse gas (GHG) reduction and carbon neutrality in accordance with the Paris Agreement, and climate adaptation, which addresses the effects of a changing climate that we are experiencing today. These effects include increased precipitation and flooding, larger, slower hurricanes, and higher heat days. Addressing both adaptation and mitigation is critical for Houston's future.

DEVELOPING THE RESILIENT HOUSTON STRATEGY

In August 2018, the one-year anniversary of Hurricane Harvey, Mayor Sylvester Turner, 100 Resilient Cities—Pioneered by the Rockefeller Foundation, and Shell joined forces to name Houston as the 101st member of the 100 Resilient Cities Network, now known as the Global Resilient Cities Network. Houston was the first—and only—city to obtain local support to join 100 Resilient Cities before the program's funding ended in July 2019. The $1.8 Million grant from Shell supported Houston in the four key areas of the program: funding for a chief resilience officer to lead resilience efforts; resources for drafting a resilience strategy; membership in a global network of peer cities to share best practices and challenges; and access to a variety of resilience tools, including the City Resilience Framework. The remainder of the grant will go directly toward implementation of priority initiatives identified in *Resilient Houston*.

PRE-STRATEGY

PHASE 1

AGENDA-SETTING WORKSHOP
(NOVEMBER 2018)

The first workshop brought together 200 diverse stakeholders critical to the development of goals for *Resilient Houston*, including representatives from city and regional governments as well as faith leaders, community-based leaders, economic development organizations, local non-profits, the private sector, academic institutions, and philanthropic groups. The initial focus was to establish a shared understanding of resilience and of the 100 Resilient Cities initiative, establish a strong and clear foundation for the *Resilient Houston* strategy process, identify how a resilience strategy can help stakeholders to address their existing priorities, and build relationships to engage and connect key stakeholders.

LIVING WITH WATER CONVENING
(NOVEMBER 2018)

As part of the development of *Resilient Houston*, the Mayor's Office for Resilience worked with The Water Institute of the Gulf, Waggonner & Ball, and the Kingdom of the Netherlands to hold two "Living with Water" workshops to develop specific recommendations at the regional, city, bayou, and neighborhood scales based on a place-based design approach through the lens of water and flood risk reduction. The first of these workshops focused on reviewing and assessing existing and near-term flood mitigation projects. This convening brought together the local leaders and practitioners who are designing and implementing these initiatives with experts from the U.S. and the Netherlands. Convening participants provided recommendations for other risk-benefit considerations, project expansions or linkages, multiple-benefit project enhancements, resilience and equity considerations, and the potential for nature-based additions to existing projects.

STRATEGY INITIATION
(FEBRUARY 2019)

The resilience strategy development process was officially initiated in Houston with the formal hiring of Houston's Chief Resilience Officer, Marissa Aho, AICP. Aho quickly began meeting with attendees of the Agenda-Setting Workshop and formed an informal steering committee made up of members of the Mayor's Office and various City departments to begin coordinating the strategy development process.

RESILIENCE ASSESSMENT
(MAY 2019)

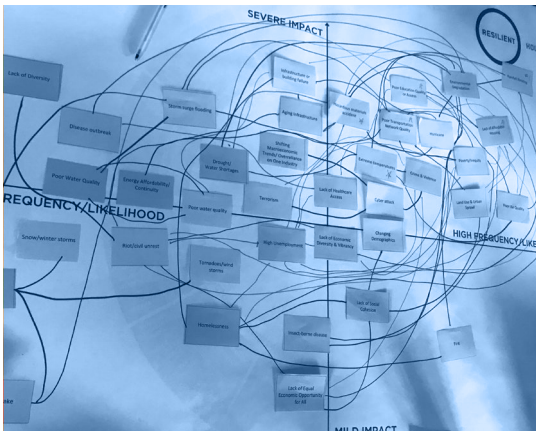
The *Resilience Assessment* for Houston was prepared as a summary of more than six months of research on the priority shocks and stresses for Houston, existing and aligned efforts, and demographic and scientific data. The *Resilience Assessment* was intended to be a "briefing book" for Working Group members and other partners to begin developing Actions for the strategy. The *Resilience Assessment* set the framework of five Scales (Houstonians, Neighborhoods, Bayous, City, and Region) and five thematic "Discovery Areas," including: Achieving Equity and Inclusion, Building Forward, Improving Health and Safety, Integrating Housing and Mobility, and Living with and without Water.













PHASE 2 | IMPLEMENTATION

WORKING GROUP KICKOFF
(MAY 2019)

Throughout the summer of 2019, approximately 100 Working Group members representing community organizations, academic institutions, philanthropy, business organizations, professional associations, and government developed more than 100 recommendations for Actions across the five thematic Discovery Areas. Each of these Actions aimed to address multiple shocks and stresses. Working Group members presented some of their recommendations to a group of multidisciplinary subject matter experts during an Acceleration Workshop in order to further enhance multiple benefits and identify implementation pathways.

LIVING WITH WATER DESIGN WORKSHOP
(MAY 2019)

The second Living with Water workshop brought together local, national, and international experts across multiple disciplines—engineers, hydrologists, planners, ecologists, architects, and landscape architects—for a three-day design sprint to solve site-specific water and resilience challenges. Three Houston neighborhoods—Independence Heights, Kashmere Gardens, and Greenspoint—were used as example areas for living with water design proposals that could be implemented in other neighborhoods across the city and region.

DRAFT RESILIENT HOUSTON FEEDBACK PERIOD
(SEPTEMBER 2019)

A draft outline of *Resilient Houston* with five Chapters, 17 Goals, 65 Actions, and many more subactions was circulated to Working Group members and other partners and posted online in English and Spanish with a feedback survey. The City received hundreds of comments—mostly suggestions for additional Actions.

LAUNCH AND IMPLEMENTATION OF RESILIENT HOUSTON
(FEBRUARY 2020)

The launch of *Resilient Houston* and the accompanying Executive Order on *Resilient Houston* begins the implementation phase through 2020 and beyond. *Resilient Houston* will be used as a guiding document for all City staff and existing partners as they prioritize policies, programs, and investments. *Resilient Houston* also introduces new partners to resilience Visions and Actions that Houstonians, local neighborhoods, stewards of our bayous, the City, and our region are already taking and invites them to join us in building resilience.

IMPLEMENTATION FOCUSED

From the beginning, *Resilient Houston* has been focused on implementation. Six Implementation Themes have been identified that will help guide implementation of the Actions identified in *Resilient Houston*. Actions are organized by Implementation Theme on page 168. Rather than implement each Action independent of each other, we will work collaboratively to coordinate the implementation of related Actions based on the six themes.



ENGAGEMENT

Houston is committed to improving engagement opportunities to better listen to and inform Houstonians and partners and to ensure that more people have access to accurate and timely information. That expert information and lived experience are both valued and shared and trust and transparency are built through participation and collaboration.



FINANCE

The City of Houston, like most Houston families, is on a budget. We will need to develop new funding and financing tools that enhance our current funding processes to achieve the primary and co-benefits of building resilience. Innovative tactics may involve developing resilience bonds, creating a new market, or identifying a new funding partner.



POLICY

Updates to local, state, or federal policies will help facilitate additional resilience building and create additional opportunities. These changes will provide Houston with better rules with which to operate. Some existing rules impose barriers to increasing resilience; these rules will need to change. We will need more partners and policy champions at local, state, and federal levels to continue building resilience.



METRICS

Resilient Houston has **18** main Targets—one for each goal—but many of the Actions also have specific metrics embedded within the Action to hold partners accountable and measure progress over time.



PARTNERSHIPS

"If you want to go fast, go alone. If you want to go far, go together." Resilient Houston is a framework intended to take the Greater Houston region far. At its core, and through each scale, are its partnerships. The City will advance these Actions in collaboration with individuals, neighborhood groups, watershed stewards, businesses, scientists and researchers, advocates, community-based organizations and local, state, and federal partners.



SMART CITIES

Technology is advancing at an exponential rate, and Houston is known for its innovation and entrepreneurial spirit. Smart Cities partners will use Actions that identify Smart Cities as an implementation theme as a framework to develop opportunities to deploy Smart Cities technology, increase data usage and measurement, and support the next generation of Houston's innovators.

HOUSTON'S RESILIENCE TARGETS

Resilient Houston **focuses on the pressing challenges and opportunities that will shape Houstonians' lives today and for future generations. The 18 Targets below correspond with the 18 Goals outlined in this strategy. These high-level Targets will be used to measure the impact of *Resilient Houston*. Each Target will be achieved through the implementation of multiple Actions, often across multiple Scales.**

1. Provide at least 500,000 Houstonians with preparedness training by 2025.
2. Offer 20,000 Hire Houston Youth Summer Jobs in 2020.
3. Ensure zero traffic-related fatalities and serious injuries on Houston streets by 2030.
4. Develop 50 neighborhood plans by 2030.
5. Invest $5 million in local artists to create resilience awareness projects across the city by 2025.
6. Plant 4.6 million new native trees by 2030.
7. Build at least 375,000 new homes across every income level by 2050 to welcome new residents to the city of Houston.
8. Remove all habitable structures from the floodway by 2030.
9. Construct at least 500 miles of trails and bike lanes by 2025.
10. Achieve carbon neutrality by 2050 in accordance with the Paris Agreement.
11. Complete 100 new green stormwater infrastructure projects by 2025.
12. Eliminate geographic disparities in life expectancy by 2050.
13. Appoint Department Resilience Officers in every City of Houston Department in 2020.
14. Attract or incubate 50 Energy 2.0 companies in Greater Houston by 2025.
15. Provide 100% of Houstonians access to high-frequency public transportation choices within a half-mile by 2050.
16. Conserve 24% of undeveloped regional lands as natural spaces by 2040.
17. Ensure that 100% of Houstonians and visitors have access to accurate, real-time emergency alerting by 2030.
18. Invest $50 billion in major recovery, mitigation, and modernization projects that increase resilience by 2040.

BUILDING RESILIENCE AT EVERY SCALE

Only when our people, our neighborhoods, our bayous, our city, and our region truly integrate the value of resilience into everything we do, will we truly be resilient. *Resilient Houston* is organized by Scale, to encourage every Houstonian, every neighborhood, every steward of our bayous and watersheds, the City of Houston, and all the cities and counties in Greater Houston to use this framework as we continue to work together to advance resilience at every scale.

CHAPTER 1
PREPARED & THRIVING HOUSTONIANS

CHAPTER 2
SAFE & EQUITABLE NEIGHBORHOODS

CHAPTER 3
HEALTHY & CONNECTED BAYOUS

CHAPTER 4
ACCESSIBLE & ADAPTIVE CITY

CHAPTER 5
INNOVATIVE & INTEGRATED REGION



HOW TO READ AN ACTION

***Resilient Houston* includes five Chapters, 18 Goals, and 62 Actions to benefit Houstonians, neighborhoods, bayous, the city, and the region. Approximately one-third of the Actions are currently underway, another third of the Actions build on existing efforts using a resilience lens, and the final third are new Actions that address gaps or new opportunities for building resilience in Houston.**

The 62 Actions within *Resilient Houston* follow a consistent format and are organized by Scale and Goal. Each Action has a title and description and identifies the associated shocks and stresses, timeframes, partners, alignment with UN Sustainable Development Goals, and Implementation Themes. At the end of *Resilient Houston*, all the Actions are listed in the order they appear in the document, noting associated Implementation Themes and Sustainable Development Goals for easy navigation.

ACTION DESCRIPTION

Each description presents specific policies or programs the City and its partners will deploy to help achieve resilience goals, as well as important context that explains why the Action is needed.

RESILIENCE VALUE

Action descriptions further explain the Action and highlight the resilience value of each Action, explaining how the Action will make Houston better able to withstand multiple shocks and stresses by prioritizing projects with multiple benefits. By aiming to maximize resilience value, policies and programs throughout this strategy can save time, money, and help Houstonians survive, adapt, and thrive.

SHOCKS/STRESSES

These icons represent the acute shocks and chronic stresses to which Houston is susceptible that the action aims to address.

TIMEFRAME

The timeframe for implementing each Action is identified as Immediate (2020), Short-term (2025), Medium-term (2030), or Long-term (2050).

IMPLEMENTATION THEMES

Key themes, including Engagement, Partnerships, Metrics, Smart Cities, Finance, and Policy, will allow for Actions to be grouped in ways that will accelerate implementation.

PARTNERS

Implementation partners include key public, private, nonprofit, and academic collaborators that will advance *Resilient Houston* Actions in the years ahead. Partnership is not exclusive and is meant to be a starting point for implementation.

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

The Sustainable Development Goals (SDGs) are a collection of 17 global goals set by the United Nations General Assembly in 2015 for the year 2030. Global cities are aligning local actions with the SDGs.

03 SUPPORT SMALL BUSINESSES TO BETTER WITHSTAND ANY DISRUPTION.

Ensure Houston's more than 100,000 small businesses have access to information and resources so they can reduce the impact of disruptions and disasters.

RESILIENCE VALUE: Small businesses are typically more vulnerable when faced with a disruption or disaster. According to FEMA, 40% of small businesses never reopen after a disaster and another 25% that do reopen fail within a year. Working to better understand the existing disaster preparedness and resilience of Houston's small businesses will create opportunities to support businesses and their employees directly, strengthen supply chains and lifelines within communities and the region, and create more disaster resilient communities. The City and its partners will develop and deploy a small business disaster resilience assessment focusing on businesses that support community lifelines, like water, food, and fuel, and operate along targeted commercial corridors. The City will also engage participating small businesses about climate risk awareness and share existing resources available through the City's Business Solutions Center and other partners. Key findings from the small business resilience assessment will inform targeted recommendations at the business, community, and city levels. Guided by the findings of the assessment, the City will work with partners to develop additional resilience toolkits and trainings for Houston small businesses.

SHOCKS/STRESSES



TIMEFRAME



Short Term (2025)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

City of Houston (COH) /
Houston Community College /
Houston Chamber of Commerce /
Rice University /
Houston Small Business Association

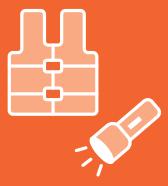
UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS





CHAPTER 1

PREPARED & THRIVING HOUSTONIANS



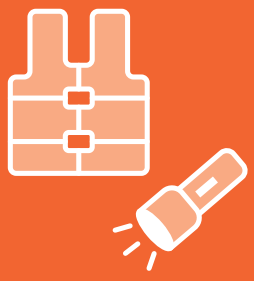
GOAL 1 **We will support Houstonians to be prepared for an uncertain future.**



GOAL 2 **We will expand access to wealth-building and employment opportunities.**



GOAL 3 **We will improve safety and well-being for all Houstonians.**



GOAL 1

WE WILL SUPPORT HOUSTONIANS TO BE PREPARED FOR AN UNCERTAIN FUTURE.

Making Houston more resilient begins with supporting Houstonians with tools and resources to be resilient as individuals. Everyone experiences shocks and stresses in their own way—as a parent with children to care for, as the owner of a small business, as someone whose primary language is not English—and will need different resources to cope.

Goal 1 builds individual resilience by amplifying information, education, and awareness for Houstonians about the risks of potential emergencies and the resources available to prepare for and withstand those emergencies—and to assist their friends, families, and neighbors. To achieve this Goal, we have outlined concrete actions in the areas of personal finance, home improvements and retrofits, planning, insurance, education, and other actions that individual Houstonians can take to prepare for a range of disruptions. Many of these resources already exist and simply require better communication and outreach. In other cases, new programs will need to be developed to address identified gaps. Implementation of these actions relies on support from multiple public, private, and non-profit entities, but the impact is directed squarely at individual Houstonians.

1 **Provide at least 500,000 Houstonians with preparedness training by 2025.**

01 ENSURE HOUSTONIANS HAVE THE INFORMATION, SKILLS, AND CAPACITY TO PREPARE FOR ANY EMERGENCY.

Expand preparedness education and risk awareness programs to help Houstonians be prepared and ready to support their neighbors in an emergency.

Houstonians face emergencies on a regular basis. Whether that emergency is related to flooding, a chemical fire, a traffic crash, or something unexpected, the results can range from disruptive to deadly. Houstonians have a responsibility to prepare and plan for any emergency with their families, co-workers, and neighbors. Specific actions can be taken at the household, building, or block level using existing community resources. Emergency preparedness and disaster recovery training and resources will prevent loss of life and property, minimize disruption to livelihoods, reduce the emotional and economic costs of disruptions and disasters and allow Houston to recover more quickly and efficiently.

SHOCKS/STRESSES



TIMEFRAME



Short Term (2025)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HCJO / HCC / Houston Businesses / Academic Institutions / Business Associations and Chambers

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



1.1 Build community through preparedness and disaster literacy.

In 95% of all emergencies, bystanders or even the victims themselves are the first to provide emergency help or to perform a rescue, according to Ready Houston. Emergency personnel are often overwhelmed during extreme weather emergencies and neighbors quickly become first responders. The City will work toward increasing the capacity of its residents to be self-reliant for the first 72 hours/7 days following an extreme weather emergency. Through strategic partnerships with non-profits such as United Way, Red Cross, Salvation Army, and AARP, we can leverage existing programs to build individual and community preparedness. Programs and resources like Ready Houston enable Houstonians to stay informed and safe before, during, and after a disaster, through education and information, such as how to make a disaster plan and emergency kit. The City will work to ensure that Ready Houston provides up-to-date, accurate, and accessible information that can help Houstonians prepare, including providing additional information about personal and property risk.

1.2 Provide targeted Community Emergency Response Team (CERT) training to residents in neighborhoods that experience chronic flooding.

Community Emergency Response Team (CERT) training prepares an individual to help themselves, their family, and their neighbors in the event of a disaster. CERT is a 24-hour program taught by first responders over eight weeks that is free of charge and covers fire safety, disaster psychology, basic medical treatment, and light search and rescue. More than 42,000 volunteers in Greater Houston have received CERT training to support disaster response since 2002 and classes are held regularly. CERT classes are accessible, providing training in Spanish and Vietnamese, for the deaf and hard of hearing, and for the blind and visually impaired. The City will train a minimum of 5,000 additional Houstonians by 2025. The City will continue to partner with neighborhood and community groups including Super Neighborhoods, parent groups, faith-based organizations, and HOAs, and will prioritize training Houstonians in neighborhoods that experience chronic flooding.

Under the direction of local emergency responders, CERT teams help provide critical support by giving immediate assistance to victims, providing damage assessment information, and organizing other volunteers at a disaster site. During the Hurricane Harvey response, CERT members assisted at the distribution center and shelters, rescued neighbors, mucked and gutted neighborhoods, and set up feeding sites. The CERT program also builds strong working relationships between emergency responders and the people they serve.

1.3 Expand the outreach and engagement of the Houston Neighborhood Ready training program.

Neighborhood Ready was developed for communities to plan and prepare together before a disaster strikes; stay informed before, during, and after a disaster; and get to know their neighbors, particularly their elderly or ill neighbors who may not be able to plan independently for a disaster. This 90-minute training can be held by any Houstonian with up to 20 neighbors. Readyhoustontx.gov has meeting kits available to order, with materials for neighbors and a facilitator's guide. The City will encourage 5,000 Houstonians to hold neighborhood meetings by 2025 to help their neighbors prepare—training nearly 100,000 Houstonians—and will track the neighborhoods where trainings occur.

1.4 Improve mobility during emergencies.

Hurricane Harvey flooded an estimated 500,000 cars, leaving people stranded with no evacuation options. While formal evacuation plans need to remain flexible and event-specific and are hard to develop in advance, Houstonians need to have access to information that improves mobility during emergencies. This can be achieved through increased public information on which roads flood, either by design or by historic flooding patterns, so Houstonians can make more informed travel decisions. Houston can now offer, thanks to advances in technology, real time or predictive applications for better navigation and improved warning systems, especially for all underpasses and freeways that have repetitive flooding. Identifying high ground and improving wayfinding and signage are also key for improving public understanding of safe routes. The City will support ongoing research and technology to achieve better, faster, and more accurate information on road hazards and conditions.

1.5 Expand flood insurance coverage.

Flood insurance is crucial for households to recover from flood damage, yet many are not aware of the role of the National Flood Insurance Program (NFIP) or how flood insurance can help them recover from a disaster. The City will increase awareness and coverage of NFIP and encourage Houstonians to maintain flood insurance policies on their homes regardless of their location. The City can also work to increase the accessibility of flood insurance by making it less expensive through FEMA's Community Rating System (CRS) program. Through CRS, Houstonians can receive discounts on their flood insurance policies, depending on the community's rating within the program. Currently, the City of Houston is a Class 5 community, discounting premiums by 25%, but a Class 4 rating would provide a 30% discount. The City has set a goal of achieving a Class 4 rating by late 2021. Communities earn these ratings through actions that protect residents from flood hazards.

At the state level, reforms could focus on requiring flood insurance as part of the home-buying process, especially focusing on homes inside the floodplain or homes acquired without a mortgage. At the congressional level, the City and local partners could advocate to make insurance more affordable for those that have lower risk, including revising risk calculations and rates to include future impacts, not just historic ones.

1.6 Develop cash and direct assistance programs for vulnerable populations during disaster recovery.

The 2019 Kinder Houston Area Survey identified that 39% of Houstonians do not have $400 for an emergency. However, $400 in assistance could prevent the cascading impacts of disruption that happen when a disaster strikes. While many families are eligible for federal disaster assistance, those who are not eligible, whether because of employment, housing, or immigration status, are more vulnerable and in need of emergency cash assistance. The City and County will work with partners to develop a program that could expedite such support through gift cards or other tools that help to ensure that privately-raised disaster relief funding is prioritized for individuals who are ineligible for federal disaster relief programs, whether due to employment status, housing status, or immigration status. The City will also explore features like micro-banking that could pre-qualify households for the assistance and automatically deposit funds when the triggering event occurs.

1.7 Establish a corps of short-term case managers to fast-forward recovery programs after an event.

Recovery programs are strengthened when staffed by experienced personnel. Houston's experience has confirmed this: processes and programs that were established after Hurricane Harvey were used for Tropical Storm Imelda—just two years later. By establishing a group of case managers who are trained and ready to respond after the next event in Houston, we will continue to improve recovery programs. These case managers could be non-essential government employees or people whose job would be disrupted by a disaster. A proactive case management program would transfer institutional knowledge from one recovery effort to the next.

1.8 Introduce culturally-informed disaster case management.

By any measure, Houston is staggeringly diverse. 1.6 million immigrants call this city home and 140 languages are spoken in Houston homes. 35% of Houstonians do not speak English well or at all, and almost 50% of our undocumented population and people with permanent residency lack English proficiency.

To ensure an equitable recovery, the region must invest in culturally competent disaster case management. This includes prioritizing grassroots organizations deeply rooted in immigrant communities and including them in case management funding and planning systems. Many immigrants report not fully trusting the confidentiality of some assistance programs, so having case managers from those communities increases the likelihood that immigrant communities will receive the benefit of recovery programs and services. By working with local universities and other partners, we will increase the number of case managers that are multilingual in keeping with the region's demographics and to reflect the populations that they serve. Language capacity should begin with Spanish, French, Vietnamese, Chinese, Urdu, and Arabic.

CAPE TOWN, SOUTH AFRICA

"DAY ZERO"

Cape Town provides a timely example of how individuals can change their behavior quickly to be more prepared for an uncertain future. The mayor of Cape Town predicted in October 2017 that the city would run out of water by March 2018. The city made world headlines as "Day Zero approached after experiencing the driest three-year period since the 1930s. However, the city's residents, community organizations, and businesses mobilized to take action to reduce consumption, develop response strategies, and to tap into alternative water sources which ultimately pushed "day zero" to 2019, which was enough time for the immediate crisis to be averted. A key part of the success was the local government's willingness to share information and partner with stakeholders and residents to form a collective response to the threat at hand. The approach had a positive impact on city governance and operations that continues to be felt today.



Photo: City of Cape Town

02 MOBILIZE HOUSTONIANS TO ADAPT IN THE FACE OF CLIMATE CHANGE.

Engage Houstonians in the increased risks associated with climate change and what actions need to be taken to help reduce and adapt to these risks.

Every Houstonian can play a role in making our homes and communities more climate-ready and resilient. While a concerted effort to develop policy and infrastructure solutions is important, building awareness among Houstonians on climate change and the local impacts of extreme weather is equally critical. Houstonians can lead by advocating and promoting meaningful steps toward lessening our contribution to and risks from extreme weather events by learning about, mitigating, and adapting to climate change.

SHOCKS/STRESSES



TIMEFRAME



Short Term (2025)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

Housing / Public Works / COH / HCJO / HPB / CenterPoint Energy / Public Sector / Private Sector / Philanthropy / Community Organizations / Houstonians

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



2.1 Grow climate risk awareness.

The City will work with partners to collaboratively develop and implement an education and advocacy campaign to build Houstonians' awareness about the risks that are exacerbated by climate change and the impact they have on their health, the economy, and the built environment. This campaign will develop relatable and easy-to-understand lessons based on climate data specific to Houston with mitigation and adaptation steps that Houstonians can take to be good stewards of their communities in the face of increased climate risk. Creating accessible information allows Houstonians of all ages to become more climate aware.

2.2 Weatherize existing homes and properties.

Simple steps can be taken to improve existing and new single- and multi-family homes to minimize the need and expense of recovery after future flooding events. Weatherizing homes, including sealing seams, updating insulation, and replacing doors and windows, can lower power costs as well as make a home more comfortable in an extended power outage. Adding rain gardens and native trees reduces water runoff and adds shade, reducing heat. Small solar installations can power attic fans, critical medical equipment, or a small refrigerator for food and medicine; they could remain online even after a major power outage during a disaster. The City will work with partners, such as CenterPoint Energy, to grow existing weatherization education efforts and implement weatherization programs, prioritizing low- to moderate-income households and neighborhoods with repeated flooding damage.

2.3 Advance green stormwater infrastructure.

Green stormwater infrastructure (GSI) on private property plays an integral part in the City's complex stormwater system as it aims to mimic the natural flow of water in pre-development conditions. Property owners and developers have a significant role in embracing greener practices for stormwater infrastructure if provided with alternatives on how best to use and incorporate them. In 2019, the City of Houston's *Incentives for Green Development* recommendations were released with generous support from the Houston Endowment. These recommendations consist of four proposed incentive programs geared toward private property that are site-specific, practical, cost-effective, and regionally appropriate for a greener foundation for Houston. They include Integrated GSI Development Rules, Property Tax Abatement, Award and Recognition Program, and Increased Permitting Process Certainty and Speed and represent a menu of tools that can be used in a number of combinations to achieve the greatest benefits.

The City will move forward with the implementation of Houston's *Incentives for Green Development* in 2020. Once implemented and launched, the City will evaluate the effectiveness of the incentives. The City will also identify and create additional green infrastructure programs that benefit residential properties.



2.4 Educate Houstonians on property maintenance.

Houston property owners and renters are the primary users of our public infrastructure—pipes, drains, and ditches—and can and should play a critical role in its maintenance. The City will launch a public education campaign focused on the benefits of infrastructure maintenance and basic steps Houstonians can take to adopt better habits and practices that prolong our public infrastructure's lifespan by limiting the strain placed on the city's systems, most notably the drainage system. The campaign will include information such as the basic functions of the drainage system, its components, and the direct impact poorly maintained systems have on their homes, businesses, and neighborhoods. By actively engaging with communities and tailoring information, Houstonians will learn the definitions of public versus private rights-of-way and easements; the responsibilities of renters and property owners; maintenance of driveway culverts, ditches, and gutters; and proper debris removal. Property maintenance also includes notifying the City by calling 311 when ditches need to be dug out or debris needs to be removed, ensuring that regular and proper maintenance is provided.

2.5 Feature resilient building innovations at Houston's Green Building Center.

Houston's Green Building Resource Center celebrated its 10-year anniversary in 2019. The Resource Center is located within Houston's Permitting Center, a LEED gold building. Here, Houstonians can see more than 50 displays to learn about green building technology and materials, including a vegetated roof that is irrigated with air conditioning condensate. The Green Building Resource Center is a prime location for Houstonians to learn more about climate adaptation technology, including resilient design, floodproofing technology, weatherization tools, and GSI. As Houston's buildings continue to be built with sustainable and resilient designs and technology, the Green Building Resource Center will also be able to connect Houstonians to best practices and demonstration projects in the community.

03 SUPPORT SMALL BUSINESSES TO BETTER WITHSTAND ANY DISRUPTION.

Ensure Houston's more than 100,000 small businesses have access to information and resources so they can reduce the impact of disruptions and disasters.

Small businesses are typically more vulnerable when faced with a disruption or disaster. According to FEMA, 40% of small businesses never reopen after a disaster and another 25% that do reopen fail within a year. Working to better understand the existing disaster preparedness and resilience of Houston's small businesses will create opportunities to support businesses and their employees directly, strengthen supply chains and lifelines within communities and the region, and create more disaster resilient communities. The City and its partners will develop and deploy a small business disaster resilience assessment focusing on businesses that support community lifelines, like water, food, and fuel, and operate along targeted commercial corridors. The City will also engage participating small businesses about climate risk awareness and share existing resources available through the City's Business Solutions Center and other partners. Key findings from the small business resilience assessment will inform targeted recommendations at the business, community, and city levels. Guided by the findings of the assessment, the City will work with partners to develop additional resilience toolkits and trainings for Houston small businesses.

SHOCKS/STRESSES

TIMEFRAME

Short Term (2025)

IMPLEMENTATION THEMES

IMPLEMENTATION PARTNERS

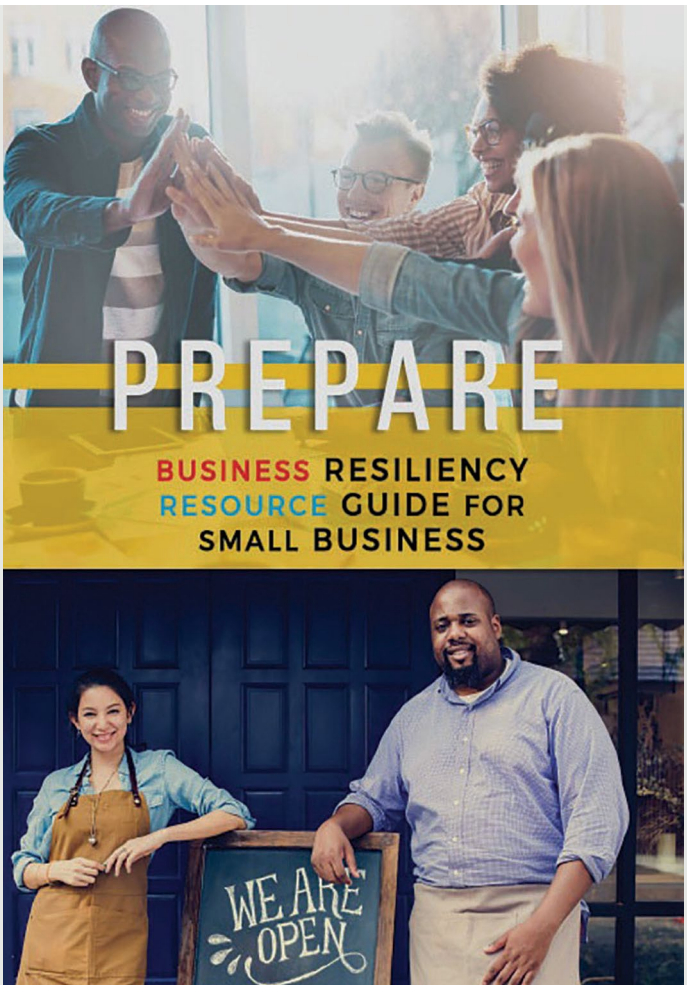
COH / HCJO / HCC / Houston Businesses / Academic Institutions / Business Associations and Chambers

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

BUILDING ON EXISTING EFFORTS

PREPARE: BUSINESS RESILIENCY RESOURCE GUIDE FOR SMALL BUSINESSES

The Business After Harvey Initiative, a program of the Houston Minority Business Development Agency Business Center operated by Houston Community College, aims to equip small business owners with opportunities, training, and information to rebuild after Hurricane Harvey. This local initiative also developed a resource guide to assist small businesses in preparing for business disruption caused by everything from flooding to cyberattack to an industry disruption to power outage. The guide features information on insurance, property and equipment, data and information, social media and how to plan for and communicate with the essential people, including employees, customers, and vendors. The guide challenges small business owners to take 30 steps to prepare in 30 days. For more information, visit: *houstonbri.com/resources/*



04 ENCOURAGE COMMUNITY LEADERSHIP, STEWARDSHIP, AND PARTICIPATION.

Enhance local stewardship of community resources and assets through improved connections with local leaders and stakeholders, especially those from underrepresented communities.

A diverse population is one of Houston's strengths and defining characteristics. However, many of Houston's communities suffer from underrepresentation in traditional civic platforms and forums, often resulting in inequitable allocation of resources. Equity-driven engagement empowers community members to build resilience in their own communities. Interventions—from workforce development programs to new open spaces with built-in flood mitigation—will be tailored to community needs. This will increase government transparency and accountability and, over time, strengthen relationships between the City and its diverse communities.

SHOCKS/STRESSES

TIMEFRAME

Short Term (2025)

IMPLEMENTATION THEMES

IMPLEMENTATION PARTNERS

COH / Super Neighborhood Alliance / Houstonians / Young Houstonians /

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

4.1 Increase Super Neighborhood Council representation.

Houston's Super Neighborhood Councils serve as a forum where residents and stakeholders can discuss issues and establish priority projects for their area and develop a Super Neighborhood Action Plan to help them meet their goals. However, 38 of Houston's 88 recognized Super Neighborhoods do not have access to this forum as their councils are "inactive." To better support neighborhood engagement, the City will work with partners to develop strategies for encouraging more neighborhood leaders to form Super Neighborhood Councils. Increasing the number of "active" Super Neighborhood Councils will create new community leadership opportunities as well as diversify representation on the Super Neighborhood Alliance. Comprised of the presidents or chairs of each active Super Neighborhood Council, the Alliance meets monthly on various topics that are important to Houston's neighborhoods and regularly interacts with the Mayor's Office, City Council Offices, and City Departments. The Mayor's Assistance Office maintains the list of "active" Super Neighborhood Councils and can assist Houstonians interested in activating a dormant Super Neighborhood Council.

4.2 Expand leadership and stewardship opportunities for Houston's youth.

The City will continue to support and expand the numerous successful programs for Houston's youth to gain leadership experience and improve their communities. The Mayor's Youth Council, formed in 1998, provides high school students the opportunity to learn about city government, develop leadership skills, and bring awareness to issues that are important to Houston's youth. The Houston Police Department (HPD) has a number of youth leadership and educational opportunities, including Gang Resistance Education Awareness Training (GREAT), a prevention program for middle school students; Teen Driver Safety, an effort to help reduce teen driver crashes and fatalities; the Explorers training program; and the Youth Police Advisory Council, which when created in 1997 was the first of its kind in the nation. The Environmental Health Youth Council prepares 9th–12th grade youth in communities facing significant environmental risks to become future leaders on climate and air pollution issues and more knowledgeable about how to help improve the health and prosperity of their communities. The Mayor's Student Leadership Alliance is the newest program, established in 2019, for college and university students to promote collaboration, communication, and coordination among post-secondary youth in Houston.

4.3 Support community stewardship through a Resilience Ambassador program.

Houston is full of local resilience champions—leaders and stewards of their communities who keep their neighbors safe and connected. The City will work with partners to develop a Resilience Ambassador program to support local resilience champions with resources and tools, promote opportunities for neighbors to engage neighbors in risks and efforts to build resilience, and to formalize communication channels with the City and with other community leaders.

4.4 Ensure every Houstonian gets counted.

Every 10 years, the U.S. government conducts a census to count everyone living in the United States. The next U.S. Census will be held during the Spring of 2020. The City of Houston, Harris County, and our partners are committed to ensuring that every Houstonian is counted, but we need each Houstonian to participate and make sure their friends, family, and neighbors get counted! The count determines how many congressional representatives each state receives and the levels of federal funding for federal, state, and local government programs. It also serves as the statistical foundation for how we measure population, economic, and social data over time. An accurate Census with maximum participation will ensure proper political representation and federal funding.
The City could miss out on more than a half billion dollars of funding if there is a 1% undercount of Houstonians. We are committed to working with partners to reach Houstonians for whom it is more difficult to participate in the Census, such as single parent households, low-income people, people of color, or people whose primary language is not English. The City, County, and partners are spending the year prior to the 2020 Census educating Houstonians about the role of the Census and the importance of being counted.





GOAL 2

WE WILL EXPAND ACCESS TO WEALTH-BUILDING AND EMPLOYMENT OPPORTUNITIES.

Despite the strength of Houston's diverse economy, not all Houstonians benefit. In 2017, 21.2% of Houstonians lived in poverty.[43] To become more resilient, Houston's economic growth must benefit everyone, enabling all Houstonians to build wealth and save for their futures. Increased financial capacity and stability for families and small businesses enable Houstonians to better prepare for and recover faster from shocks and stresses that disproportionately impact those with limited financial resources. Providing Houstonians with the right tools and resources can support generational wealth building.

In the short term, we can support Houstonians by building financial literacy, facilitating access to financial services, encouraging the development of more living-wage jobs, and supporting the growth and development of small businesses. In the long term, we can better position Houstonians by training a workforce for the future, focusing on new curriculums and vocational programs as well as enhanced pathways to emerging industries. Collaboration with the private sector is critical to bridging the current disconnection between living-wage jobs and those in search of sustainable employment. Taking these steps will improve the lives of individuals as well as boost the regional economy by increasing the competitiveness of Houston's workforce.



Offer 20,000 Hire Houston Youth Summer Jobs in 2020.

05 MAXIMIZE ACCESS TO ECONOMIC OPPORTUNITY AND PROSPERITY FOR ALL HOUSTONIANS.

Create more opportunities for Houstonians to generate wealth and prosperity through increased access to capital, financial literacy, and a higher minimum wage.

Houstonians can build individual resilience by achieving financial stability. Households with more opportunities to generate wealth and build financial security are in a better position to prepare for and respond to the next disaster. Having increased access to capital and higher wages for workers will also increase household income and allow families to cover basic needs without stretching budgets. The everyday benefit will be more households that can cover basic needs such as housing, education, health care, and food.

SHOCKS/STRESSES



TIMEFRAME



Short Term (2025)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / Financial Institutions / Philanthropy / The Alliance / LISC / United Way / UpSkill Houston / Genesys Works / Houston First / Houston Businesses / Houstonians / Bank On Houston

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



5.1 Support access to banking for more Houstonians.

Bank On Houston is an ongoing City program to help Houstonians without bank accounts to be able to access financial services. Bank On Houston is a partnership with banks and credit unions, non-profit organizations, and national partners. Access to banking for some Houstonians has additional barriers due to credit requirements, income levels, or identification constraints. The City and its partners will grow the Bank On Houston program to provide more Houstonians with resources that help them connect to low-entry banking opportunities that have low monthly fees, no hidden fees, no minimum balance required, and require a low opening deposit to avoid predatory lending alternatives like payday loans.

5.2 Offer municipal identification to help more Houstonians access banking, jobs, and services.

Many immigrants, individuals experiencing homelessness, people with disabilities, and the elderly do not have a form of identification that confirms their identity and residence in Houston. Without an ID, these community members are unable to access services that are essential to their daily lives. The City will explore offering a municipal ID that increases all Houstonians' ability to apply for a job, rent or buy a home, open a bank account, interact with law enforcement in a safe manner, access City services, access a food bank or housing shelter, and pick up children from school. A municipal ID should be tied to the Bank On Houston program mentioned previously to help residents seamlessly apply for banking services as they are receiving their IDs. A municipal ID could also facilitate faster dissemination of emergency response and recovery resources.

5.3 Expand financial empowerment centers.

The City will enhance and expand financial empowerment centers to provide Houstonians with the fundamental tools and resources to gain access to banking and build wealth. Many services require additional support, such as remedial academic programs to prepare people for vocational workforce development and job training programs—ultimately increasing access to higher wage jobs. In early 2020, the City in partnership with The Alliance, opened three new financial empowerment centers in targeted Complete Communities that offer financial capability and financial literacy services to connect Houstonians to safe and affordable financial products and services to build savings and wealth. Where disaster recovery funds are used to support programs aimed at increasing economic opportunities, such as workforce development programs, job training programs, and small business programs, the City will encourage integrating financial literacy programs as a service available to Houstonians. It will expand programs and networks that have a proven track record of providing these services, such as LISC's Financial Opportunity Center Network, United Way THRIVE Programs, UpSkill Houston, and Genesys Works.

5.4 Advance targeted local hire practices.

As the City of Houston continues to invest billions of dollars into infrastructure, these investments should be used to drive economic opportunity for all. The City of Houston's Minority, Women & Small Business Enterprise Program and similar programs like Houston First's Diversity Programs have been designed



to create opportunities to improve the participation of minority- and women-owned small business in contracting and procurement activities. The City sets participation goals for small, minority-owned, and women-owned business enterprises (SMWBE) for eligible contracts.

In Houston, the overall unemployment rate has been below 4% for most of 2019, but in some of Houston's neighborhoods, more than 20% of Houstonians are unemployed—with many more underemployed or working low-wage jobs. A targeted local hire policy will set requirements for employers to hire a certain portion of their workers from among residents and neighborhoods with a disproportionately high unemployment rate and/or a high degree of low-wage employees. A local hire policy for the City and its partners, especially Houston's anchor institutions, will help to ensure that local residents and traditionally disadvantaged communities are recipients of the benefits of economic growth. This would advance current practices, most notably the Housing and Urban Development (HUD) Section 3 requirements for Federally funded housing programs. The City will find opportunities to advance local hiring targets for infrastructure and City-supported development projects in and near these neighborhoods. In addition to distributing the benefits of living-wage jobs equitably throughout Houston, a targeted local hire program can benefit employers by connecting them to a skilled workforce and can also increase the quality of life of employees by reducing the distance they need to travel to find work.

5.5 Encourage living wage jobs for more Houstonians.

In October 2019, Mayor Sylvester Turner signed an Executive Order implementing a new city policy regarding the prospective negotiation of contracts with airlines and concessionaires that would enable workers at George Bush Intercontinental, William P. Hobby, and Ellington Airports, to achieve at minimum a "living wage" and, ultimately, $12 per hour by 2021. The City will encourage more sectors to establish minimum living-wage standards with a goal of reaching $15 per hour as a standard by 2025. The City will also lead by example to incorporate additional minimum living-wage standards for employees, contractors, and vendors. The City will explore a preferred vendor status for City contractors and vendors who pay workers a living wage, as highlighted in 2017 by the report *Rising Together: A Roadmap to Confront Inequity.* The City will also work with partners to focus on Houstonian workers that are "ALICE"—Asset-Limited, Income-Constrained, and Employed individuals ages 24–64—a population identified by United Way that includes predominantly people of color whose households earn above the Federal Poverty Level, but not enough to afford to sustain the basic needs of a household. These Houstonians may work multiple minimum-wage jobs to make ends meet and will benefit from living-wage jobs and other coordinated economic stability solutions.

06 PROVIDE OPPORTUNITIES FOR MORE HOUSTONIANS TO START, MAINTAIN, AND GROW SMALL BUSINESSES.

Provide better coordination, access to capital, capacity-building services, and commercial corridor programs to ensure that all small businesses have a chance to grow jobs, opportunity, and wealth for Houstonians.

Houston is a place where small businesses and entrepreneurs can thrive. More than half of all businesses in Houston are minority-owned and 40% of businesses are women-owned. However, small, minority-owned, and women-owned business enterprises (SMWBEs) in Houston encounter several barriers to success—most notably, access to capital, including debt and equity financing. SMWBEs also earn a fraction of the sales and receipts compared to white-owned or male-owned businesses. Providing additional support to small, minority-owned, and women-owned businesses will help strengthen the entrepreneurial ecosystem in Houston and ensure that more Houstonians have access to wealth-building opportunities. Measures that support the long-term success of small businesses can also increase their resilience to disruptions and disasters.

SHOCKS/STRESSES



TIMEFRAME



Short Term (2025)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HCJO / Academic Institutions / Financial Institutions / Philanthropy / TOP / LiftFund / PeopleFund

TruFund / Grameen America / Democracy at Work Institute / SCORE / Houstonians

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



6.1 Help business owners understand and navigate the landscape of business services and support.

As detailed in *Houston's Minority and Women Business Ecosystem Assessment* released in August 2019, there is no "one-stop shop" for business owners to learn about business support and capital resources available. There is also a lack of coordination between the dozens of business-serving organizations in Houston. The City will work with partners to create a network of business-serving organizations and capital providers as a public-private partnership to support continual collaboration and marketing to ensure that existing and new resources for business owners get shared and that priority initiatives are supported by the full business-support ecosystem.

6.2 Create a commercial corridor improvement program to support small businesses.

Commercial corridor economic development programs have a long history of successfully driving business and dollars to small businesses. These programs include assisting local businesses to form merchants' associations; providing infrastructure dollars that support street improvements, walkability, and placemaking; and providing funding for facade improvements that help small businesses modernize the front of their stores in order to enhance their visibility and branding. These programs often have a strong emphasis on preserving and growing businesses that represent local culture and community. The City will work with partners to implement a strategy to support economic development programs along target corridors.

6.3 Expand access to capital for minority-owned and women-owned small businesses.

Houston's entrepreneurial spirit is an asset to the city and a good investment. By exploring innovative ways to create more opportunities for small businesses to access capital, Houstonians can invest in their neighborhood businesses. By working with mission-driven alternative lenders like Community Development Financial Institutions (CDFIs), the City can explore the feasibility of developing small business grant or loan programs or alternative financing programs that can reduce initial costs or barriers that Houston's entrepreneurs face when starting a business.

Access to capital is not only an issue for Houston's families; it also affects small businesses, who often need to access small loans (under $50,000) to buy or replace equipment, expand employment, change and upgrade their physical location, or fulfill the terms of a contract. Minority- and women-owned businesses often have a harder time accessing loan funding through traditional sources. The City will continue to work with CDFIs to establish a microloan program that targets staffing and marketing toward the minority-owned and women-owned business communities. The loan pool could leverage funds from the public sector, financial institutions, banks, and private-sector sources to meet the needs of businesses seeking to stabilize, expand, and evolve lines of business and expertise.

BOSTON, MASSACHUSETTS, UNITED STATES

ECONOMIC MOBILITY LAB

Boston's Economic Mobility Lab was launched in 2017 as a flagship program of the City's resilience strategy. The lab is made up of social entrepreneurs who research and test ideas with the potential to economically help low- and moderate-income Bostonians. The lab has three focus areas: working to support parents and young children by focusing on early childhood and childcare, preparing students and families for income growth by focusing on the transition to college and career, and helping families prepare for unexpected expenses by improving credit scores and incentivizing emergency savings accounts.



The fund could be administered through a single community financial institution or a group of institutions that offer business-oriented capacity-building services as well as access to capital.

6.4 Establish more cooperatively owned businesses.

From home care to laundry services to groceries to breweries and beyond, worker-owned cooperative businesses are another proven model for workers to build wealth, especially workers or communities that are marginalized. Houston has an opportunity to support and build a cooperative economy built on the values of equity, cooperation, worker democracy, and environmental sustainability to provide meaningful living-wage jobs, reduce racial inequalities, and build community wealth. To accomplish this, the City and its partners through Houston's Small Business Development Center and the Complete Communities Financial Empowerment Centers will develop programs to assist Houston entrepreneurs in establishing cooperative businesses, encourage cooperative businesses to participate in the City's procurement process, and educate individual sole proprietors on the potential benefits of pooling resources and talents in a cooperative business.

07 PREPARE HOUSTON'S WORKFORCE AND ALL YOUNG HOUSTONIANS FOR THE JOBS OF THE FUTURE.

Ensure that Houstonians are well equipped for the industries of today and tomorrow with more pathways from workforce development to employment.

Workforce development and job training programs ensure that Houstonians will be competitive and well-trained for jobs in tomorrow's industries. Educating our youth to increase their access to post-secondary education and quality jobs will also form a basis for Houston's future economic and social success. Creating opportunities for all Houstonians to receive training for relevant jobs is essential to ensuring all can partake in the city's economic growth. A skilled workforce that can engage in existing and emerging industries will ensure Houston continues to attract employers and companies from around the world.

SHOCKS/STRESSES



TIMEFRAME



Short Term (2025)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HCJO / GHP / Academic Institutions / Philanthropy / My Brother's Keeper / NLC / Businesses Associations / Houston Businesses / Houstonians / Young Houstonians / Business Incubators / Professional Associations

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



7.1 Prepare Houston's youth for jobs of the future.

The City will expand its youth career development services while supporting the school system and non-profit partners to reduce educational disparities. The City's Hire Houston Youth program provides internship and job opportunities for 16–24 year-olds at public and private companies throughout the Houston area. The City will support expansion of this program through increased dedicated funding as well as increased outreach to and partnership with employers to create more internship and job opportunities. The City will also dedicate resources to increase enrollment in the My Brother's Keeper program, which seeks to increase graduation rates, household incomes, employment opportunities, and neighborhood safety for young men of color. Finally, the City will work with local schools and academic institutions to ensure that their curriculum supports the needs of emerging industries. Schools and academic institutions need to coordinate with local employers to calibrate their curriculum to train students for the jobs of tomorrow. This coordinated work will ensure that Houstonians have direct pathways from education to employment and that the local workforce can support job growth in new industries.

7.2 Promote creative STEAM-based learning methods to engage the next generation of resilience leaders.

The City will partner with educational organizations and academic institutions to create a standards-aligned curriculum for K–12 students that uses the tools and approaches of science, history, design, arts, and writing to explore the challenges of Houston's environmental risks and approaches to resilience. Students will be able to work on real problems in their community, using a place-based learning approach that challenges them to develop solutions using cross-disciplinary methods and knowledge. To address risk, resilience, and adaptation, students will need to use scientific methods like prediction, observation, modeling, and experimentation, but they will also use creative techniques like drawing, photography, and creative writing to understand and design solutions. Through this approach, a new generation of leaders can tackle Houston's specific resilience challenges while learning about the city's unique history and ecology.

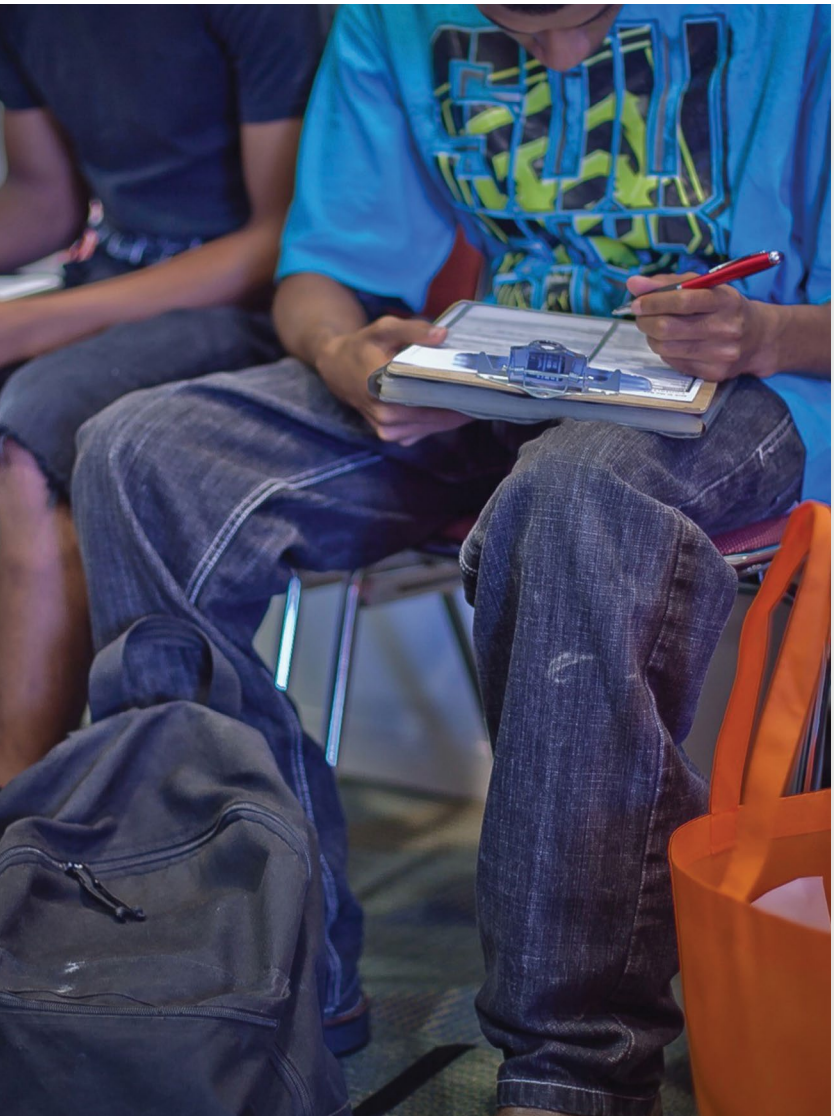
7.3 Train and grow a green stormwater infrastructure workforce.

Few planners, engineers, builders, and maintenance companies in the area are familiar with green stormwater infrastructure (GSI) approaches. The City will work with partners to develop a GSI workforce to offer Houston a broader variety of skills for design, delivery, and maintenance of GSI features. The City will also work with partners and the Green Building Resource Center to create a "one-stop shop" for educational materials and GSI best practices and case studies around Houston. The City will continue to lead by example, providing training to City employees—similar to Harris County—through the ENVISION certification process. The City will train employees at various levels within Houston Public Works and General Services Division and other key departments to be certified in ENVISION. In parallel, the City will work with partners to establish a program to train a broader community and build the capacity of a new and growing workforce to account for the increased demand for GSI employment opportunities. Additional partners include educational institutions that can offer courses through colleges, universities, and technical programs.

7.4 Support and enhance career pathways in resilience-related industries.

Houston's economy requires qualified individuals to fill in-demand jobs. The educational and vocational requirements for the "jobs of the future" are changing with exponential growth in technology, rapid automation, climate change, and energy sector transitions to renewable and cleaner, more efficient options. These changing trends require a coordinated approach to ensure that Houston's workforce is ready for the next 30 years and that pathways exist to quality jobs for Houstonians to participate in these growing fields. The City and its partners will work with the Texas Workforce Opportunity Commission and Workforce Solutions Gulf Coast to advance workforce opportunity and to convene economic development partners, the private sector, non-profits, academic institutions, workforce training providers, and Houston's youth to make regional workforce policy recommendations. The City will work with partners to ensure the region maintains its long-term global and economic competitiveness by aligning our education, workforce development, and economic development systems to produce the skilled workforce needed to meet the current and future needs of the region's businesses and industries and to strengthen pathways to quality jobs for Houstonians.

The City will partner to build career pathways in resilience-related industries and green and blue jobs, including water management, public safety, resilient design and construction, and climate change mitigation. Houston already has a deep base of expertise in industries from engineering to manufacturing to architecture and design that translate well into resilience projects, programs, and companies. Many of these sectors, like construction, manufacturing, and technology do not require a college degree. The City can use its procurement processes to ensure that contractors for resilience projects hire Houstonians trained through public and partner programs. The City will help facilitate these connections, focusing on the ALICE (Asset Limited, Income Constrained, Employed) population from 24-64 years of age as well as Houston's youth.



HIRE HOUSTON YOUTH

Imagine if every Houston youth was employed? That is the mission of Hire Houston Youth. Once a City of Houston program that employed approximately 400 youth a summer at city-sponsored jobs just four years ago has grown into a public-private partnership that employed 10,800 young people in Houston during the summer of 2019. Young Houstonians ages 16-24 earn at least $8.00 an hour for at least seven weeks of part-time to full-time employment over the summer at a public or private employer throughout the Houston area. For more information visit *hirehoustonyouth.org*.



GOAL 3

WE WILL IMPROVE SAFETY AND WELL-BEING FOR ALL HOUSTONIANS.

A resilient Houston is a welcoming and safe place for all Houstonians, no matter their age, health status, or physical ability. This means ensuring that people can walk, bike, and ride on safe streets without fear. It means that Houstonians who need mental health services or housing that provides extra supportive services can access the care that they need in a safe and nurturing environment. And it means that streets, parks, neighborhoods, and buildings are designed to accommodate residents of all physical abilities and ages, including our children, our senior citizens, and Houstonians with disabilities.

The Actions within Goal 3 support individual resilience through adapting the physical fabric of our neighborhoods, including adopting and implementing a Vision Zero Action Plan to make our streets safer for everyone and bringing Universal Design and accessibility to more of our public spaces. These policies and initiatives will help ensure that neighborhoods incorporate age-friendly design principles that enable everyone, from children to seniors, to navigate safely to services, shopping, jobs, and open spaces. Building new supportive housing stock will provide housing options for Houstonians experiencing homelessness and will allow seniors to find housing that offers built-in care. In addition, mental and behavioral health programs will expand supportive services to all Houston youth and adults—because everyone needs mental health support at some time in their life.



Ensure zero traffic-related fatalities and serious injuries on Houston streets by 2030.

08 MAKE OUR STREETS 100% SAFE FOR ALL HOUSTONIANS.

Reframe how we approach and coordinate around traffic safety to affirm that roadway fatalities are preventable, no loss of life by traffic collision is acceptable, and everyone deserves safe, accessible, and affordable mobility.

Houston joins an international movement of city governments committed to ending traffic-related deaths. Policies are put in place that reflect a creative, holistic approach to support how Houstonians move around the city every day. Safety and accessibility will be the number one priority in the design and construction of Houston streets, bikeways, and sidewalks. Improvements will be achieved through a combination of engineering and street design, enforcement and technology, education and engagement, evaluation and data, and a focus on equity. Safer roads and increased mobility options will make Houston a more efficient and livable city for all road users, including people walking, biking, using wheelchairs, pushing strollers, and taking public transit. Enhanced walkability and non-vehicular transit such as cycling improves health, reduces carbon emissions, eases traffic congestion, and reduces commuting costs. Increased pedestrian activity builds neighborhood connectivity and safety while supporting local businesses.

SHOCKS/STRESSES



TIMEFRAME



Medium Term (2030)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HCJO / TxDOT / METRO / H-GAC / LINK Houston / Bike Houston / Together for Safer Roads / HPB / Academic Institutions / Greater Houston Coalition for Complete Streets / Houstonians

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



8.1 Develop and implement a Vision Zero Action Plan that keeps all Houstonians safer.

In coordination with and building upon ongoing efforts such as Houston's Safer Streets Initiative, the Houston Bikeways Program and Houston Bike Plan, the Vulnerable Road Users Ordinance, Walkable Places, CIGNA Sunday Streets, and goals set by the Texas Transportation Commission to reduce the number of deaths on Texas roadways, the City of Houston has kicked off the development of a Vision Zero Action Plan to be released in 2020.

The City's Vision Zero Action Plan, developed in partnership with Metro, Harris County, TxDOT, and community partners will identify short-, mid-, and long-term goals to comprehensively address engineering, enforcement, education, evaluation, and equity. Each action identified in the plan will have a lead implementer and identified partners. The Vision Zero Action Plan will have the opportunity to learn from more than 45 U.S. cities and additional cities across the world who have advanced and adopted similar programs that have offered varied solutions to see what the best tactics are for Houston.

A more resilient Houston includes eliminating traffic deaths and serious injuries, encouraging alternate travel modes, traffic calming, and prioritizing moving people safely over moving vehicles efficiently. As we continue to invest in mobility infrastructure that builds Houston forward, one focus will be on safe and accessible streets that encourage people of all ages and abilities to thrive.

8.2 Expand access to high-comfort bike lanes and bike share.

Building on the success of the Houston BCycle bicycle-sharing system, Houston's Bike Plan, and BikeHouston's Build 50 Challenge to construct 50 miles of high-comfort bikeways by April 2019, we will grow the network walking/biking trails and high-comfort bike lanes to 200 miles by 2025 and encourage bike share to serve as a last-mile solution in more of our neighborhoods in partnership with Metro's transit network. These new bike lanes will include additional East-West corridors near many of the city's bayous as well as critical North-South connections in coordination with street and public transit investments. By tying these investments to implementation of Houston's Vision Zero Action Plan, we will make bicycling a safer and more accessible option for more Houstonians to get around the city.

8.3 Create and implement a plan for pedestrians that includes expanding accessible sidewalks.

Most Houstonians are also pedestrians at some point in their week—moving fast or slow; with or without assistance; in a parking lot, crosswalk, sidewalk, or road. A concentrated effort to plan for pedestrians that includes accessible sidewalks and pathways will make traveling Houston's built environment safe, comfortable, and enjoyable for all Houstonians. The City will kick off a pedestrian planning effort in 2020 that will complement Bike Houston and the City's Vision Zero Action Plan. The pedestrian plan will build on and connect with other initiatives to help standardize sidewalk choices for a variety of neighborhoods and contexts in Houston and will include sidewalk improvements, safety improvements for intersections, identification of safe routes and additional wayfinding, pedestrian-scale design, and increased shading.

09 SHELTER AND HOUSE ANY HOUSTONIAN IN NEED.

Enhance and expand systems to rapidly house Houston's most vulnerable population, the homeless, and provide them with the supportive services that they need to remain in housing.

Following Hurricane Harvey, Houston saw a marked increase in homelessness. Although homelessness decreased in the 2019 Homeless Count & Survey, it showed that on any given night, there are approximately 3,938 Houstonians living on the streets or in emergency shelters, with an additional 58,000 Houstonians touching the homeless services system in 2018. By investing in the re-housing system in non-disaster times, we will be better equipped to respond in times of disaster. Thousands of Houstonians could become homeless after a major disaster, while those homeless prior to the disaster will be disproportionately impacted. During a long-term recovery, the homeless services provider system should be strengthened so that it can scale up to serve a population that may have become homeless.

SHOCKS/STRESSES



TIMEFRAME



Short Term (2025)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HCJO / Coalition for the Homeless / TMC / HHSC-Medicaid / TDHCA-Affordable Housing / PSH / DOJ / HUD / DFPS-Child Welfare / HHA / United Way / Workforce Solutions / Homeless and Housing Service Providers / Houstonians

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



9.1 Expand and enhance the affordable housing supply and access to supportive services.

Supportive housing, a highly effective strategy that combines affordable housing with intensive coordinated services, is underfunded in Houston and thus incapable of sufficiently addressing the community's full need. We will expand access to health facilities and services to the homeless population, expand aftercare to support individuals transitioning from shelters to permanent housing, expand quality affordable housing options, and provide additional rental assistance and other housing resources. To help implement these strategies, we will pilot new funding and intervention models, and capitalize on affordable housing resources brought to Houston through federal disaster recovery funds (CDBG-DR).

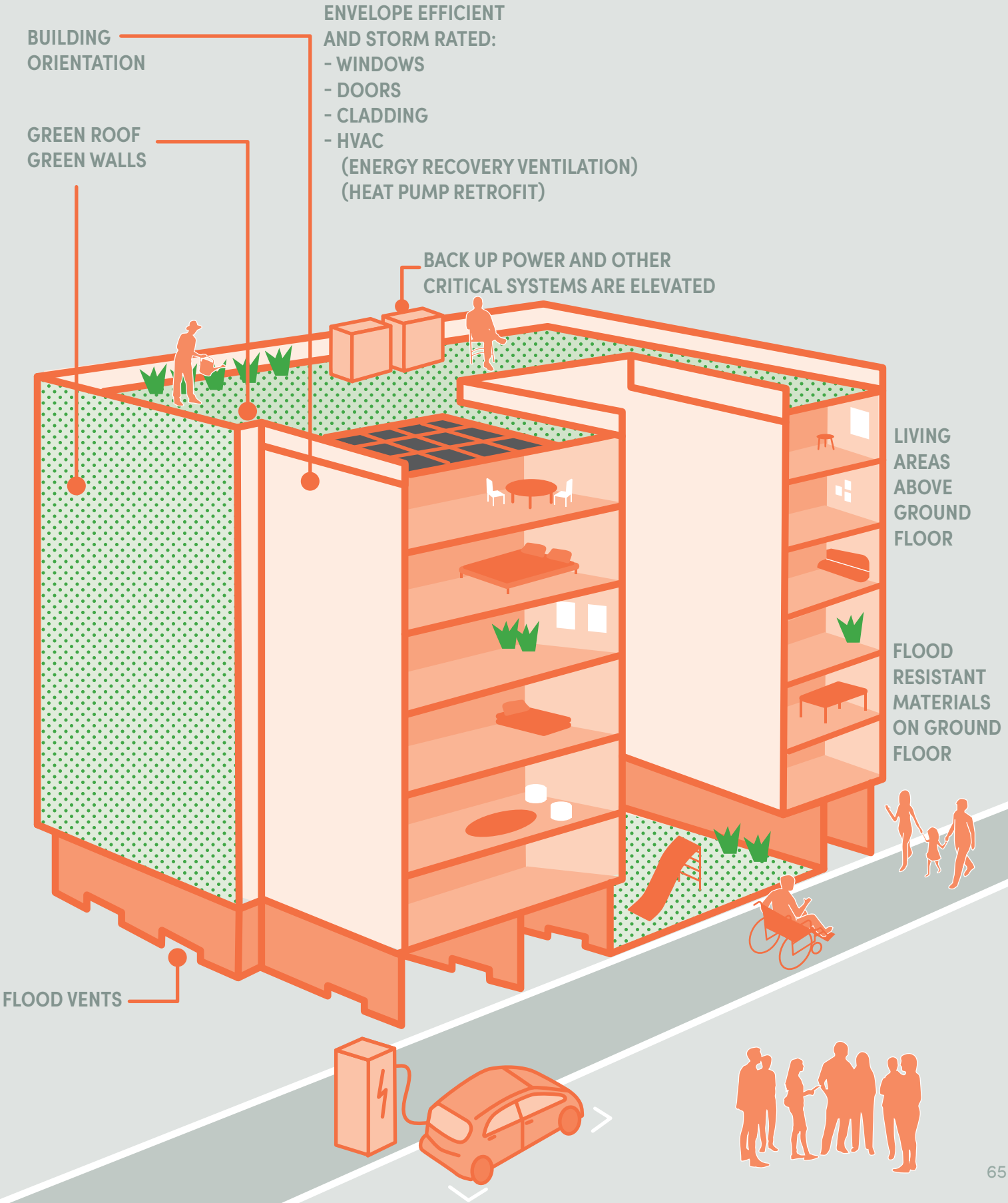
9.2 Capture and reinvest cost savings created by supportive housing.

Supportive housing effectively helps people with disabilities maintain stable housing, which decreases the costly strain typically placed on emergency health services and the justice system. These cost savings can be redirected to the homeless services provider system to increase the overall supply of supportive housing through acquisition and development of new housing as well as the preservation of existing housing. There are clear opportunities to redirect funds generated through cost savings by partnering with local agencies, institutions, and industries. For example, of the 9,000 people held at the Harris County Jail, 500 self-identify as homeless and 5,000 self-identify as having behavioral health issues. The jail reduces its costs by reducing bookings, but many of the individuals who are released become homeless. The cost savings achieved through reduced bookings should be redirected to the homeless services provider system. We will identify and leverage these opportunities through new partnerships to increase critical funding for supportive housing.

9.3 Make greater use of Medicaid services for supportive housing.

We will push legislative action to call for a value-added service to Medicaid for supportive housing case management to ensure that our most vulnerable Houstonians not only access housing but maintain their housing with support as needed. While many see adding a value-added service to Medicaid as an increased cost, it is a cost-saving measure for the State. The City will develop an educational campaign to inform the public about the benefits of such legislative action.

RESILIENT HOMES



10 PROACTIVELY CARE FOR HOUSTONIANS' MENTAL HEALTH.

Integrate mental and behavioral health with preparedness, response and recovery programs to improve the well-being of Houstonians.

More than two years after Hurricane Harvey made landfall, Houstonians are still fearful when it rains—especially our children. As documented in the Children at Risk report *Texas Continues to Recover Two Years After Harvey* and through the Hurricane Harvey Registry, a long-term project tracking the physical and mental health and housing impacts of the storm on Houstonians, there is increasing attention on the emotional and psychological trauma Houstonians have experienced. Hurricane Harvey Registry found that two-thirds of respondents reported intrusive or unintended thoughts about Harvey and associated flooding. This trauma is not only from one hurricane, but from repetitive flooding in some neighborhoods as well as daily fears of violence, poverty, isolation, and loneliness that many Houstonians experience on a regular basis. There are existing resources and opportunities to increase mental and behavioral health education and training and to identify and address gaps in existing services. To make sure Houstonians thrive in the future, mental and behavioral health must also be addressed in disaster preparedness, response, and recovery.

SHOCKS/STRESSES



TIMEFRAME



Short Term (2025)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HCJO / HHR / Children at Risk / GHCF / Health Professionals / Academic Institutions and Educators / Houstonians

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



10.1 Train more first responders and service providers in psychological first aid.

Psychological first aid is a supportive intervention used in the immediate aftermath of disasters and terrorism. By increasing psychological first aid training to emergency personnel and service providers, these professionals with have another set of tools to assist Houstonians and will have additional support to improve their own mental/behavioral health.

10.2 Increase mental and behavioral health training for young people and professionals who work with youth.

Houston will begin to address gaps in mental health services by focusing on improving young people's ability to cope and improve their mental and behavioral health. The City's expansive network of health professionals at Houston's Medical Center, Texas Children's Hospital, Baylor College of Medicine, Menninger, and numerous preschools, public and private schools, and local colleges and universities will be called upon to increase opportunities for collaboration.

We seek to initially increase the psychosocial support and training of teachers and students using a "train-the-trainers" cascade approach for capacity building. Trained facilitators can then train school educators, including teachers and non-instructional staff, aiding them in self-care; group counseling; and identification of symptoms that indicate a need for referrals, care, and treatment as needed. To ensure the continuum of care goes beyond recognition by school staff, we seek to increase the means of care and treatment delivery by supplementing with the utilization of mobile mental health units and telemedicine. This will also require the training of teachers and school counselors to become acquainted with these new service delivery methods.

Research establishes that early trauma and adverse childhood experiences can damage young children's brains and bodies leading to long-term problems in physical health, mental health, and learning. To mitigate the impact of grief, trauma, and distress and to meet the needs of the most vulnerable children under the age of five, we seek to support a train-the-trainer model to reach early childhood professionals, parents, and community leaders with the skills they need to provide social-emotional support to young children, aged 0–5, who are coping with distress and trauma from a disaster. Training from the National Child Traumatic Stress Network will be delivered to child care professionals. These professionals will then train parents and early childhood caregivers in some of the most vulnerable communities in Houston, so they understand infant



mental health and brain development and the impact of trauma on very young children, allowing parents to support their families after traumatic events. Young children that receive social-emotional support are better able to cope with experiences such as fear and distress from storms, displacement, and loss. They feel more secure, protected, and loved, and they have a higher likelihood of healing through strong attachment and support from their parents and caregivers. The program will serve as an evidence base and model for local authorities to take sound early childhood social-emotional programs to scale, strengthening overall systems and support to very young children.

10.3 Enhance the ability of local schools to support students and their families with mental health services.

The City, in collaboration with Baylor College of Medicine, local school districts, and community agencies, will develop an integrated care program named “Be Well Be Connected” for youth at risk of mental and behavioral health challenges. The program’s goals will be to increase the number of youths receiving assessments for serious mental health conditions, increase collaboration with community mental health teams, enhance Houston schools’ ability to support young people with cultural sensitivity, develop comprehensive monitoring for youth at high risk, and increase engagement with youth and their families. Through this program, more than 500 young Houstonians will be provided additional screenings and services by 2025.

11 CREATE A CITY WHERE HOUSTONIANS OF DIFFERENT AGES AND ACCESSIBILITY NEEDS CAN THRIVE.

Foster an environment more advantageous for Houstonians of different ages and abilities by developing and implementing plans and programs that clearly identify how best to serve these Houstonians.

Houston is proud to be an inclusive and equitable city, which is demonstrated by how we treat our most vulnerable residents. Three of the largest groups of Houstonians that we must serve well are our youngest, oldest, and those with disabilities. These groups, as any other, should feel welcome, safe, and supported to thrive. When planning for and implementing mobility, housing, education, health, or safety policies and programs, ensuring they address different ages and accessibility needs is essential. The City will take steps to address these issues through policy change, programming, and urban design interventions to ensure universal access to services and amenities and support participation in all aspects of civic and community life.

SHOCKS/STRESSES



TIMEFRAME



Short Term (2025)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / DRTX / SWADA / HCIL / UNICEF / AARP / Community Organizations / Houstonians

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



11.1 Strive for better accessibility.

Although the Americans with Disabilities Act (ADA) is almost 30 years old, the City strives to enhance our City infrastructure to further promote accessible and integrated service delivery for all and making aging and disabled residents less vulnerable during emergencies and disasters. The City's Director of the Mayor's Office for People with Disabilities coordinates the City's efforts to comply with the ADA, including updating the City's ADA Transition Plan from 1994. While tackling inaccessible public infrastructure in Houston is an enormous task, building an ADA Transition Plan will allow the City to create an inventory of facilities (broadly defined) where structural modifications are needed. Using this inventory, local governments can prioritize infrastructure improvements based on availability of funding, planned construction, and other factors. This plan will also allow the City to ensure that information and communication technologies such as websites, forms, applications, and databases are accessible to people with disabilities, consistent with the Web Content Accessibility Guidelines (WCAG 2.1 Level AA). ADA Transition Plans are reevaluated every three years and can be updated to address changes in demographics, climate, and technology. Houston has an opportunity to go beyond compliance and work to incorporate Universal Design into future investments in public facilities including parks, streets, public transit, as well as information and communication technology.

11.2 Become a Child-Friendly City to better serve Houston's youth.

Children under 18 comprise 25% of Houston's population, with children under five accounting for 7.8%. Our youngest Houstonians need neighborhoods where they can grow up being safe, healthy, and happy. Working with UNICEF, Houston has committed to becoming a Child Friendly City (CFC) that will include the development of a CFC Action Plan that commits to upholding the rights of children. CFC principles include respecting the views and best interests of children; upholding their inherent rights to life, survival and development; and identification and prioritization of the most vulnerable children. To be a CFC, among other things, Houston must be clean, unpolluted, and a safe environment with access to green spaces; where children are protected from exploitation, violence, and abuse; and where they have a fair chance at life regardless of their ethnic origin, religion, income, gender, or ability.

11.3 Foster age-friendly, livable communities to improve health and overall quality of life for an aging population.

Houstonians over the age of 65 comprise 10% of the city's population, a demographic that is expected to significantly increase over the next 20 years. The City recognizes the importance of anticipating the needs and preferences of older Houstonians and respecting their lifestyle choices by ensuring access to services and amenities that support a healthy and active lifestyle. Houston must continue to plan for an aging population with higher rates of disability that hinder their mobility and comfort and may affect household response to disaster. The City will also work to implement the activities in the *Age-Friendly/Livable Communities Action Plan* related to transportation, housing, public safety, health and community support, communication and information, open spaces and buildings, social participation, health and community support, respect and social inclusion, civic participation, volunteerism, and employment.



MEXICO CITY, MEXICO

VISION ZERO CDMX AND MOBILITY LAW

Mexico City is a largely car-oriented city of 20 million residents. The City spent 73% of its federal transportation dollars over 30 years on car-oriented infrastructure. As part of the City's commitment to improve mobility through an integrated, safe, and sustainable system, a new mobility law was approved in 2015. The law's approval marked a paradigm shift toward pedestrian-focused infrastructure and a change in mobility culture. The new law established a mobility hierarchy, which promoted pedestrian, cyclist, and public transportation mobility over private auto-focused mobility. The Ministry of Transport and Roads changed its name to the Ministry of Mobility. This cultural shift also included adopting Vision Zero CDMX to deter the loss of human lives caused by traffic crashes. Mexico City's Vision Zero Action Plan identified 22 goals and 43 actions from mobility and road safety audits to reducing speed limits. Mexico City decreased the number of traffic collision casualties by 18.3% in approximately two years.

BUILDING ON EXISTING EFFORTS

THE WAY HOME

The Way Home is a multi-jurisdictional collaborative effort to prevent and end homelessness in Houston, neighboring city of Pasadena, Harris County, Fort Bend County, and Montgomery County that has housed more than 18,000 people and families since 2012 reducing homelessness in the region by 55%. Currently, The Way Home is comprised of more than 100 local partners, including homeless service agencies, local governments, public housing authorities, the local Veterans Affairs office, and other nonprofits and community stakeholders who work to meet the needs of those experiencing homelessness. In 2020 Mayor Sylvester Turner challenged Houstonians to raise $50 million dollars to support The Way Home in providing essential housing and wrap around services to Houstonians experiencing homelessness by the end of 2021.

To learn more about The Way Home go to: *www.thewayhomehouston.org*.





Artist: Color Condition; Photo Katya Horner

CHAPTER 2

SAFE & EQUITABLE NEIGHBORHOODS



GOAL 4 We will ensure that all neighborhoods have equitably resourced plans.



GOAL 5 We will invest in arts and culture to strengthen community resilience.



GOAL 6 We will ensure all neighborhoods are healthy, safe, and climate-ready.



GOAL 7 We will build up, not out, to promote smart growth as Houston's population increases.



GOAL 4

WE WILL ENSURE THAT ALL NEIGHBORHOODS HAVE EQUITABLY RESOURCED PLANS.

In a city the size of Houston, each neighborhood has different resilience priorities, including flooding, air quality, displacement, mobility, and more. One-size-fits-all solutions do not work to build resilience, so Chapter 2 focuses on building resilience by strengthening community cohesion and developing and implementing place-based solutions at the neighborhood scale. So much of urban resilience is linked to the strength of a city's neighborhoods. Strong neighborhoods foster community through social infrastructure and invisible social bonds that help neighbors prepare for, survive, and recover from emergencies together rather than on their own.

A variety of factors contribute to the strength of a neighborhood, including quality housing, safe streets, open spaces, sustainable land-use patterns, cultural preservation and pride, and access to social programs and resources. Today, there are wide disparities in life outcomes for Houstonians depending on the neighborhoods in which they live. Ensuring all neighborhoods have these critical elements depends on a robust practice of equitable stakeholder engagement and neighborhood-scale planning. Houston can build upon its Complete Communities program to strengthen and empower all its neighborhoods.



Develop 50 neighborhood plans by 2030.

12 SUPPORT EQUITABLE NEIGHBORHOODS THROUGH COMMUNITY PLANNING AND PROGRAMS.

Adopt a citywide practice of neighborhood-scale planning to integrate equity and resilience principles.

The Complete Communities program has shown the benefits of working with neighborhoods, especially those that have experienced disinvestment, to create community-driven Action Plans. The Complete Communities program and Action Plans provide the framework for neighborhood-scale planning that is implementable by the City and partners.

These plans are developed through equity-driven engagement practices and provide neighborhoods with a process to determine priorities and address community concerns. The City will work with partners to expand the Complete Communities process to more interested neighborhoods. Until the Complete Communities Action Plan process is scaled to all 88 neighborhoods, the City will work with community members and partners to implement community priorities developed through Livable Centers plans, Quality of Life Agreements, and other district-oriented plans that have had meaningful public input.

SHOCKS/STRESSES



TIMEFRAME



Medium Term (2030)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / TIRZs / MMDs / HGAC / Academic Institutions / Neighborhood Organizations / Super Neighborhoods

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



12.1 Support neighborhoods to develop their own Complete Community Action Plans.

The City will empower neighborhoods with tools, a framework, and partners to self-nominate and lead their own Complete Communities Action Plans by 2021. To be eligible for funding, interested communities will have to demonstrate how their neighborhood plan advances the goals and strategies of *Plan Houston*, the City's General Plan, while also strengthening communities to withstand major shocks and stresses identified in *Resilient Houston*. The City will support neighborhoods with staff to manage the planning process, planning tools and primers, and implementation resources. The City will further support these efforts by holding a regular Complete Communities University for neighborhood leaders to learn from and with each other to support the development and implementation of new and existing Complete Community Action Plans.

12.2 Pilot Resilience Districts.

Cities like New Orleans and Seattle are establishing Resilience Districts as a place-based strategy to concentrate investments that build resilience in one neighborhood for maximum impact. Resilience Districts weave together climate adaptation and risk reduction, economic development, infrastructure modernization, and social empowerment strategies into one neighborhood strategy. Resilience Districts demonstrate to community members, practitioners, and policy makers how solutions can be integrated to achieve multiple benefits. The Complete Communities program and Action Planning process is well-positioned to pilot Resilience Districts in one or more neighborhoods as a specific method for tackling complex shocks and stresses, such as flood risk, subsidence, extreme heat, energy unreliability, disinvestment, displacement, environmental injustice, and aging infrastructure.

A Resilience District designation would help to affirm a community's future vision and could attract and leverage multiple sources of funding for implementation through Management Districts, TIRZs, merchants' associations, business groups, philanthropy, non-profits, and other public agencies.

13 ACCELERATE INVESTMENTS IN INCLUSIVE HOUSING AND NEIGHBORHOOD DEVELOPMENT.

Support equitable development with innovative financing tools, incentives, and partnerships.

Financially secure communities are better able to support the provision of high-quality services and infrastructure. The City's existing fiscal constraints are compounded by an overdependence on property and sales taxes for city, county, and school district services. By bringing public, private, and non-profit actors together around equitable development objectives, we can leverage resources, information, and cost-sharing opportunities to make the most of limited public financing in pursuit of equity and inclusion. The City will use incentives, financing tools, and partnerships to support equitable development by working with public, private, and nonprofit entities to identify and attract innovative revenue streams, public financing, and public-private partnership opportunities that support the implementation of equitable development and mitigate ongoing fiscal stresses.

SHOCKS/STRESSES



TIMEFRAME



Short Term (2025)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / METRO / Philanthropy / TIRZs / The Rockefeller Foundation / GRCN / HLB / HCLT / USIIA / The Beeck Center at Georgetown University / FRBNY

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



13.1 Create an Equitable Housing and Neighborhood Development Investment Fund.

The City will work with partners to establish an Equitable Housing and Neighborhood Development Investment Fund to support affordable housing, neighborhood development, and affordable transportation across Houston. Modeled on equity funds in cities like Detroit, Los Angeles, and Denver, the Equitable Housing and Neighborhood Development Investment Fund will have a public-private management structure and include public, private, and philanthropic revenue sources. The purpose of the fund is to complement and accelerate investments in housing, neighborhoods, and transportation; encourage and expedite innovation and experimentation at the neighborhood scale; promote investment in targeted areas through land acquisition; increase the speed and lower the cost of development; and enable the leveraging of dollars put aside for growing an affordable housing market to last across more than one generation and protect and preserve areas in Houston for those purposes.

13.2 Leverage publicly owned land to invest in housing and neighborhood-serving uses.

Public land owners like the City, regional counties, METRO, Houston Housing Authority, Houston Land Bank, Houston Community Land Trust, area school districts, and other public agencies should be encouraged to work with communities and community partners to leverage these land resources for public benefits, including economic development and housing opportunities. Once identified, publicly-owned land can be developed with public-private partnerships or a mix of government and private uses that ultimately result in additional revenue-generation potential for the public. Revenue from ground leases could be dedicated revenue for the equity fund to support implementation of equitable development throughout Houston and will be used by public agencies to sustainably fund infrastructure in the near-term with lease revenue as collateral. Co-benefits will include revitalizing underutilized public property; removing a significant barrier to developers—the cost of property acquisition—in exchange for a ground lease of more than 50 years; and encouraging more compact, mixed-use development near public transit, schools, and employment centers. Additionally, public agencies will be able to expand their borrowing capacity for infrastructure projects by using rental agreements and revenue as collateral.

13.3 Expand the footprint of Houston Land Bank and Houston Community Land Trust to increase community wealth and cohesion.

The Houston Land Bank (HLB) and Houston Community Land Trust (HCLT) are working to repurpose publicly owned properties into permanently affordable homes for Houstonians. The community land trust model involves non-profit ownership of land and a ground lease to homeowners that incorporates permanent affordability protection. Community land trusts across the country have found that deep neighborhood partnerships and education are required to realign residents' goals toward the ongoing preservation of community wealth and cohesion, rather than the more traditional individual wealth-building

model that characterizes the majority of U.S. homeownership. To advance public trust and community partnerships, HLB and HCLT will select pilot neighborhoods to pursue this affordable development model. They will identify community liaisons in pilot neighborhoods, conduct data analysis and review of conditions, and work to develop and sell properties to informed homebuyers. They will also work to broaden impact in future years by creating a new citywide Land Legacy Working Group to address issues of land ownership and community wealth. The City will work with these partners to develop specific policy solutions to address securing affordable housing in pilot and future neighborhoods.

13.4 Attract Opportunity Zone funds for transformative and inclusive neighborhood development, in collaboration with existing residents.

Opportunity Zones were established by federal legislation in 2017 to help attract investment into historically disinvested areas. Within Opportunity Zones, federal regulations offer tax benefits to investors in Opportunity Funds, which put funding behind businesses and real estate projects in the designated zones. However, federal rules set few parameters on the types of investment preferred in Opportunity Zones. The City has established equity priorities that seek to attract Opportunity Funds interested in creating positive economic and social outcomes in eligible Complete Communities and other neighborhoods. The City's guiding principles include encouraging development that creates jobs suited to the skill level of residents and provides opportunities for career advancement in distressed communities, fostering economic opportunity, reducing food deserts, and constructing or preserving affordable and mixed-income housing. Leveraging its relationship with the Rockefeller Foundation, the City is also using an Opportunity Zone Investment Framework, developed by the U.S. Impact Investing Alliance, the Beeck Center at Georgetown University, and the Federal Reserve Bank of New York, to help guide investment and measure impact. The City will actively seek Opportunity Zone investment that can leverage ongoing public investment and that is compatible with Complete Communities and other economic development and community planning goals.

13.5 Join The Opportunity Zone Community of Practice.

As part of Houston's membership in the former 100 Resilient Cities Network, and now the new Rockefeller Foundation-funded Global Resilient Cities Network, the City will participate in The Opportunity Zone Community of Practice. This Rockefeller Foundation program will convene at least 25 U.S. cities' Chief Opportunity Zone Officers (COZOs) and other local government administration officials serving in similar capacities to share tools and analytics that support equitable development through Opportunity Zones. The Opportunity Zone Community of Practice will serve as a center of excellence that will accelerate knowledge transfer and sharing data and evaluation tools, best practices and offer support for cities that are delivering equitable growth to distressed communities.

13.6 Direct TIRZ investments to accelerate the implementation of neighborhood plans and policies consistent with community priorities.

Tax Increment Reinvestment Zones (TIRZs) are valuable partners for the Houston neighborhoods in which they are located. The City will work with TIRZ leadership to align the tax increment fund investments with neighborhood plans and community priorities. Through enhanced coordination, engagement, and planning, TIRZ resources should continue to enhance their neighborhoods, with resilience building in mind.

NEW ORLEANS, LOUISIANA, UNITED STATES

GENTILLY RESILIENCE DISTRICT

The Gentilly Resilience District is a combination of efforts in the Gentilly area of New Orleans to comprehensively address pressing environmental and social challenges. The city's first resilience district uses various approaches to water and land management that have been successfully piloted throughout New Orleans and, when implemented together, are intended to create even greater neighborhood benefits—such as improved health, economic opportunity, environmental education, and recreation. Projects like blue-green corridors that retrofit major boulevards with canals to store stormwater, improved multi-modal transportation connections, and public space improvements are designed to be scalable and replicable such that other neighborhoods across New Orleans and in other cities can learn from Gentilly's efforts to build resilience and adapt to a changing environment.


Waggonner & Ball Architecture / Environment



GOAL 5

WE WILL INVEST IN ARTS AND CULTURE TO STRENGTHEN COMMUNITY RESILIENCE.

Houston is a multicultural metropolis with internationally renowned arts institutions, diverse entertainment offerings, and vibrant neighborhoods rich in cultural traditions. Houstonians take pride in these resources and their role in defining the unique identities of our neighborhoods and Houston's image as a cosmopolitan city.

We can strengthen community resilience by leveraging our rich tradition of arts and culture unique to Houston's diverse neighborhoods. Strong support for and relationships among anchor arts and culture institutions, community groups, and local artists and entrepreneurs can build neighborhood identity and drive economic development. Not only do these strategies enhance neighborhood resilience by promoting community cohesion and local economic development opportunities, they also provide creative ways to engage Houstonians and build increased risk awareness and preparedness strategies.

5 **Invest $5 million in local artists to create resilience awareness projects across the city by 2025.**

14 INVEST IN LOCAL ARTS AND CULTURE TO BUILD COMMUNITY COHESION AND TO CELEBRATE NEIGHBORHOOD IDENTITY.

Grow new and existing programs to implement Houston's *Arts and Culture Plan*, support artists and culture bearers, and enable Houston's arts and diversity of cultural traditions to thrive.

Houston's arts and culture are broadly defined to include music; dance; food; art; the preservation of cultural assets, historic structures, and heritage; and more. The creative and cultural expression of Houstonians and our neighborhoods include faith traditions, cuisine, graffiti culture, festivals, events, and parades—all tied to the multiculturalism of Houston's diverse communities. One of the greatest strengths of a resilient community is the strong culture created through shared local identity, heritage, and relationships with neighbors. Cultural expression is a marker of the social cohesion so vital for resilient communities.

SHOCKS/STRESSES

TIMEFRAME

Short Term (2025)

IMPLEMENTATION THEMES

IMPLEMENTATION PARTNERS

COH / HAA / HFC / Artists / Houston Businesses / Arts and Culture Organizations / Texans for the Arts / TCA

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

14.1 Grow the number of Arts Districts.

Houston has five State-recognized Arts Districts including Museum, Theater, Midtown, Washington, and East End. Arts Districts leverage this designation for branding, coordination, and eligibility for State grants and other resources. Other communities who have arts and cultural resources that should be preserved, enhanced, or revived may be eligible for this designation as well. The City of Houston will work with communities to support and expand existing Arts Districts and associated opportunities, particularly in Complete Communities. The City will work with existing and new districts to support and co-locate arts and culture incubators, like the existing TX/RX Labs, which provide resources and community for a diverse network of innovators, creators, artists, and investors.

14.2 Launch a Made in Houston program to support local production.

The City will work with partners to create a regional Made in Houston campaign to foster pride in local Houston goods and boost the local economy through the promotion of products made locally. This campaign will highlight the diversity of Houston products and strengthen Houston's image as a multicultural metropolis by establishing common branding for local artisans and small businesses to promote the local production and consumption of high-quality Houston products. The Made in Houston campaign and marketing support will leverage the entrepreneurial spirit of Houstonians and increase economic opportunity.



Growing a Brighter Tomorrow in Gulfton Produced by: UP Art Studio Artist: Rahmaan Statik
Location: Salvation Army Gulfton, 6150 Bissonnet St, Houston, TX 77081

15 LEVERAGE ARTS AND CULTURE TO CREATIVELY ENGAGE HOUSTONIANS IN RISK AWARENESS.

Engage Houstonians in flood and climate risk education, mitigation, and adaptation strategies by leveraging arts and culture assets.

The City will work with artists and creative professionals to establish an initiative to educate and engage the public in flood and climate risk education, mitigation, and adaptation strategies in Greater Houston. This comprehensive campaign should also include public engagement around preparedness, mitigation behaviors, adaptive capacity, and post-disaster lessons. Some examples of art that engages on this subject include murals showing the role of green stormwater infrastructure (GSI), totems near bayous and in public parks that show past high-water marks, and sculptures that also provide increased shade.

Community partners will identify opportunities to incorporate cultural and arts-based risk education in their neighborhoods. Through this participatory approach neighbors will get to know each other and will be better equipped to offer aid in times of need. Giving communities control of their own messaging allows for community buy-in and stakeholder engagement, not just in flood and climate risk education and mitigation, but also in neighborhood stewardship. In partnership with local educational institutions, this approach to risk education could also be applied in local schools. Young Houstonians will develop an understanding of Greater Houston's landscape and its climate challenges, creating lifelong advocates for infrastructure and neighborhood stewardship with a sense of pride and ownership in Houston.

SHOCKS/STRESSES

TIMEFRAME

Short Term (2025)

IMPLEMENTATION THEMES

IMPLEMENTATION PARTNERS

COH / TEA / Academic Institutions / School Districts / THC / HAA / Artists / Arts and Cultural Organizations

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

MEDELLÍN, COLOMBIA

YOUNG WOMEN'S TALENT CONTEST

As part of the Safe Medellín for Women and Girls program, Medellín is empowering young women by recognizing their intellectual, artistic, scientific, social, and sports talents and achievements. The Young Women's Talent Contest is designed to support and praise Medellín's young women and supports the city's goal of a "Safe and Peaceful Medellín." Young women ages 16-25 are recognized across categories that include organizational leadership, physical education, art, science and technology, business enterprise, and environment.





GOAL 6

WE WILL ENSURE THAT ALL NEIGHBORHOODS ARE HEALTHY, SAFE, AND CLIMATE READY.

Climate change occurs at a global scale, but its impacts, including extreme heat, flooding from severe storms and heavy rainfall, and prolonged periods of drought, can vary from one neighborhood to the next, with low-income communities and communities of color often disproportionately impacted.

We can apply a neighborhood planning approach to adapt to climate change, with place-based interventions to ensure that all Houstonians live in neighborhoods that are healthy, safe, and climate ready. Place-based interventions include neighborhood Resilience Hubs that cater to the specific needs of the surrounding community, local greening initiatives to enhance open space and combat the urban heat island effect, and community gardens and fruit forests to increase access to fresh food.

6 **Plant 4.6 million new native trees by 2030.**

16 MAKE HOUSTON NEIGHBORHOODS GREENER AND COOLER TO COMBAT EXTREME HEAT.

Prepare for rising temperatures through neighborhood-based interventions that combat extreme heat and the urban heat island effect.

We can address escalating temperatures and extreme heat waves through a neighborhood-based approach. By mapping urban heat island concentrations and identifying areas at greatest risk and with the most vulnerability, the City can work with communities to strategically mitigate urban and extreme heat through proven tactics, such as light-colored cool roofs and pavement, green roofs, shade trees, and evaporative cooling from plants and vegetation. Trees and vegetation not only provide shade and reduce heat—they also contribute to stormwater mitigation, improved air quality, and enhanced open spaces. By focusing on planting trees and vegetation in areas with minimal green space and improving shade in areas without it, Houston can also address environmental injustice and improve neighborhood equity.

SHOCKS/STRESSES



TIMEFRAME



Short Term (2025)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / TNC / HARC / NOAA / Trees for Houston / Houston Wilderness / SPARK / METRO /Academic Institutions / School Districts / Philanthropy / Professional Associations / Developers / Neighborhoods

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



16.1 Launch an urban heat island mapping campaign.

We will conduct an urban heat island mapping campaign to engage and educate the general public about Houston's urban heat islands and heat-health safety. Houstonians will be empowered as "citizen scientists," collecting data that will help us understand how the built environment affects perceived temperatures across different neighborhoods. This initiative can be modeled after similar efforts successfully executed in other cities, including Richmond; Washington, D.C.; and Baltimore, in coordination with the National Oceanic and Atmospheric Administration (NOAA).

16.2 Accelerate tree planting and prairie restoration.

Houston's neighborhoods have experienced a significant loss of tree cover over the last few decades. One study estimated the value of lost tree canopy in Houston at $55 million each year from 1972 to 1999.[44] The 2011 drought also caused significant tree loss in public spaces like Memorial Park.

The City will work with community partners to develop and implement a large-scale tree planting strategy using native trees—replacing the canopy first in places of greatest need. Partners will focus efforts in areas with the strongest urban heat island effects, air pollution issues, environmental injustice, inequitable tree canopy cover, and a high concentration of pedestrians and bicyclists who would benefit from shade. The City will also reduce barriers to tree planting along streets and sidewalks and will encourage tree planting on private properties.

16.3 Expand cool and green roofs.

In hot climates, dark-colored roofs and roof materials that absorb heat can increase the total cost of cooling homes and other buildings. Retrofitting roofs is a cost savings strategy that is both visually interesting and reduces extreme heat impacts. Light-colored roofs that reflect the sun's rays and green roofs that use plants and recycled water are two common options. The City and community partners will assist building owners and developers through design guidelines, incentives, and/or mandates for specific types of structures.

16.4 Pilot cool pavement.

Another emerging technology that Houston is well-positioned to pilot is "cool pavement," which coats existing pavement with a light-colored slurry seal to reduce its temperature during the day. Reducing the temperature of asphalt on streets and surface parking lots can have a dramatic impact on neighborhoods.

16.5 Develop innovative shade structures.

Innovative shade structures can provide not just shade, but also other cooling techniques such as fans or misters to enable more outdoor activities in the summer months. These structures can be placed in a variety of public spaces, including at schools, libraries, community centers, METRO stops, parking areas, and pedestrian walkways. One example of a collaborative public-use shade project is SPARK Park's work with the University of Houston College of Architecture and Design to create a shade structure at a Houston Independent School District (HISD) middle school campus in Denver Harbor. The structure provides a cool space for students during recess, as well as neighborhood residents and children during various athletic practices and games. With the addition of a small bioswale and solar panels to operate a fan, the structure also serves as an outdoor classroom for students.

17 DEVELOP "LILY PADS" TO SERVE AS NEIGHBORHOOD RESILIENCE HUBS.

Create safe places of refuge in communities that also build neighborhood resilience between disruptions and disasters.

Neighborhood Resilience Hubs are physical spaces, hosted within trusted spaces in neighborhoods, that facilitate social, climate, and economic resilience along with disaster preparedness. In times of disruption and disaster, Hubs can facilitate emergency response and recovery by providing a safe place of refuge with emergency supplies, communication tools, and recovery support and services. Communities around the world are advancing the Resilience Hub model, and in Houston, we are calling Hubs "Lily Pads" to indicate that these locations must be on high ground to provide safe refuge during a flood event. The City will work with partners to develop a toolkit for Lily Pads that includes minimum functional and design criteria, potential partners and locations, and examples from other communities. The City will then work with partners to develop a pilot Lily Pad, which could be at a school or other public facility like a neighborhood library or at a campus or non-profit facility. Ultimately, having Lily Pads established in many of Houston's neighborhoods will help to prepare for, respond to, and recover from future disruptions and disasters. Lily Pads have the potential to provide Houstonians with a safe place of refuge in their own neighborhood that can simultaneously cultivate stewardship and community building on dry, blue sky days.

SHOCKS/STRESSES

TIMEFRAME

Medium Term (2030)

IMPLEMENTATION THEMES

IMPLEMENTATION PARTNERS

COH / USDN / School Districts / Academic Institutions / Community Organizations / Faith-based Institutions / Anchor Institutions / Neighborhoods

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



MELBOURNE, AUSTRALIA

METROPOLITAN URBAN FOREST STRATEGY

Resilient Melbourne, in partnership with The Nature Conservancy, developed the Metropolitan Urban Forest Strategy. The strategy acknowledges that infill development is resulting in less green space and higher population densities in Melbourne's inner and middle areas, while new suburbs are being built on open land with native vegetation. In Melbourne, hard surfaces like roofs and roads dominate areas where rain once soaked easily into permeable soils. The strategy maps canopy cover in the city, unites existing initiatives, and provides a cohesive roadmap for improving biodiversity and forest cover in an effort to lessen the effects of extreme heat, fire, and flooding. This strategy unites 32 local government councils to reach for the goal of increasing canopy cover levels by 20–30% by 2050.

18 ENSURE ALL NEIGHBORHOODS HAVE ACCESS TO QUALITY PARKS AND NATURE.

Help Houston neighborhoods thrive with safe, equitable, and accessible green spaces.

Houston has 23.4 acres of park space for every 1,000 residents and 17.6 acres of park space for every 1,000 daytime occupants, according to a 2016 Trust for Public Land study. Yet only 48% of Houstonians can reach a park within a half-mile walk and some of Houston's neighborhoods lack park space and amenities. By leveraging the Bayou Greenways 2020 and Beyond the Bayous programs that are building bayou-adjacent trails and connecting them with other green spaces in neighborhoods, Houston is making great strides in growing parks and green space accessibility. By creating, connecting, conserving, and committing additional resources to our parks, Houston will increase the number of quality parks in our neighborhoods and the ability for more Houstonians to access green spaces and nature within a half-mile walk. Parks improve physical and mental health, serve as family and community gathering spaces, absorb water, clean and cool the air, beautify neighborhoods, create jobs and economic development, and help to grow community pride and stewardship.

SHOCKS/STRESSES



TIMEFRAME



Medium Term (2030)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HPB / GHP / Academic Institutions / SPARK / School Districts / HLB / HCLT / Park Associations and Conservancies / Private Sector / CPA / CCCN / GBAN /

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



18.1 Grow the 50/50 Park Partners program to enhance our existing neighborhood parks.

Houston must have thriving parks to support thriving neighborhoods. Public and private investment in the development and improvement of Houston parks, greenways, and public spaces has solidified Houston's national reputation as a green space leader. Signature parks such as Memorial Park, Hermann Park, Discovery Green, Emancipation Park, Levy Park, and MacGregor Park and the Bayou Greenways 2020 initiative have transformed the city. The work to lift up neighborhood parks, however, is just beginning. Mayor Sylvester Turner's announcement for this new City initiative, 50/50 Park Partners, challenged 50 companies to join a citywide coalition driving improvements to neighborhood parks. 50/50 Park Partners is based on three founding principles: park equity, community engagement, and long-term sustainable impact. In this program, neighborhood parks are selected and improved based on need and citywide distribution. Improvements, projects, and volunteer support are responsive to the community and focus on existing parks. The 50/50 Park Partners initiative provides a multi-year investment, starting a long-term partnership between businesses, neighborhood parks, and the community.

18.2 Develop an equity metric to guide investments in parks.

The City will incorporate a park equity metric into the Capital Improvement Projects (CIP) budgeting process to prioritize investment in the development of new parks and the maintenance and programming of existing parks to alleviate disparities between different neighborhoods with variable levels of park space and income. The park equity metric will ensure that low-income areas have green space comparable in quality and quantity to middle- and high-income areas. The City can leverage its investments in open space by forging partnerships with local businesses and developers to support long-term operations and maintenance costs.

18.3 Increase access to nature for young Houstonians.

The Cities Connecting Children to Nature (CCCN) initiative champions all children having opportunities to play, learn, and grow in nature, from urban parks and community gardens to the great outdoors. This program has three priorities: to increase the utilization of nature spaces through nature-themed programs at public libraries in Houston's 10 Complete Communities; to increase the accessibility of green career pathways that encourage youth to pursue environmental stewardship and sustainability; and to increase and create green spaces at schools that function as living laboratories, which boost academic achievement, student engagement, and overall health. The City will continue to support and promote CCCN and other programs that increase opportunities for young Houstonians to spend time in nature and see the benefits to environmental stewardship.

18.4 Leverage schools and other public facilities as neighborhood parks.

The SPARK program to develop neighborhood parks on public school grounds first originated in 1983 to address the disparities in available park land in Houston compared to other cities. Using available public land has proven to be a fast and cost-effective way to increase park acreage. SPARK has built more than 200 community parks in 12 different school districts to serve neighborhoods throughout Greater Houston. Each park is designed based on the ideas and needs of the school and surrounding neighborhoods. While all the parks are different, a typical park consists of modular playground equipment, a walking trail, benches, picnic tables, trees, an outdoor classroom, and a public art component. The City will continue to expand the SPARK program to more schools and will explore other opportunities to leverage the success of the program so more of Houston's neighborhoods have access to park amenities.



19 GROW EQUITABLE ACCESS TO QUALITY FOOD TO NOURISH HOUSTON'S STATUS AS A CULINARY CAPITAL.

Invest in Houston's food ecosystem through education, economic and workforce development, and local agriculture.

Many of Houston's neighborhoods are food deserts without access to quality fresh foods. These conditions have persisted for years despite successful collaborations to address them. Community members still desire major grocery store chains in their neighborhoods, not a 15-minute-or-more drive away. The City will work with grocery stores to locate in more food deserts to better serve residents.

Research also suggests that in addition to food access, increased nutritional awareness and urban farming education in neighborhoods may help increase the adoption of healthier food choices. By fostering investments in local sustainable agriculture practices, urban farming, community gardens, and food forests that are integrated into neighborhoods, community members have greater access to fresh foods as well as opportunities for economic and workforce development. The City will work with partners, including education institutions, to increase urban farming and food production education and job training. The City will also work with partners to identify spaces for urban farming, community gardens, and food forests. The City will support the equitable expansion of farmers markets and community compost opportunities. Neighborhoods will have an opportunity to take ownership of community garden spaces and program them in ways that are specific to their needs.

SHOCKS/STRESSES

TIMEFRAME

Medium Term (2030)

IMPLEMENTATION THEMES

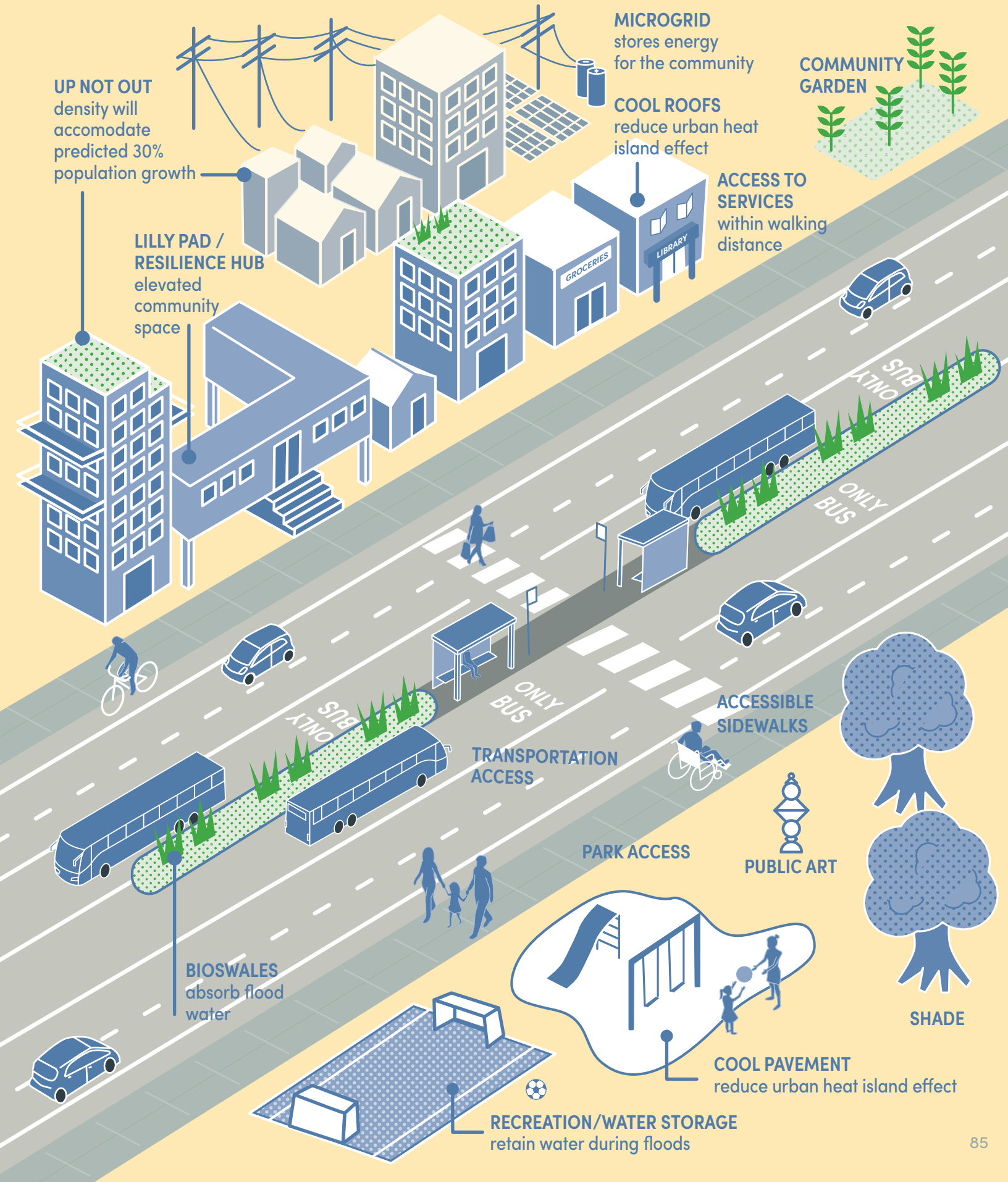
IMPLEMENTATION PARTNERS

COH / HFSC / Philanthropy / Academic Institutions / School Districts / Community Organizations / Food Suppliers / Farmers and Food Producers / Neighborhood Organizations

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



RESILIENT NEIGHBORHOODS



20 PREVENT, MITIGATE, AND RECOVER FROM THE EFFECTS OF ENVIRONMENTAL INJUSTICE IN OUR COMMUNITIES.

The City will develop and adopt a comprehensive environmental justice (EJ) strategy, leveraging and expanding upon existing mapping and monitoring tools.

Neighborhoods in Greater Houston have suffered environmental injustices for generations. The petrochemical and refining industry in this city has boomed as the health and well-being of poor people and people of color have suffered. Houston's land-use patterns of sprawling development and urban highway system that impacts public health and safety have amplified pollution and environmental concerns in many neighborhoods. The City will work with community and industry representatives to develop and prioritize specific preventive and protective actions that will ensure every resident has a safe and healthy environment, including clean air, clean water, and pollution-free waterways. The City will increase its air and water monitoring capacity; work with local and state partners, including regulatory agencies, to develop stronger enforcement mechanisms; and empower community organizations to give and receive input on environmental decisions.

SHOCKS/STRESSES



TIMEFRAME



Medium Term (2030)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / Harris County / State and Federal Government Agencies / Community Organizations / Academic Institutions / Private Sector / Neighborhoods

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



20.1 Coordinate environmental justice actions with partners.

To better align existing and new efforts, the City of Houston and Harris County will form an Environmental Justice Working Group. This group of government stakeholders, advocate stakeholders, academic institutions, and industry partners will coordinate and collaborate with community members on program and policy recommendations to mitigate environmental injustices.

20.2 Leverage environmental justice mapping and research to inform decision making.

The first step in creating protections for EJ communities is to identify communities experiencing the greatest cumulative impacts from environmental hazards, health risks, and social stresses. As part of the City's EJ strategy, the City will use existing mapping tools like the EPA's EJSCREEN and Trust for Public Land's Park Smart Precinct 1 tool to inform policy recommendations and prioritize communities for mitigation and funding to reduce their exposure to environmental hazards.

20.3 Increase air and water monitoring capacity.

By utilizing existing EJ Mapping tools, the City will work with partners to prioritize specific locations in EJ communities for increased air and water quality monitoring. In addition, the mapping tools will inform the routes for regular mobile air monitoring and locations for stationary monitors.

20.4 Establish recommendations for planning and land-use policies around clean air, clean drinking water, and pollution-free waterways.

Historically, the City has not engaged EJ communities in land-use processes and decisions, resulting in environmental degradation by hazard-producing uses placed in and around communities of color and low-income neighborhoods. As part of an EJ strategy, the City will work with partners to develop equitable planning and land-use policies around clean air, clean drinking water, and pollution free waterways. A critical component of these recommendations will be to establish a two-way engagement structure to incorporate community voices into future neighborhood planning and land-use decisions, especially related to sensitive or potentially hazardous uses.

20.5 Prioritize environmental justice communities in disaster planning, response, and recovery.

EJ communities are often hardest hit by and are slowest to recover from disasters. After identifying the communities most at risk, the City will review existing disaster planning processes to ensure these communities are receiving sufficient resources to prepare for and mitigate risks from future emergencies or disasters. Additionally, the City will tailor its disaster response and recovery programs and funds to prioritize these communities in future recovery efforts.



GOAL 7

WE WILL BUILD UP, NOT OUT, TO PROMOTE SMART GROWTH AS HOUSTON'S POPULATION INCREASES.

Houston is one of the fastest growing cities in the U.S. and is the core of one of the nation's fastest growing metropolitan regions.

To accommodate Houston's next one million residents, our city and neighborhoods need to grow up, not out. The Houston region has grown outward for more than 70 years. Today the city is 650 square miles and its extraterritorial jurisdiction (ETJ) stretches to more than 1,300 square miles. As a result of this outward growth, heavy traffic and the costs of reliance on car-based travel affect families every day. Houstonians on average spend an estimated 45% combined in housing and transportation expenses—including 20% on transportation alone, which is the highest percentage in the United States.[45] New greenfield development on the region's native prairies and woodlands also increases flooding downstream within the city.

To mitigate these challenges and allow for sustainable growth, Houston must find ways to encourage denser development within the city and provide housing for its diverse workforce and families. Growing sustainable mobility modes like transit and biking and making neighborhoods more walkable will also be critical to growing up, not out. Reducing traffic and ensuring that all families have quality housing they can afford will ensure that Houston's growth continues to provide economic success and a good quality of life for all Houstonians.

7 **Build at least 375,000 new homes across every income level by 2050 to welcome new residents to the city of Houston.**

21 CREATE A CITYWIDE COMPREHENSIVE HOUSING STUDY WITH NEIGHBORHOOD-SPECIFIC RECOMMENDATIONS.

Preserve and enhance each of Houston's neighborhoods, with the goal of providing quality housing for Houstonians at every income and age level.

The city will work with partners to create a comprehensive housing study that lays out neighborhood-based strategies to meet the diverse housing needs of Houstonians. This will include the creation of more affordable and market-rate housing to accommodate projected population increases, demographic change, and current unmet needs for affordability. The plan will focus on directing growth toward areas that have access to high-quality transit, jobs, and services, enabling the city to grow up, not out. It will also establish specific goals for the number of housing units to be created, repaired, or made more resilient to extreme heat and increased precipitation.

The housing study will suggest individualized strategies for different neighborhoods based on their existing assets, character, and real estate market characteristics. It will also work to help each neighborhood leverage infrastructure investments, educational investments, and transportation investments to ensure that all projects are creating multiple benefits. Ultimately, the housing study will help to create recommendations for affordable and safe housing for all types of people in every part of the city, which will also improve other measures of resilience such as community health, access to quality jobs, and educational equity. This housing study began in 2020 in coordination with Harris County, the Kinder Institute, and other partners.

SHOCKS/STRESSES

TIMEFRAME

Medium Term (2030)

IMPLEMENTATION THEMES

IMPLEMENTATION PARTNERS

COH / Harris County / Kinder Institute / Ford Momentum / Asakura Robinson / UT School of Architecture / CDCs / Academic Institutions / Housing and Homeless Service Providers / Philanthropy / Community Organizations / State and Federal Government Agencies / Neighborhood Organizations

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

BELFAST, NORTHERN IRELAND

BELFAST VIBRANT CITY CENTRE

Belfast's City Centre Regeneration and Investment Strategy was developed based on the concept that climate-resilient cities are increasingly investing in greater levels of densification to reduce urban sprawl and remove dependencies on carbon-intensive forms of travel. The strategy identified five geographical focus areas, including the Inner North West and Linen Quarter areas. Area master plans embody the concepts of inclusive growth, climate resilience, connectivity, and a commitment to involve children and young people in shaping their future city.





22 PROMOTE THE NEED FOR SAFE, SECURE, AND AFFORDABLE HOMES AND TRANSPORTATION ACCESS FOR ALL HOUSTONIANS.

Launch an educational campaign to inform Houstonians about the growing need for safe, secure, and affordable homes and public transit choices for low- and middle-income working families, seniors, and Houstonians who live on fixed incomes.

Houston has long been an affordable place to live, but rising housing and transportation costs are now creating a burden for many families. Teachers, police officers, firefighters, paramedics, construction workers, and caretakers are just some of the essential professions who often make less than the median income in Houston and would benefit from affordable housing opportunities. However, some residents have hesitations about affordable housing or do not see it as a potential asset to their neighborhood.

To change these perceptions and meet the growing need for affordability, in coordination with the comprehensive housing study (Action 21), the City will create an educational campaign to encourage Houstonians to welcome affordable housing solutions as well as affordable transportation. The campaign will seek to humanize the need for affordable housing and to show how different types of affordable housing, from "granny flats," also known as accessory dwelling units, to multi-family development, can fit into every neighborhood. The educational campaign will be an opportunity to humanize the narrative of housing as the City and its partners seek to leverage disaster recovery funds to develop a variety of resilient, affordable housing types in neighborhoods across Houston. The campaign will also show Houstonians the hidden costs of building affordable housing outside the central city and the need to invest in more affordable transportation options.

SHOCKS/STRESSES

TIMEFRAME

Medium Term (2030)

IMPLEMENTATION THEMES

IMPLEMENTATION PARTNERS

COH / HHC / Kinder Institute / Ford Momentum / Asakura Robinson / Academic Institutions / Housing and Homeless Service Providers / Philanthropy / Community Organizations / State and Federal Government Agencies / Neighborhood Organizations

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

23 INVEST IN TRANSIT-ORIENTED AND TRAIL-ORIENTED DEVELOPMENT.

Comprehensively promote transit- and trail-oriented development through funding, policy, and site identification.

Transit-oriented and trail-oriented development provide templates for sustainable future growth in Houston. As our neighborhoods' populations increase, traffic and congestion will also increase without an alternative approach to development that encourages transit, biking, and walking in each neighborhood based on the assets that are available. These assets include the many miles of new trails being constructed through the Bayou Greenways 2020 and Beyond the Bayous initiatives of the Houston Parks Board and current and future transit investments that are part of the METRONext strategy, as further described in Goals 9 and 15. The City will seek to use high-capacity and high-frequency transit corridors, and areas near high-quality multi-use trails, as sites for land acquisition and focus areas for investment of recovery dollars to help create mixed-income and flood-resilient communities. For example, 21 new or improved Transit Centers and commuter Park & Rides are included in the METRONext *Moving Forward Plan*. These are suitable locations for adjacent transit-oriented development, which could yield 8,400 housing units and 10,500 jobs within a five-minute walk of a transit station.[46]

SHOCKS/STRESSES



TIMEFRAME



Medium Term (2030)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / METRO / TxDOT / GHP / HPB / HHC / Academic Institutions / TIRZs / Management Districts / Developers and Financial Institutions / Professional Associations / Regional Transit Organizations

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



23.1 Pursue joint development with METRO to transform transit centers and Park & Rides while generating funding for additional transit investment.

The City will work with METRO and other partners to develop a process and criteria for transforming underutilized transit centers and Park & Rides into mixed-use, transit-oriented destinations that include housing, retail, and services. METRO's Park & Ride centers have long been an essential part of the transit system; now, needs are changing, and some parking lots in more central areas are underutilized, while others are busy but isolated from surrounding development. Transforming METRO-owned properties into mixed-use development sites through the federally approved joint development process will increase transit's appeal to riders, residents, and retailers, thereby building and increasing transit ridership and taking full advantage of available real estate with direct transit access. Joint development will also enable METRO to collect ground lease rents from the areas of its property that are developed, increasing future bonding capacity and revenue available for investment in transit infrastructure.

23.2 Build equitable development near transit and trails.

The City will coordinate funding and update policies as needed to incentivize development of housing and services near transit stops and trails. Efforts may include land acquisition along transit corridors, subsidies for affordable and mixed-income development in these areas, and encouragement of mixed-use development that provides community services and retail. New development near transit and trails will include high-quality pedestrian and bicycling amenities, as well as transit stop amenities, to encourage and orient residents to these transportation options. Changes to parking requirements through Walkable Places and transit-oriented development ordinance efforts will reduce costs and space used for parking and will help to make these alternative design features viable.

23.3 Provide transit options for affordable neighborhoods.

The City of Houston will collaborate with METRO to define a high-quality affordable transportation standard for neighborhoods that contain a concentration of affordable housing, including naturally occurring and subsidized affordable housing. Transit service improvements in these areas will connect residents to activity and job centers throughout the city as well as to local services and destinations. They should also prioritize the addition of amenities that are tailored to the neighborhood's population, including language services, commuter amenities, or student populations.

23.4 Unbundle parking costs.

National studies have found that just 22% of park-and-ride users actually park at designated lots, and that free park-and-rides generally are a major financing drain on operating agencies. On average, Park & Rides in Houston are only 65% occupied at any given time. Some are used even less frequently—especially those closer

to the urban core. The City will work with METRO to unbundle the cost of parking embedded in the commuter fare system and set a price for parking at Park & Rides to manage parking supply more efficiently, raise additional revenue, and encourage more sustainable first- and last-mile trip making. Unbundling costs on a pilot basis at certain Park & Rides with lower average parking usage could help test the impacts on ridership in order to determine how best to roll out this policy across the system.[47]

23.5 Improve collaboration and coordination of new transit and development investments.

As new transit investments are made through METRONext implementation and through future transit infrastructure investments, neighborhood plans should be developed or updated to incorporate last-mile opportunities through trails, bike paths, and enhanced pedestrian safety elements that stitch the neighborhood to the new transit investment. New transit is also an opportunity for complementary economic development investments that are considerate of the neighborhood context and mindful of displacement concerns. Through additional coordination between the City, METRO, community serving organizations, and private sector partners, new transit investments will be leveraged for multiple benefits.



24 PROTECT AND STRENGTHEN NEIGHBORHOODS THROUGH APPROPRIATE INFILL DEVELOPMENT.

Build up, not out, by creating additional living and job opportunities in urban core neighborhoods.

Currently, for every single-family home built within Houston's boundaries, four are constructed in the city's extraterritorial jurisdiction (ETJ). This push to build out—to expand the boundaries of the region—has been consistent for much of Houston's history. However, today, city and regional infrastructure systems are stretched to their limits. Traffic, flooding, and other issues that harm local families and decrease economic growth can all be traced back to this outward-growing trend. In order to sustainably and successfully accommodate the next one million Houstonians, the City must change its development pattern to encourage denser urban infill development and reduce development pressure in greenfield, undeveloped areas. In short, the city needs to build up its existing neighborhoods, not build out into new areas. Policy change and resource allocation will help ensure that this is a top priority in the coming years.

SHOCKS/STRESSES



TIMEFRAME



Medium Term (2030)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / Academic Institutions / HLB / TIRZs / Management Districts / Developers and Financial Institutions / Community Organizations / Neighborhood Organizations / Professional Organizations

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



24.1 Incentivize denser urban infill development to reduce pressure on greenfield areas.

Denser infill developments are critical to the sustainability and resilience of Houston's neighborhoods. More compact development encourage walkable neighborhoods, reduces the price per person costs to build and maintain infrastructure and reduces household transportation costs and commute times. The City will work with partners to develop specific recommendations for how to effectively incentivize infill development, including by geography, to spur development in specific locations, and by type, including accessory dwelling units and transit-oriented development. Incentives could include tax abatement, permit expediting, or more flexible parking requirements.

24.2 Integrate accessory dwelling units into existing neighborhoods.

As Houston confronts the rising economic and environmental costs associated with housing, traffic, and flooding, accessory dwellings can help. Accessory dwelling units (ADUs) are second houses—garage apartments, granny flats, backyard houses—built alongside single-family homes. Houston currently permits one per lot up to 900 square feet with one additional parking space. ADUs effectively double the density of single-family neighborhoods without negatively impacting the existing neighborhood fabric or character. They reduce sprawl and traffic while helping to mitigate flooding with better infrastructure and land use. ADUs can also increase the socioeconomic diversity of a neighborhood by providing lower-cost rental housing—more affordable, resilient, and built to today's energy and flooding standards. With ADUs, Greater Houston could provide more than one million new units of housing, all without using a single additional piece of land. To encourage ADU development, the City of Houston will review and amend the development standards for ADUs to maximize their effectiveness, which may include modifications in size, number of permitted units, and reductions in parking requirements. Additionally, the City will work with partners to create a program to incentivize ADU development in exchange for providing truly affordable housing to those in need. The City will also engage with partners to help inform residents about the benefits of ADUs and how they can finance and build one on their property.



24.3 End one-size-fits-all parking regulations.

To promote denser and more walkable development near transit and services, the City will introduce reduced parking requirements for properties in strategic areas. Updates to the city's transit-oriented development ordinance will allow certain properties within a quarter-mile of a transit stop to choose how much parking to include in their development without any restrictions. Properties within a half-mile of a transit stop will be able to choose up to a 50% parking reduction from the standard requirements. Within the City's designated Walkable Places, property owners will be able to apply for a Special Parking Area, allowing local businesses to share parking and reducing the amount of parking that must be provided on any one development site.

24.4 Develop strategies to reclaim vacant properties in Houston's urban core.

The City will bring vacant properties in urban core neighborhoods back into productive use through research, neighborhood engagement, strategic policy recommendations, and pilot programs. Vacant properties in the urban core near commercial centers are particularly attractive for transformation into housing for Houstonians of all income levels, because they offer easy access to jobs and services. Some neighborhoods with large numbers of vacant properties have experienced disinvestment in the past; equitable redevelopment in these neighborhoods will require coordinated community engagement with the City and its partners to ensure that new uses benefit existing residents and new residents alike. Pilot programs as referenced in Action 13 will provide initial opportunities for community engagement and strategy on securing vacant land and the Houston Land Bank will provide the vehicle to convey vacant land into productive use for comprehensive community development.



CHAPTER 3

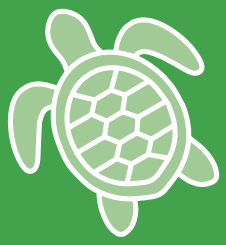
HEALTHY & CONNECTED BAYOUS



GOAL 8 **We will live safely with water.**



GOAL 9 **We will embrace the role of our bayous as Houston's front yard.**



GOAL 8
WE WILL LIVE SAFELY WITH WATER.

While building resilience means more than just preparing for the next storm, Houston's future will be defined in large part by how we address increasing flood risk. As we have seen with the six federally-declared flooding disasters Houston has experienced in the past five years, extreme rainfall events and subsequent flooding in communities across our region are becoming the new normal.

Our bayous are central to how we will live safely with water. As critical elements of our drainage infrastructure, they convey stormwater away from our neighborhoods to Galveston Bay. Our bayous also contribute to our ecosystems though aquifer recharge, subsidence reduction, and by having an overall cooling effect. Detention basins adjacent to our bayous complement this system by providing additional storage capacity during peak flows. Improved natural features and functions of our bayous—restoring the native flora and fauna and making room for water—can make them do even more for us. A nature-based approach can not only further reduce flood risk but also improve air and water quality, mitigate urban heat, restore habitats, and provide opportunities for recreation.

Our comprehensive approach to water management must not only focus on the function of our bayous, but also on decisions we make in the floodplain as well as throughout the watersheds that drain to our bayous and waterways. Decisions made across a watershed, including those upstream, regardless of jurisdictional boundaries, should always consider the impact to communities downstream. We must also address risks to property within floodways and floodplains while keeping communities whole and preserving affordability.



Remove all habitable structures from the floodway by 2030.

25 MAKE ROOM FOR WATER.

Ensure that the waterways of the Bayou City can effectively take on more volume and convey water using a variety of techniques while also improving the water quality of surface water citywide.

Increased urbanization throughout the region and amplified climate concerns require new detention areas that capture and store stormwater during major rainfall events. New stormwater investments must be highly efficient at performing multiple functions: reducing peak flows, mitigating erosion and sedimentation that happen when large quantities of water move quickly through our bayous, and improving surface water quality issues in every bayou across the region. Addressing multiple benefits at once will be more cost-efficient. When implemented effectively, Houston will have a more functional and diverse bayou system: some areas will have more extensively reclaimed floodplains, while other areas with less space will use hybrid gray and green features. Houston will have a coordinated plan to ensure effective partner collaboration to achieve bayou-related goals across the region.

SHOCKS/STRESSES



TIMEFRAME



Medium Term (2030) to Long Term (2050)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HCJO / HCFCD / Academic Institutions / HPB / USACE / TNC / FEMA / HLB / HLCT / GHFMC

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



25.1 Remove all habitable structures and prevent new development of habitable structures in the floodway.

The City will work with partners to ultimately remove all habitable structures and prevent new development in the floodway. As Houston developed, the City granted permits for new homes adjacent to bayous before the National Flood Insurance Program required mapping of the floodway. As a result, many homes were built within portions of bayou floodways where flow is concentrated and moves at high velocity, placing the homes at higher risk of flooding. These homes will continue to flood as a result of more intense rainfall events; therefore, relocation of these residents to safer areas is the only responsible alternative. To accomplish this objective, some mapped floodways may be able to be made smaller through engineering solutions; in other areas, buyouts and property swaps will need to occur. Local ordinances have already been updated to prevent the development of habitable structures within the FEMA-defined floodway and other high-hazard areas. However, these ordinances may need to be updated to include new flooding and climate data. Ultimately, these changes will not only relocate Houstonians currently in harm's way, but will also protect future development and guide the city to a more resilient growth strategy.

25.2 Hold water where it falls, before it enters the bayou.

The City will continue to encourage the use of innovative on-site water capture and retention strategies that will provide relief to the overburdened stormwater system and reduce downstream watershed impacts and costly conveyance requirements. A combination approach integrating low-impact development and traditional stormwater best management practices is required for a resilient and effective stormwater system across the bayous.

Site-specific green stormwater infrastructure (GSI) techniques, such as green roofs, permeable pavement, and rainwater harvesting, mimic the natural flow of water while improving rainwater infiltration and reducing runoff. On-site water retention may also be provided through the preservation of green space and increased water detention. The *Houston Incentives for Green Development* report defines a path forward for the private sector to incorporate GSI into new development and redevelopment projects, reducing the amount of rainwater that collects in storm drains. The City will continue to promote these incentives while also incorporating techniques that hold water in place in public projects.

25.3 Expand the detention capacity of bayou corridors.

The City will look for partnership opportunities to work with Harris County Flood Control District (HCFCD) and key stakeholders to support the restoration and expansion of the storage capacity of bayou corridors throughout all watersheds. While many detention basins have been constructed or are planned for bayou corridors, they could be more effective by incorporating large-scale GSI and nature-based planning and design approaches, such as detention basins with permanent pools of water and wetland vegetation, natural stable channel design, riparian restoration, wetlands restoration and preservation, and prairie restoration and preservation.

A combination of these features along bayou corridors and the associated expansion of the width of bayou corridors to accommodate these tools will slow down and store volumes of water to reduce peak flows and reduce flood extents. The expansion of floodplain areas where previous development encroached on historic floodplains and the preservation of existing intact floodplains also provide the opportunity to restore or maintain a more natural curve in a bayou's water path, which increases capacity and slows water flow.

25.4 Create a Community Buy In/Buy Out Property Swap program.

For homes inside the floodway and homes in the floodplain that cannot be reasonably repaired or elevated, buyouts and relocations are essential tools. However, federal buyout programs can often be slow and difficult processes for homeowners to navigate. The City will work with partner agencies and organizations to establish a program to provide resources for expedited buyouts and relocation opportunities that allow Houstonians to "buy in" to the strength and safety of their community. We will explore and pilot a voluntary program to relocate people and families that meet certain criteria (low or moderate income, severe or repetitive flooding, location within the floodplain, not eligible for federal funding assistance, etc.) to new, refurbished, or relocated homes with lower flooding risk within the same community. Vacant properties outside of the floodplain or at significantly higher elevation will be strategically acquired to provide locations for property swaps. The intent is to reduce but not eliminate risk to the vulnerable people and households within a community while being respectful of social networks and community resources. If and when flood-prone properties are acquired as part of the relocation project, the lots will be used to support flood risk reduction and serve as public amenities.

25.5 Increase water storage ambition over time to adapt as the climate changes.

The City and partners will develop a design methodology for stormwater improvement projects that can incorporate climate impact projections and regional development forecasts. The region's current stormwater system design criteria have changed dramatically with NOAA Atlas 14 data—redefining the region's floodplains and requiring new criteria to accommodate for increased volumes and intensity of rainwater. As our climate changes, increasingly intense rainfall patterns are expected to occur in the Gulf Coast region, further increasing exposure to flood risk over time. Conservative design parameters need to be included in infrastructure projects to ensure systems maintain stormwater storage and conveyance capacity and are adaptive to changing regional climate and hydrological conditions. The City will use the results of the Climate Impact Assessment (Action 32) to evaluate whether the current design criteria appropriately address increased future risk.

25.6 Establish a new elevation requirement for structures outside the 500-year floodplain.

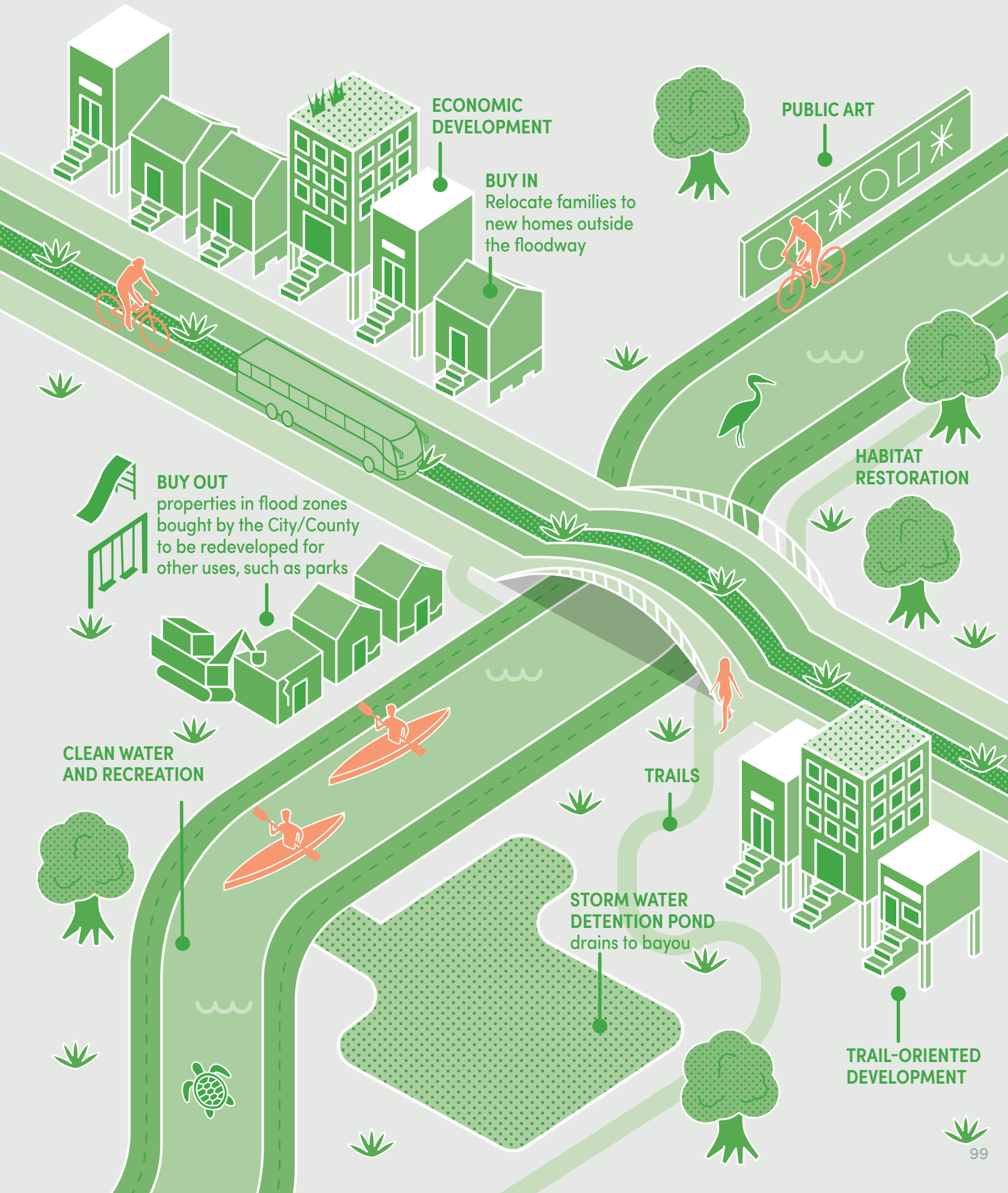
The City will evaluate historical flooding data and improve inundation models to determine new elevation requirements for structures outside the 500-year floodplain. Many homes that have flooded, including during Hurricane Harvey, are located outside of the 500-year floodplain. The current regulatory criteria for homes in this area may not be adequate to address the flood risk caused by local drainage challenges or bayou flooding in extreme events. More stringent elevation requirements will ensure that homes are less exposed to flood risk inside and outside the changing floodplain boundaries. In addition, developing an accurate inundation model and re-convening the Redevelopment and Drainage Task Force will aid in identifying the new structure elevation policy required to protect homes, achieve consensus and community support, and educate Houstonians on preparing for the next storm.

25.7 Collaborate further with Harris County Flood Control District and other counties for integrated watershed management.

The City will strengthen its relationships with HCFCD and other cities and counties to identify and implement stormwater management solutions that maximize flood reduction benefits to entire watersheds. Houston's patchwork of jurisdictional bodies require collaboration to effectively manage development within Houston's bayous. Additional City/County partnerships will be explored with specific attention to cross-boundary buyouts, residential relocations, channel improvements, and dual-purpose water detention and recreation areas. This will enable the creation of a collaboration framework that highlights the goals of living safely with water at a regional scale.



RESILIENT BAYOU



26 CLEAN HOUSTON'S BAYOUS AND WATERWAYS.

Improve surface water quality and urban stormwater runoff quality to promote clean, enjoyable bayous for all.

The City will work to ensure that the bayous are protected from pollutants, invasive species, and unchecked sedimentation and erosion, which threatens people's health and the region's environmental and economic stability. While flood risk is a priority concern for Houstonians, water quality is also critical to our overall health and safety. Many of our bayous are not considered suitable for contact recreation by the Texas Commission on Environmental Quality (TCEQ). Houston's bayous receive treated wastewater discharge, urban runoff, and significant amounts of trash, debris, and sediment—particularly during storm events. Improving the water quality of the bayous will not only bring environmental benefits to Houston's flora and fauna, but will also expand the use of the bayous for recreation. Like flood risk reduction, water quality in our bayous must be addressed through a watershed approach in order to understand the sources and pathways of all contaminants and sediment. The City will need to take a more active leadership role in education and enforcement; coordinate with partner agencies like Texas Department of Transportation (TxDOT), Houston-Galveston Area Council (HGAC), HCFCD, TCEQ, and EPA; employ natural systems for improving and protecting surface water quality; and manage trash and litter through the Buffalo Bayou Partnership (BBP) trash program, Houston Adopt-a-Drain, and other programs. Managing water quality will contribute to healthier and more beautiful bayous, generating lasting effects that will trickle down to Galveston Bay.

SHOCKS/STRESSES



TIMEFRAME



Long Term (2050)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HCJO / HCFCD / Academic Institutions / USACE / Port of Houston / KPC / Houston Wilderness / EPA / TCEQ / TxDOT / HPB / BBP / BCW / GBF / CEER

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



26.1 Prioritize challenges with wastewater discharges.

The City will ensure the protection of waterways through the control and effective management of wastewater discharges. The federal consent decree to address overflows will provide a $2 billion investment to restructure the city's sanitary sewer system and consolidate wastewater facilities across Houston. This effort will allow Houston's wastewater treatment operations teams to reduce the risk of contamination of waterways when flooding occurs, mitigate health hazards, and drive efficiency in the treatment process. The City will modernize the sanitary sewer system by integrating technology to target areas at risk of overflow, improve maintenance on all wastewater assets and pipes, and perform an intensive public education campaign to prevent hard-to-remove substances like oils, fats, and chemicals from reaching wastewater plants. The City will also integrate the wastewater consolidation efforts with Hurricane Harvey recovery programs, which provide reimbursement for impacted facilities and can further the objectives specified in the federal consent decree.

26.2 Advance sedimentation management.

The City, in partnership with the U.S. Army Corps of Engineers (USACE), Port of Houston, and HCFCD, will develop technical solutions, policy changes, and funding mechanisms to mitigate the negative impacts of erosion and sedimentation in our waterways. Starting with a geomorphological assessment of sediment in the watersheds contributing to the Houston Ship Channel and West Fork of the San Jacinto, the City will prepare a sedimentation and erosion action plan that includes preventative measures, mid-river solutions, and water-level opportunities. Revisions to stormwater pollution and prevention policies at the street level, revegetation of riparian areas, enforcement of the region's stormwater management program, development of a pilot program for various techniques, continuous dredging, and regional collaboration between public agencies and the private sector are essential to the effectiveness of a sediment capture and control program.

ROTTERDAM, THE NETHERLANDS

WATER SENSITIVE ROTTERDAM

Water Sensitive Rotterdam (WSR) is a series of scalable projects that approach water in a new way—as a valuable resource and not a threat. This is done by integrating the water cycle into the urban environment, including collection, treatment, and conveyance. Each project also considers how it contributes to the further development of a livable city.

One project example is Climate-Resilient District Zomerhofkwartier (ZOHO) which includes the Benthemplein water square. The water square has three large rainwater collection ponds that hold and then slowly drain water when it rains. When it is dry, the square, which is located near multiple schools, is used as an amphitheater and for sports including basketball and skateboarding.



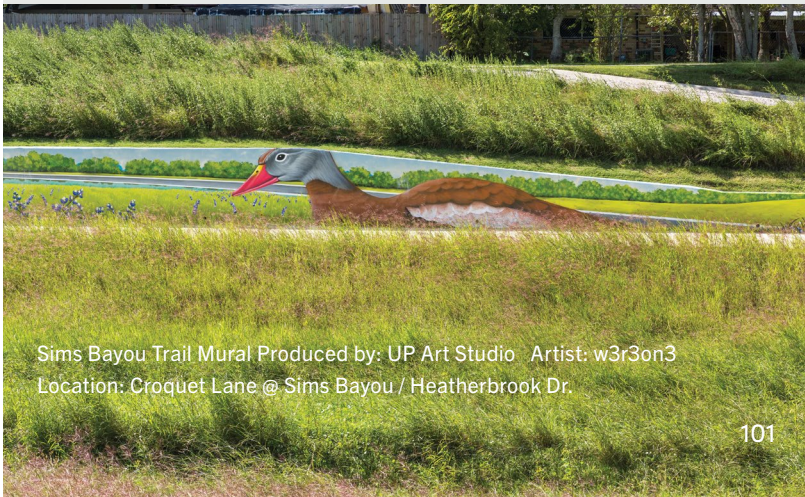
Photo: Ossip van Duivenbode

26.3 Promote natural infiltration and treatment of stormwater by wetlands, prairies, and woodlands.

The City will integrate natural stormwater infiltration and treatment techniques to improve water quality in the bayous and their diverse ecosystems. Wetlands, prairies, and woodlands provide critical flood risk reduction by retaining stormwater on site and encouraging infiltration through the soil for plant absorption or groundwater recharge. Wetlands, prairies, and woodlands are critical and complex ecosystems that provide flood management and significant water quality benefits. They support plants and other living organisms that can consume pollutants, naturally treating contaminated water and preserving land. The City will preserve wetlands, prairies, and woodlands while restoring these habitats in flood control projects. The City will also continue to pursue low impact development and GSI techniques to mimic the functions of the natural environment to enhance the water treatment across various watersheds.

BAYOU GREENWAYS 2020

Houston Parks Board's Bayou Greenways 2020 is transforming Houston into a healthier, happier, and more resilient city. 150 miles of bayou adjacent trails and 3,000 acres of greenspace are being created through a $220 million public-private partnership. These improvements are being made along seven bayous—Brays, Buffalo, Greens, Halls, Hunting, Sims, and White Oak—in addition to the West Fork of the San Jacinto River. Building on the success of Bayou Greenways 2020, the Houston Parks Board is working with the City and other partners to look Beyond the Bayous to create parks and greenways that weave throughout Houston's urban fabric to improve equitable access to natural resources. For more information on Bayou Greenways 2020 and Beyond the Bayous visit *houstonparksboard.org.*



Sims Bayou Trail Mural Produced by: UP Art Studio Artist: w3r3on3
Location: Croquet Lane @ Sims Bayou / Heatherbrook Dr.

27 ADVANCE RESEARCH AND TECHNOLOGY TO IMPROVE WATER MANAGEMENT.

Become a leader in data- and technology-driven processes to incorporate innovative approaches to solve Houston's most challenging water management constraints.

Advances in technology and data availability have provided many cities with the opportunity to improve processes while encouraging more data-driven policy and decision making. Houston can use new technology and research to monitor real-time operations, identify choke points, and integrate smart city concepts into water management practices across the city's bayous. Predictive technology enables decision makers to react to changes quickly and identify the correct course of action. These technological tools are also an opportunity for our city and region to develop new expertise and attract new businesses specializing in creatively solving these challenges.

SHOCKS/STRESSES



TIMEFRAME



Short Term (2025)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HCFCD / Academic Institutions / HARC / TxDOT / CEER / HCJO /

Green Infrastructure Leadership Exchange

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



27.1 Study water system choke points to remove obstructions that impede water flow.

The City will study water system choke points across bayous and systems within watersheds to identify and remove obstructions that slow down or impede the movement of water downstream. Network intersections, such as railway crossings and roadways, can create choke points in drainage systems if not properly designed. Therefore, a thorough analysis of overland water movement across a watershed will determine the priority locations for addressing choke points, focusing on areas with a high risk of flooding. Depending on the location of obstructions, the City will work with HCFCD or other agencies like TxDOT to design a solution to remove the obstruction and allow natural water flows. Downstream impacts will be evaluated to achieve the maximum benefit for the entire watershed.

27.2 Develop a local, multi-sector coalition to research, test, and advance the implementation of nature-based infrastructure.

The City will partner with local academic institutions and other partners to advance research, testing, and implementation of nature-based infrastructure. Many regional and external agencies have conducted benchmarking and reviews of the specific GSI solutions that are applicable to Houston. However, applied research on the specific designs and locations best suited for the Houston area has not been conducted or brought to scale. The coalition would be encouraged to develop prototypes that include nature-based solutions specifically tailored to Houston and develop new products that are commercially viable. The coalition may also conduct research measuring the benefits and co-benefits of GSI projects, supporting their implementation across the city.

27.3 Evaluate and pilot smart city technologies to manage and monitor stormwater and flooding.

The City and its partners will evaluate opportunities to incorporate additional smart city technologies and innovations into the way we live with water. These technologies include real-time controls into detention systems at a watershed scale to more efficiently manage volumes of water, real-time flooding information connected to mobile apps and other route guidance platforms, and crowdsourced response and recovery. These technologies will help the City acquire, manage, and share data for initiatives including flood detection sensors, sanitary sewer outflow monitors, roadway flood warning systems, smart water meters, and smart grease traps. Houston's Water Innovation Hub, a demonstration site for emerging technologies in water, is working with partners to deploy more than a dozen solutions that aim to improve the efficiency and resilience of Houston's water system, leveraging the expertise and capacity of Houston's Public Works Department—the nation's third largest water utility.



Photo: Waggonner & Ball Architecture / Environment

LIVING WITH WATER

As a core component of *Resilient Houston*, the Living With Water Houston workshops explored the regional water system and natural and built environments that define the Bayou City, including an analysis of regional flood risk in the context of climate projections and increased urbanization. The workshops produced a framework for flood resilience that includes recommendations for the region, city, bayous, and all neighborhoods, as well as specific design proposals for three focus neighborhoods of Independence Heights, Kashmere Gardens, and Greenspoint. The recommendations of the final report have been primarily integrated into the Healthy and Connected Bayou chapter of *Resilient Houston* but will serve to guide place-based approaches to building resilience in Houston at all scales.

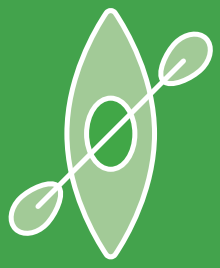
The full Living With Water report is located at *houstontx.gov/mayor/chief-resilience-officer.html*

GREENSPOINT

Greenspoint was one of three focus areas of the Living with Water Houston design workshop. Greens Bayou has been straightened, chanelized, constricted and encroached on over time as people moved to Greenspoint in the 1970's and 1980's. Homes built in this area were some of the earliest buyout properties in Houston. Greens Bayou overtopped its banks multiple times from 2014–2019, including Hurricane Harvey in 2017. The City, through the Living With Water Houston process, as well as the Greater Houston Flood Mitigation Consortium and the North Houston Management District-sponsored Livable Centers Study on Greenspoint are all revisioning this area as a prime example of the need to live safely with water. Greenspoint is one of many examples where transformational change is possible, especially as partners continue to collaborate.



Drawing: Waggonner & Ball Architecture / Environment



GOAL 9

WE WILL EMBRACE THE ROLE OF OUR BAYOUS AS HOUSTON'S FRONT YARD.

Houston is the Bayou City. Our past, present, and future is indelibly tied to our relationship with the meandering system of bayous that weave through our region. Founded in 1836 at the confluence of Buffalo and White Oak Bayous, Houston's early growth centered on shipping and commerce along Buffalo Bayou. Our bayous define our evolving relationship to water and approach to flood risk. As we look to the future, our bayous provide an arterial system for a resilient model of growth. All of the elements of a resilient city come together along our bayous: flood risk reduction and climate adaptation measures meet healthy ecosystems and healthy communities; safe and high quality trails provide new ways to get around the city and drive economic development; arts and cultural practices lift up the Bayou City identity; and neighborhood connections to and along our bayous provide equitable access to these amenities.

This goal builds on the existing efforts of Buffalo Bayou Partnership (BBP), Houston Parks Board (HBP), Houston Wilderness, the City of Houston, and their many partners in efforts such as bayou recreation, Bayou Greenways 2020, and Beyond the Bayous. These efforts provide a template and a basis for further action to expand ecological, community, and economic benefits along our bayous.



Construct at least 500 miles of trails and bike lanes by 2025.

28 RESPECT BAYOUS AND NATURAL FLOODPLAINS AS AN INTEGRAL PART OF HOUSTON'S URBAN NATURE.

Advance nature-based approaches to restore and enhance bayou corridors.

Houston's bayous function as a network of ecological patches and corridors for many diverse species, including migratory birds and pollinators. By building in ecological value to planned investments for flood mitigation, the City can cost-effectively improve habitat, mitigate urban heat and air pollution, and create carbon sinks such as wetlands, prairies, and forests. Deploying natural defenses is beneficial not only for the environment but also for the economy, as ecosystem services are enhanced. Nature-based approaches to bayou restoration can be equally or even more cost-effective when compared to traditional infrastructure.

SHOCKS/STRESSES



TIMEFRAME



Medium Term (2030)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HCJO / HCFCD / Academic Institutions / BLC / HPB / HARC / KPC / Houston Wilderness / TNC / BCW / BPA

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



28.1 Create an ecosystem toolkit for bayou and floodplain restoration.

The City will coordinate efforts with HCFCD and local, state, and national partners, as well as environmental non-profits, to create a toolkit of nature-based approaches for restoring bayou corridors and improving holistic ecosystem health. This toolkit will include many kinds of flood mitigation projects, such as riparian, urban forest, wetland, and prairie restoration and conservation, and hybrid projects that marry channel stabilization with green techniques to amplify ecological and aesthetic value. Toolkit approaches will specifically outline the ecological, air pollution reduction, urban heat mitigation, and other co-benefits of improved, nature-based design for bayou corridor systems. The Katy Prairie Conservancy (KPC) is already piloting work that addresses the large-scale ecosystem services benefits of the region's coastal prairie beyond flood mitigation and will be a key part of pilot project implementation and monitoring.

28.2 Enhance ecological patches and corridors using restoration in city parks as a model.

The City will work with The Nature Conservancy (TNC), Houston Wilderness, regional land conservancies and land banks, and other partners to create and implement an Urban Ecology Plan for the city's bayous focused on the role they play in supporting many species' habitat needs. This plan will prioritize investments in existing and future conservation and preservation lands along bayou corridors based on the convergence of four key factors: protecting biodiversity, improving corridor connections, size, and ownership. Sites with high existing or potential biodiversity value, large sites adjacent to bayous; sites with public (potentially in floodplain buy-out areas), non-profit, or other ownership that would make wetland or land dedication for the purpose of conservation and carbon storage more feasible; and sites that would improve sections of bayou corridors previously seen as gaps or weak links will all be prioritized for investment. Once existing and potential conservation and preservation lands in the bayou network have been prioritized for improvement or acquisition, the Ecosystem Toolkit should inform the typologies of restoration or preservation appropriate for each site with special consideration of both historic ecosystems and the diversity of complementary typologies working together in the larger network.

28.3 Support the Headwaters to Baywaters Initiative.

The City will support the Headwaters to Baywaters Initiative that aims to protect riparian corridors that connect creeks and bayous to Galveston Bay. The initiative provides land conservation for protection and preservation of riparian wildlife. Prominent ecological resources will be protected and the water quality entering Galveston Bay will be improved. The initiative will provide improvements to the Katy Prairie at Cypress Creek headwaters, portions of the Lower San Jacinto River, and Buffalo Bayou. The City will engage with partners and continue to support efforts to ensure that land acquired adjacent to bayous through recovery and flood mitigation programs can serve and complement the Headwaters to Baywaters Initiative.

29 INCREASE ACCESS TO OUR BAYOUS FOR RECREATIONAL, HEALTH, AND OTHER COMMUNITY BENEFITS.

Leverage current and planned investments that are creating recreation, active transportation, health, and community cohesion benefits along Houston's bayou system.

The City will support and build on existing planning and implementation efforts to provide parks and trails that equitably enhance our community and celebrate our bayous. Parks provide stress relief, improve physical and mental health, and encourage community cohesion. Parks and trails along waterways can provide flood control and ecological benefits. A connected linear park system along our bayous can also serve as a safe pedestrian and bicycle connection between schools, homes, and jobs, providing a transportation alternative to all Houstonians. These features support the community in its health and resilience and are especially beneficial to neighborhoods that lack other supportive resources. The City will work with partners to determine equitable prioritization and phasing of planned projects, foster public-private partnerships, and create innovative funding methods to implement prioritized projects.

SHOCKS/STRESSES



TIMEFRAME



Medium Term (2030)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HPB / HCJO / HCFCD / BBP / TIRZs / Management Districts / TxDOT / HLB / HCLT / Academic Institutions / Kinder Institute / Philanthropy

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



29.1 Implement the Buffalo Bayou East Expansion Plan.

The City will continue to support improvements along the Buffalo Bayou corridor, including Buffalo Bayou Park and the Buffalo Bayou East Expansion Plan. Stretching from Shepherd Drive to Sabine Street between Allen Parkway and Memorial Drive, the 160-acre Buffalo Bayou Park is one of the country's renowned urban green spaces. As the Park expands to the east, the City will engage with developers and property owners along Buffalo Bayou and adjacent neighborhoods to ensure that the goals of the Buffalo Bayou East Expansion Plan are met. Conservation and development in these reaches should be balanced to create opportunities for projects that highlight multiple purposes, including recreation, flood management, habitat restoration, and community engagement and stewardship. The City will work with Buffalo Bayou Partnership to include resilience principles in the activation and implementation of the space, track and evaluate the use of these areas and the impact on quality of life and displacement, encourage use by surrounding communities, and educate the public about the park's multi-purpose benefits. The City will also tie in additional recovery efforts along Buffalo Bayou to the Buffalo Bayou East Expansion Plan. The proposed North Canal project in Downtown, which aims to reduce flood risk along Buffalo and White Oak Bayou, will exemplify how agencies can collaborate to deliver combined value to the community.

29.2 Expand and enhance the Bayou Greenways 2020 linear park system.

The City and its partner, Houston Parks Board (HPB), will expand and enhance existing efforts to implement the Bayou Greenways 2020 plan—a $220 million transformation of more than 3,000 acres of underutilized land along Houston's major waterways into publicly accessible green space, creating a 150-mile network of connected parks and trails within the city limits. The Beyond the Bayous planning framework will further these efforts to help Houston realize a vision of parks and greenways that weave throughout Houston to create a tapestry of vibrant, resilient, and connected communities. Its goals include the equitable distribution of parkland; increased access to and connectivity between parks, homes, and jobs; and enhancement of our natural resources. The City will encourage the integration of walking, biking, and transit corridors with the Bayou Greenways 2020 linear park system to provide more access to existing trails. The partnership will also identify new funding opportunities to deliver projects and increase outreach efforts to achieve higher visibility. By fostering collaboration, reinvesting in existing parks, and identifying opportunities to expand our regional park network, Beyond the Bayous provides Greater Houston a pathway toward a park-centered future that bring neighborhoods together.

29.3 Leverage investments for multi-purpose flood mitigation, recreation, transportation, and community health benefits.

The City will work with HPB and other stakeholders such as HCFCD to leverage investments in flood mitigation projects by including elements of multi-functional design. On August 25, 2018, Harris County voters passed $2.5 billion in bonds to fund flood damage reduction projects. Similarly, the City's Build Houston Forward program identifies and sets funding for completion of street and drainage improvement projects. Many federally funded projects also focus on recovery and flood risk reduction for communities impacted by Hurricane Harvey. By incorporating resilience design principles, these projects can not only provide storm protection but can also serve as recreation and transportation assets, which provide health and quality of life benefits to communities. However, these additional project design components often are not funded through existing federal grant programs and other flood mitigation funding streams. The City will work with partners to align flood mitigation and open space investments, identify opportunities to leverage other funding sources, and amend existing design standards to encourage multi-functional infrastructure. To ensure that dual-purpose flood mitigation projects are considered feasible, careful consideration must be given to the life cycle of the project and maintenance requirements, costs, and agreements. This will ensure continuity of benefits provided while leveraging funds where possible.



SINGAPORE

ACTIVE BEAUTIFUL CLEAN WATERS

In 2006, the Active, Beautiful, Clean Waters (ABC Waters) program was launched to transform Singapore's waterways and waterbodies into beautiful urban assets, integrating these drainage infrastructures with the built environment while bringing people closer to water. The strength of the program lies in its unique approach to get people involved in ensuring the sustainability of scarce water resources. Community engagement has been an important aspect of this program, which has opened up "blue" spaces for recreation, contributing to Singapore's livability. Apart from introducing water to the city and people, ABC Waters promotes the use of natural systems to temporarily absorb stormwater so that peak runoff to waterways is reduced, lowering flood risk during heavy storms when incorporated on a catchment-wide level. (Excerpt from Living with water: Lessons from Singapore and Rotterdam p. 52)

Active: Creating new recreational and community spaces while bringing people closer to water.

Beautiful: Transforming concrete waterways into vibrant and picturesque waterscapes that are well integrated within the urban environment.

Clean: Improving water quality through holistic management of water resources and public education by fostering better people-water relationships.

30 ENCOURAGE INCLUSIVE GROWTH AND ECONOMIC DEVELOPMENT ALONG BAYOU CORRIDORS.

Catalyze bayou-oriented development and promote bayou tourism that is equitable and inclusive, ensuring opportunities for local small businesses to thrive and maintaining affordable housing options for local communities.

Great urban waterways and trails can catalyze economic growth and reshape urban development patterns. As investments in our bayous are made to reduce flood risk and provide access to high quality public spaces, we will leverage these improvements to support local and regional economic development goals.

While Houston's growth has historically followed highway investments, reorienting future growth along trails and bayous, as well as near transit hubs as described in Action 23, supports communities that are healthy, safe, and connected to affordable ways of getting around the city. One of the framing values of the Buffalo Bayou East Expansion Plan is catalyzing inclusive growth that brings current residents and businesses along with it. Buffalo Bayou Partnership is working closely with local communities and affordable housing developers to design the East Sector and coordinate economic development efforts. Bayou improvements can also create jobs and support local small businesses. This includes jobs in the construction and maintenance of nature-based infrastructure and park space, small business vendors like kayak kiosks that support bayou recreation, and local shops and restaurants.

Investments in our bayous and their central role in Houston's identity can also bolster our tourism economy, which can further support local small businesses. The City will work with HPB and support the coordination of other partners and local communities to build on the lessons learned along Buffalo Bayou and advance equitable development, local jobs, small business opportunities, and bayou tourism along Bayou Greenways across the city.

SHOCKS/STRESSES



TIMEFRAME



Medium Term (2030)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HPB / BBP / Professional Associations / Developers / Financial Institutions / Community Organizations / Neighborhoods

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



30.1 Promote trail-oriented development.

The City will have an extensive trail network system in place and will encourage further trail development for enhanced connectivity throughout Greater Houston. Bayou trail networks provide safe public access to recreation while improving societal connections to natural resources. The City will promote appropriate development along existing and proposed trail networks to increase equitable access to green space. The City will encourage connections to bike trails and transportation corridors so Houstonians residing further away from the main bayou trails can also access this type of infrastructure.

30.2 Combine floodway retrofits with neighborhood-scale planning and public and private investment opportunities.

The City will work with partners to advance watershed planning to combine floodway retrofits and improvements with neighborhood-scale projects that include private and public investment opportunities, particularly in locations experiencing chronic flooding. Many communities in Houston have experienced severe disinvestment, exacerbated by flooding and development patterns. As flood-prone neighborhoods are revitalized, strategies can be explored to link capital improvement projects (CIP) and public-private partnerships (PPP), which provide the benefit of additional funding. The City will work collaboratively across local agencies and with private-sector and community partners to support community-driven planning processes for neighborhoods that have faced flood-related disinvestment, allowing them to control their own destiny and improve their neighborhoods without the risk of displacement. The City will use a robust participatory planning process to develop integrated and implementable neighborhood plans, identify funding opportunities to deliver solutions, and lead neighborhood transformation efforts.

30.3 Incentivize and promote innovative "water-aware" development that expands local examples of how to live with water.

The City will incentivize development that integrates "water-aware" principles for infrastructure and considers overall watershed characteristics. Houston has historically been a high-precipitation region and residents are learning to live with water. "Water-aware" development uses designs that work in concert with existing natural patterns. By understanding where and how water naturally moves in our region, the City may provide integrated development plans that make room for water and identify alternative building standards for higher-risk areas, such as requiring structures to be built on pier-and-beam foundations. Such development embraces the natural flows of water and preserves local ecosystems rather than modifying existing natural patterns. The City will conduct studies to understand the flow of water across watersheds and plan at a watershed scale to protect new developments and business investments across Greater Houston.

30.4 Grow tourism on bayous and in adjacent prairies and woodlands.

The City will work with Houston First Corporation and other environmentally focused non-profits to generate local tourism associated with bayous and adjacent prairies and woodlands. Houston has a unique opportunity to become a world-renowned city for water management and implementation of flood mitigation strategies. Ecosystem tourism focusing on innovative water management strategies provides enhanced recreational opportunities to residents and visitors alike. Ecotours improve the local economy by generating employment opportunities while providing education on the importance of land and habitat preservation. Tourists may be inspired by Houston's expertise and lessons on our human impact on the environment and how local conservation efforts improve our overall flood risk and quality of life. Improving water quality in our bayous, as highlighted in Action 26, will support opportunities for additional water-related activities.

BUFFALO BAYOU EAST

Houston's celebrated 160-acre Buffalo Bayou Park was completed in 2015 and has become one of the country's great urban green spaces. Building upon this success, Buffalo Bayou Partnership (BBP), the non-profit organization that developed and operates the park, seeks to extend the Buffalo Bayou greenway network along four miles of Buffalo Bayou waterfront east of Downtown Houston, catalyzing broader neighborhood revitalization in a predominantly industrial and post-industrial landscape that is disconnected from the surrounding historic communities.

The plan for the East Sector provides a blueprint for 40 miles of new and improved trails, 200 acres of public open space, and inclusive development—all informed by robust community input. The plan prioritizes the integration of community and open space, including early development of a mixed-income housing development on BBP-owned property. The long-term vision will pay tribute to Houston's industrial roots, celebrate culturally rich neighborhoods, and serve as an important symbol for the city's continuing commitment to accessible park space for all. To learn more visit *buffalobayou.org*.





CHAPTER 4

ACCESSIBLE & ADAPTIVE CITY



GOAL 10 We will demonstrate leadership on climate change through action.



GOAL 11 We will modernize Houston's infrastructure to build forward and address the challenges of the future.



GOAL 12 We will advance equity and inclusion for all.



GOAL 13 We will transform city government to operationalize resilience and build trust.



GOAL 10

WE WILL DEMONSTRATE LEADERSHIP ON CLIMATE CHANGE THROUGH ACTION.

The challenges facing Houston are complex and the proposed policies, programs, and projects identified throughout this strategy are not easy to implement. Achieving the lasting change that we know is needed to make Houston more resilient requires bold leadership to chart a new course for our future. It will require collective action fueled by a shared understanding of Houston's greatest risks and a clear vision about how to overcome them. Because of our changing climate, the City must be proactive, lead in adaptation efforts, and be prepared to manage uncertainty.

Chapter 4 focuses on the steps we need to take at the city government scale, beginning with actions that require strong leadership. To meet the needs of all Houstonians, we must make the difficult decisions needed to tackle our most pressing challenges, such as systemic inequity, dependence on fossil fuels, and urban sprawl. The long-term plans we create must be actionable and supported by staff who are empowered to implement and lead. Houston can set new standards of leadership, setting an example for the entire region.



Achieve carbon neutrality by 2050 in accordance with the Paris Agreement.

31 ADOPT AND IMPLEMENT THE CLIMATE ACTION PLAN GOALS AND ACTIONS.

The City will meet the goals of the *Climate Action Plan* (CAP) by implementing a mix of mitigation strategies for energy transition, building optimization, transportation, and materials management, focused on how the City can lead by example.

Many cities, including Houston, have committed to tackling climate change and are leading initiatives to meet the goals set forth by the Paris Agreement to reach carbon neutrality by 2050. Houston's CAP identifies the key strategies needed to reduce greenhouse gas emissions and demonstrates our capacity to reduce the severity of climate hazards in the future. With the projected devastating impacts that rising global temperatures can bring to our region, setting ambitious targets to reduce emissions is crucial. The actions outlined in the CAP are essential to the health and economic vitality of Houston's future. As strategies are developed and implemented to reduce our carbon footprint, they will provide additional value by saving money and improving the quality of life for all Houstonians.

SHOCKS/STRESSES



TIMEFRAME



Long Term (2050)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / EVolve / HARC / C40 / Texas Energy Poverty Institute / Private-Sector Partners / Academic institutions

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



31.1 Lead by example through renewable energy use.

The City of Houston currently ranks number one in the United States for municipal renewable energy use generated from solar and wind sources. While working with all departments to optimize building and plant energy use, the City will transition to 100% renewable energy in all municipal operations by 2025. The City also aims to shift to more resilient energy sources by assessing potential for solar and battery storage at municipal properties. These actions will set an example for households, businesses, and other cities in the region by increasing demand for renewable energy and contributing to the reduction of Houston's carbon footprint.

Corresponding Climate Action Plan Goals for Energy Transition:

1. *Grow Houston's investment in renewable and resilient energy.*
2. *Make Houston the leader in carbon capture technology and energy innovation.*
3. *Restore, protect, and enhance Houston's natural ability to capture and store carbon.*

31.2 Support and promote the use and development of renewable energy.

The City will support and promote renewable energy across all scales by empowering homeowners to use or purchase renewable power. Working across sectors to advance the next generation of energy investments, the City will champion policies that encourage solar power generation and storage. Among the programs that will help provide energy security for Houstonians is the development of innovative community-solar and rooftop-solar programs. The City will partner with organizations like the Texas Energy Poverty Institute to help low- to moderate-income communities obtain access to clean energy sources that will reduce their energy burden and reliance on the existing grid. Continued partnerships with the private sector will build local capacity for solar systems installation and operations by advancing investment and training. The City will also advocate at the state and federal levels for policies that lead to lower carbon power generation and introduce opportunities for expanding renewables in the energy market.

31.3 Assess opportunities for microgrid development and deployment.

The City will evaluate opportunities to incorporate microgrids as part of the local electricity network. Benefits of microgrids can include lower energy costs, reduced pollution, and a more resilient power supply that is independent and isolated from the existing grid. As opportunities are explored, the City will work with distribution companies and energy providers to create programs that allow for localized sources of energy supply tailored for the needs of the communities and critical facilities. The City will also work to identify opportunities for neighborhoods and critical facilities that will benefit from a continuous and uninterrupted supply of power and lower energy costs. The incorporation of microgrids is a step forward to creating carbon neutral neighborhoods across the Houston region.

31.4 Lead by example on electric and cleaner, more efficient vehicles.

The City will lead the shift to electric and cleaner, more efficient vehicles. Transportation is the largest contributor to greenhouse gas emissions in Houston. Addressing these inefficiencies will bring



significant reductions in our overall carbon footprint, taking us one step closer to aligning with the goals of the Paris Agreement. To increase the rate of adoption, the City will increase public infrastructure and provide incentives for electric vehicles and alternative fuels within the private sector. Leading by example, the City will convert 100% of non-emergency, light-duty municipal fleet to electric vehicle (EV) technologies by 2030. The regional shift to cleaner, more efficient vehicles will require extensive regional coordination in order to reduce the carbon footprint of commuters into the city. The City will also work with partners to expand shared and micro-mobility options within neighborhoods that offer lower-emissions transportation opportunities.

Corresponding Climate Action Plan Goals for Transportation:

1. *Shift regional fleet to electric and low-emission vehicles.*
2. *Reduce vehicle miles traveled (VMT) per capita.*
3. *Provide equitable and safe mobility choices.*

31.5 Increase electric vehicles (EVs) to 30% of new car sales by 2030.

EVolve Houston is a coalition of sustainability-minded civic, business, and academic leaders seeking to improve air quality and reduce greenhouse gas emissions by electrifying transportation. The organization's "30 by 30" goal is to increase regional EV adoption and have EVs reach a 30% share of annual new car sales by 2030. Moving toward this goal supports the City of Houston and its *Climate Action Plan*'s mission of becoming carbon neutral by 2050. EVolve Houston represents a public-private partnership between pillar local institutions—the City of Houston; Shell; NRG Energy; CenterPoint Energy; the University of Houston; and LDR, which provides management support and project execution. To accomplish its goal, EVolve Houston developed the *Electric Vehicle Roadmap*, which is organized around strategic initiatives in three focus areas: awareness, availability, and affordability. In implementing these initiatives, the landmark coalition unites government, industry, academia, and the community on pilot project implementation, demonstrations, and other activities to accelerate EV adoption.

31.6 Lead by example on building performance optimization.

Buildings that benchmark their energy consumption see an average reduction in energy use of 2.4% per year and a two-point increase annually in Energy Star score.[48] The City will lead by example and update a comprehensive municipal building policy to include resource benchmarking and public disclosure for all municipal buildings by 2021. The City will also work with Houston's Building Owners and Managers Association (BOMA) and industry partners to develop energy benchmarking and audit programs for commercial, industrial, and residential buildings. Building audit programs provide a more detailed analysis of energy use and are a powerful tool to improve the energy efficiency and comfort of a facility.

Corresponding Climate Action Plan Goals for Building Optimization:

1. *Reduce building energy use and maximize savings.*
2. *Expand investment in energy efficiency.*
3. *Invest in skilled local jobs to optimize building operations.*

31.7 Lead by example through sustainable materials management.

The City will demonstrate its climate leadership and raise public awareness of sustainable materials management by establishing an Environmental Preferable Purchasing Policy (EPPP) by 2022. The goal of an EPPP is to minimize waste, decrease operating costs, and conserve natural resources by encouraging municipal purchases of socially and environmentally preferred and recycled products and services with a preference for locally produced products and businesses.

Corresponding Climate Action Plan Goals for Materials Management:

1. *Reduce waste and transform the circular economy.*
2. *Optimize waste operations and create power from waste.*
3. *Ensure safe and cost-effective long-term disposal capacity.*

32 CONDUCT A CLIMATE IMPACT ASSESSMENT FOR HOUSTON TO INFORM CITY POLICIES AND PROGRAMS.

Conduct a climate impact assessment to ensure that Houston is appropriately and strategically planning for the impacts of the future using the latest data and science.

To truly lead, we must know where we are going. By looking at specific climate indicators for temperature and precipitation, climate scientists can forecast climate trends into the future. These trends could include the number of days in each year that the daytime temperature will reach 100 degrees, the evening temperature will stay above 80 degrees, or how long the worst heatwave each year could be. This information will help to inform emergency response and preparedness education, the City's cooling center policy, the projected costs of energy, or how extreme heat may shorten the lifespan of infrastructure. Other useful trends to examine could include the annual total precipitation or the number of days receiving four or more inches of rain. Houstonians and the City can use this information to plan future stormwater infrastructure and flood mitigation programs and projects that are adaptive in nature. Additionally, the trends evaluated could also include the number of dry days with less than .01 inches of precipitation to provide more information to Houstonians about projected weather extremes.

Conducting a climate impact assessment will encourage all public, private, academic, and non-profit partners to incorporate the results into ongoing efforts and help educate Houstonians on the realities we face. The climate impact assessment will help us understand the increasing threats that we will encounter, such as extreme heat, extreme precipitation, and drought, and how we can best address them. With the results of the assessment, we will update infrastructure design to incorporate long-range climate projections and best practices for climate adaptation and resilience.

SHOCKS/STRESSES

TIMEFRAME

Immediate (2020)

IMPLEMENTATION THEMES

IMPLEMENTATION PARTNERS

COH / C40 / Atmos Research / HARC / Academic Institutions / CEER / Environment Texas / BBP

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



33 HOLISTICALLY MANAGE OUR WATER RESOURCES TO BE CLIMATE READY.

The City will embrace and advance the "One Water" movement by working with the U.S. Water Alliance and integrating the management of Houston's water resources across different sectors for improved water quality, flood protection, and climate change adaptation as well as security of water supply.

Adopting a One Water approach, coupled with The City of Houston *Water Conservation Plan* and *Drought Contingency Plan*, will position Houston to withstand multiple shocks and stresses. Holistic water management that focuses on updating old infrastructure, avoiding water loss, integrating technology for system efficiency, and improving water quality will have a direct impact on the City's ability to provide basic services, maintain a healthy population, be good stewards of the environment, and allow for growth. Embracing the One Water movement will allow the City to advance ongoing efforts as well as enhance its understanding of the impacts of different shocks and stresses on our vulnerable water resources. The actions outlined below will begin to drive a culture change around how water infrastructure is perceived and how it can be managed efficiently, equitably, and sustainably. This initiative will depend upon partnerships with the non-profit and private sectors as the City takes a leadership role, convening key stakeholders and identifying funding opportunities.

SHOCKS/STRESSES



TIMEFRAME



Medium Term (2030)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / TWCB / TWDB / USWA / EPA / TCEQ / USACE / HCFCD / TIRZs / Management Districts / Subsidence Districts / Community Organizations / Academic Organizations / Philanthropy

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



33.1 Create a comprehensive One Water plan that includes climate-resilient infrastructure.

The City will create a comprehensive One Water plan that includes climate resilient infrastructure to address the impacts of climate change and prepare the region for the future. The impacts of climate change will primarily be felt through changing water cycles, specifically with large and uneven consequences to our food, energy, urban, and environmental systems. The proposed solutions will be focused at all scales; value water as a finite resource; and combine existing efforts at local, state, and federal levels. The City will work with partners to advance local coordination efforts, implement actions specified in the *Water Conservation Plan* and *Drought Contingency Plan*, and develop a Stormwater Master Plan with the goal of ensuring water resilient communities. The City will also implement the Incentives for Green Development program as well as execute additional watershed-scale planning and actions to tailor solutions to the geology and hydrology of an area. The development of an integrated systems approach to water management will ensure that the value of water is maintained and is managed in a sustainable, inclusive, and integrated way.

33.2 Improve coordination with all local water agencies.

Harris County Flood Control District (HCFCD) and the U.S. Army Corps of Engineers (USACE) are conducting independent studies and watershed assessments that will help shed light on the many water-related issues, including flood risk, quality, and availability experienced in the Houston region. The City will continue to coordinate with these agencies to ensure that the assessments and recommendations that are being proposed reflect the interests of Houston from an integrated water management perspective. The City will then use the data from these assessments to inform water conservation and stormwater master planning efforts, ensuring environmental stability and human health while managing flood risk and water resources across sectors of the regional economy.

33.3 Implement the City's Water Conservation Plan and Drought Contingency Plan.

The City will implement the *Water Conservation Plan* and *Drought Contingency Plan* while strengthening water conservation measures in new and existing development. The Plan identifies several strategies to ensure that water is managed efficiently, sustainably, and equitably. The City will move forward with the water main replacement program; continue to develop cost effective strategies to reduce water loss, leaks, and thefts; promote the Consumption Awareness Program to customers; and expand the Advanced Metering Infrastructure (AMI) network to replace more than 95% of existing reader systems and improve leak detection systems. The City will also further water conservation efforts by implementing a twice-per-week

outdoor watering restriction (outlined in the City's *Drought Contingency Plan*) and developing an incentive program for homeowners, renters, businesses, and wholesale customers to help reduce overall water demand. The details for the watering restriction will be developed to ensure the right policies and penalties are in place. Tied to the Incentives for Green Development program, water conservation incentives will be developed through stakeholder coordination to understand the key drivers for residential, businesses, and commercial properties. Potential options include rebates, audits, and an expansion of the Property-Assessed Clean Energy (PACE) program. Many regional partners will be consulted, including Houston water users like local jurisdictions, wholesale customers, and individual users, as well as any relevant state agencies.

33.4 Develop a comprehensive stormwater and urban runoff master plan.

The City will develop a stormwater and urban runoff master plan based on Harris County Flood Control District (HCFCD) analyses of watersheds that are currently underway. The master plan will identify areas of inundation during various rainfall events based on the recent updated rainfall data from NOAA's Atlas 14. This will serve as the basis for major investments in local drainage improvements. By developing a comprehensive model of the entire city, Houston can better identify significant strains on the stormwater system and overall watersheds. The City can evaluate cascading impacts to overburdened infrastructure networks to determine the most appropriate and feasible technical solutions, including green infrastructure, that will improve the level of protection and modernize Houston's stormwater network. The City will also focus on understanding the impacts of site-specific urban runoff from a water quality perspective, to develop both preventative policy and treatment strategies to address pollution. For the plan to be effective in the long-run, the efforts to develop a stormwater plan must be integrated with the One Water plan and take into consideration projections offered by the climate impact assessment.



LOS ANGELES, CALIFORNIA, UNITED STATES

ONE WATER LA 2040 PLAN

The *One Water LA 2040 Plan* is a collaborative effort to develop an integrated framework for managing the city's watersheds, water resources, and water facilities in an environmentally, economically, and socially beneficial manner. *One Water LA* used the Environmental Protection Agency's Climate Resilience Evaluation and Awareness Tool (CREAT) to identify that approximately 50% of the city's stormwater and wastewater infrastructure components are vulnerable to various climate risks. An additional 10% capital investment would help the City avoid 90% of future expenses and costs resulting from climate-related impacts. This process identified a number of recommendations that can be applied to infrastructure citywide. (Excerpt from *Resilient Los Angeles*, p. 88)



GOAL 11

WE WILL MODERNIZE HOUSTON'S INFRASTRUCTURE TO ADDRESS THE CHALLENGES OF THE FUTURE.

Infrastructure is the business of city government—from planning to construction to maintenance. Our infrastructure is essential to every aspect of our lives. Houston's economy depends on the effective and efficient movement of goods and people and delivery of utilities and services. Likewise, Houstonians' safety is inextricably linked to our infrastructure's ability to function in an emergency.

Routine maintenance is essential to maximizing the functionality and value of our investments, but these activities are often underfunded and deferred. As climate change leads to more extreme weather events, we must adapt our infrastructure and maintenance programs to meet higher performance standards, better withstand new pressures, and be climate ready.

On the heels of Hurricane Harvey, Houston is at a pivotal moment. Never before have the importance and shortcomings of our infrastructure been so apparent. In the coming years, we have a once-in-a-generation opportunity to transform our infrastructure with billions of federal, state, and local dollars. To build Houston forward, we can leverage the ongoing implementation of the *Houston Complete Streets and Transportation Plan*. We must embrace and integrate green stormwater infrastructure solutions, codify resilient building standards, forge strategic public-private partnerships to improve maintenance practices, and better manage our resources and waste. Taken together, these steps can modernize our infrastructure to cope with the future challenges of climate change.



Complete 100 new green stormwater infrastructure projects by 2025.

34 INTEGRATE GREEN STORMWATER INFRASTRUCTURE INTO HOUSTON'S BUILT ENVIRONMENT.

Create a multifaceted green stormwater infrastructure (GSI) program across private and public projects in order to mimic natural water flow conditions, minimize localized urban flooding, improve stormwater quality, and maximize co-benefits such as urban heat island effect reduction, neighborhood beautification, and improved air quality.

GSI improves the adaptability of our overall system, bringing additional benefits to all communities as a result. How we integrate GSI within our existing traditional stormwater systems will define how and whether our city can learn to live with and without water, as we deal with more intense but intermittent rain events as well as droughts. A GSI program will integrate nature into our built environment to reduce flooding, preserve green spaces, improve water and air quality, tackle extreme heat, and bring new investments into communities that need them the most.

SHOCKS/STRESSES



TIMEFRAME



Medium Term (2030)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HPB / TIRZs / GILE / Conservation Food Mitigation Working Group / Trees for Houston / Scenic Houston / Environment Texas / TNC / Houston Land and Water Sustainability Forum / Redevelopment and Drainage Task Force / Philanthropy / Academic Institutions / Developers / Financial Institutions / Professional Associations / Private Sector

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



34.1 Advance comprehensive construction and maintenance of green stormwater infrastructure.

The City will showcase GSI techniques via design, construction, and maintenance of demonstration projects that will serve as examples to the broader Houston community. These projects could include green roofs, permeable pavement and Habiturf, rain gardens and bioswales, and rainwater capture systems that could be placed on public or private property. The demonstration projects will highlight stormwater benefits as well as climate readiness and community health. Potential projects will be identified within the most vulnerable areas of Houston and should leverage ongoing efforts through the Complete Communities program, recovery programs, the City's planned stormwater improvement and maintenance projects, and private development and redevelopment projects. The City will form a cross-departmental green infrastructure team that will identify and evaluate these opportunities for collaboration and drive their implementation.

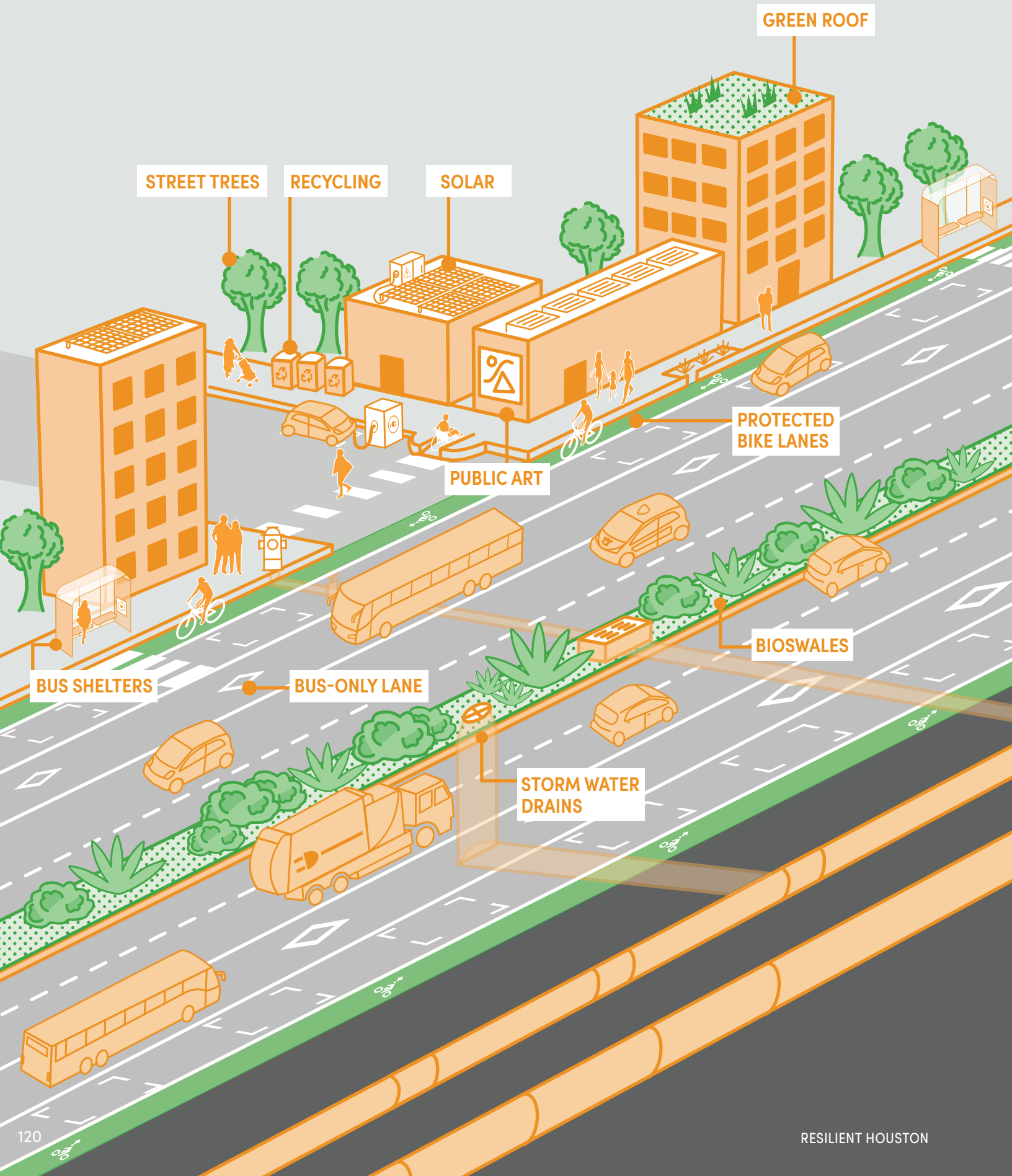
34.2 Build capacity for the design, construction, and maintenance of green stormwater infrastructure.

The City will train planning, design, construction, and maintenance personnel on the specific requirements for implementation of green infrastructure. The City will develop a training and education program that highlights the benefits of these solutions while providing the appropriate tools and resources to City personnel to design, construct, and maintain these systems. The City will leverage expertise from other cities and regions across the U.S. and incorporate these practices into its training program. Houston will also work closely with Harris County to exchange knowledge, best practices, and training materials. City personnel will understand the lifecycle impacts of projects, including improving operational inefficiencies, materials procurement, and waste management. The City will also evaluate the appropriate compensation for workers who acquire specialized skills in GSI implementation.

34.3 Apply a resilience quotient to green stormwater infrastructure projects.

Beyond demonstration projects, GSI implementation at scale will need to have a place-based strategy. According to the implementation of Sub-action 58.3, the locations for GSI must be determined with an equity lens to ensure that all neighborhoods benefit from this infrastructure. Public GSI projects should consider stormwater management needs, but also impacts on neighborhood economic development and quality of life. A team of internal and external stakeholders will be assembled to determine the specific criteria for ranking GSI projects while hydrologic analyses will be used to understand the best locations for stormwater benefits. These evaluation criteria would then be used in the decision-making processes for GSI project selection to develop the resilience quotient for GSI housing and infrastructure projects. A higher score would indicate a higher project viability.

RESILIENT ROADS



35 EQUITABLY ADVANCE COMPLETE STREETS IMPLEMENTATION TO BUILD RESILIENT ROADS.

Update the City's *Infrastructure Design Manual* and other applicable policies to advance resilience objectives.

A "complete street" is defined as a public roadway that takes into account all users, including people who are driving or riding in cars, using mass transit, riding bikes, walking, using wheelchairs, driving or riding in trucks, driving or being transported by emergency vehicles, and those being served at their residence or property by other users. Complete streets will integrate infrastructure requirements to keep people safe while highlighting additional benefits that will help transform communities, drive economic development, and shift the focus to people-centric neighborhoods and away from car-centric ones. Complete streets in Houston also incorporate drainage requirements and flood mitigation.

SHOCKS/STRESSES



TIMEFRAME



Long Term (2050)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / METRO / TxDOT / TIRZs / Management Districts / National Complete Streets Coalition / Community Organizations / LINK Houston / Bike Houston / Neighborhood Organizations

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



35.1 Build resilient roads.

The City of Houston has more than 6,200 miles of roads that have been designed primarily for vehicle circulation. In extreme precipitation and flooding events, many of these streets have been designed to carry water temporarily to keep other assets from flooding. This City infrastructure is susceptible to several shocks and stresses that accelerate its aging process, including flooding and extreme heat. Our roads also play a critical role in improving safety, accessibility, and equity for Houstonians. The City and its mobility partners will update the City's *Infrastructure Design Manual* and other applicable policies to increase the overall resilience of our roads to serve multi-modal purposes; adapt to climate change; and improve safety, accessibility, and equity.

35.2 Explore adding a "dig once" policy to existing street cut requirements.

The City will evaluate the feasibility of a "dig once" policy for all major infrastructure programs, including roads, railways, pipelines, utilities, energy distribution, and stormwater. The objective of dig once is to leverage ongoing infrastructure programs to install an underground fiber link when building or renovations occur. Dig once policies will lower the cost of broadband deployment by providing internet companies access to State- or City-owned rights-of-way. This is complemented by the mandatory installation of conduit for fiber-optic cable during road construction or by allowing qualified broadband deployments to be installed during construction projects. A tailored dig once policy for Houston will help bridge the digital divide as neighborhoods prioritized for infrastructure repairs receive the benefit of broadband.

35.3 Coordinate complete streets investments with Complete Communities.

The City will coordinate the investments in complete streets with goals set forth by Complete Communities program and neighborhood Action Plans. The goal of complete streets is to deliver walkable and bike-friendly neighborhoods with amenities like trees, landscaping, and public art. Streets that are safe, accessible, and convenient to use by all Houstonians, regardless of mode, speaks to the heart of providing access to quality services—the goal of Complete Communities' neighborhood approach.

36 ADVANCE AND MODERNIZE BUILDING CODES AND STANDARDS.

Ensure that our building codes and standards are up to date and reflect the latest resilient building methods, technologies, and materials.

Building codes—and their consistent and timely updating and enforcement—ensure the health and safety of buildings, their functions, and the communities they serve. Adopting a standard code review process that follows the same cycle as the International Code Council (ICC), which issues the International Building Codes (IBC), the City's model codes, allows the City to keep up with building practices that are inherently more resilient and adaptive and have a greater focus on advances in building sciences. Following the ICC's lead and creating benchmarks for building beyond conventional minimum standards will significantly increase the resilience of our communities by mitigating the damages caused by disasters.

SHOCKS/STRESSES



TIMEFRAME



Medium Term (2030)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / Professional Organizations / Private Sector / Redevelopment and Drainage Task Force / Community Organizations

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



36.1 Comprehensively review and update current building codes.

The City will conduct a comprehensive review of its building codes and standards—currently based on the 2012 ICC model code—and work toward adopting the 2021 ICC model codes by 2025. The City will seek federal recovery and mitigation funding to identify opportunities for improvement in the current building codes with a specific focus on safety and resilience. As part of this process, the City will engage key stakeholders, such as City departments, professional associations, contractors, architects and engineers, academic institutions, and the public. Using the IBC as a guide, the City will revise existing codes and develop new codes where necessary that integrate resilience standards and practices that create stronger buildings, infrastructure, and communities.

36.2 Adopt a minimum five-year update frequency for building codes.

By regularly reviewing and upgrading building codes, the City will ensure the latest resilient building products and practices are adopted and applied to Houston's buildings. This process will also encourage the private sector to keep up with the latest industry best practices, focusing on new technologies, materials, and methods. A minimum five-year review cycle frequency also allows for these practices to be incorporated into the next generation of buildings with enough time for performance evaluation reviews. Regular, incremental improvements will help us build better, smarter buildings.

36.3 Review and amend lot-size and coverage-area requirements for subdivisions.

The City will amend the subdivision development requirements in Chapter 42 of the City's Code of Ordinances, including changing lot-size and coverage-area requirements, to require a permeable-surface ratio instead of a minimum-square-footage requirement. With these amendments, the City will allow for high-density developments while also accounting for more suitable permeable surface area. Furthermore, by amending the building-footprint requirement to include driveways, sidewalks, patios, and other amenities, the City will create opportunities for more permeable surfaces through a ratio requirement. The review of these requirements can help identify opportunities to integrate rules that are more conducive to more thoughtful development that fits the different needs of communities around Houston.

36.4 Review and amend building elevation requirements for structures outside of the regulatory floodplain.

The City will conduct additional modeling to understand where flooding occurs inside and outside of the floodplain. A single focus on regulatory floodplains misses the potential for mitigating widespread losses. While one in five homes built since Harvey have been built in the floodplain, more than 60% of the homes flooded during Harvey were outside of the regulatory floodplain. This demonstrates the importance of using both up-to-date floodplain data as well as understanding where and why flooding occurs outside of the regulatory floodplain.

HCFCD is moving forward with a modeling, assessment, and awareness project (MAAPnext) to provide a better understanding of flood risk in Houston, including unmapped urban flooding. The results will inform policy makers and decision makers on appropriate elevation levels required to reduce risk to Houstonians and their homes.

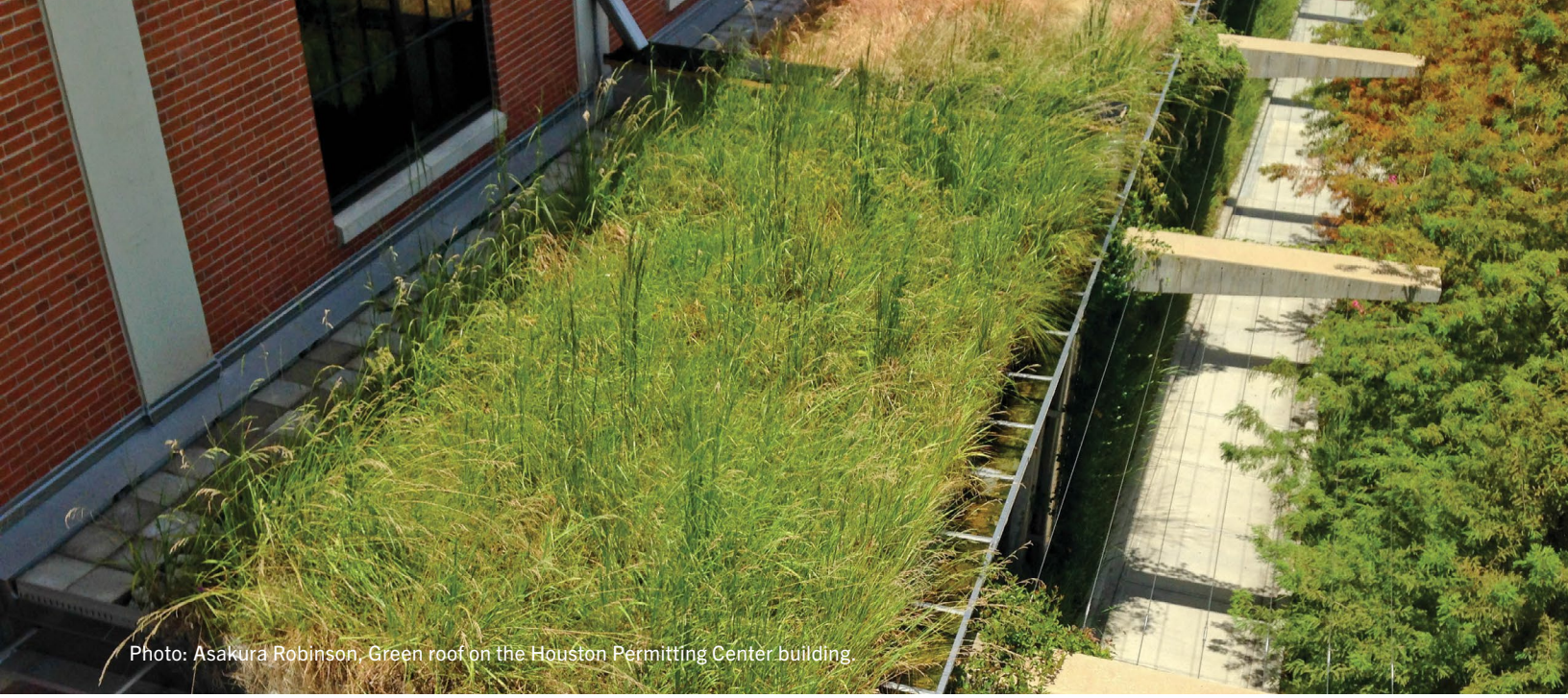


Photo: Asakura Robinson, Green roof on the Houston Permitting Center building.

The City will work with stakeholders and subject-matter experts to develop recommendations for minimum building elevations for structures that are outside of the existing floodplain. A recent update to Chapter 19 of the City Code requires buildings be elevated at least two feet above the 500-year base flood elevation. This group will continue to study challenges and opportunities of implementing the Chapter 19 requirements in low-income communities. Elevating damaged homes two feet above the 500-year base flood elevation disproportionately impacts communities with lower property values, as home elevation costs can often exceed the value of the structure. Without a proper mechanism to defray costs in these communities, the cost of elevation is passed through to the homeowner. The City will work with these communities, assisted by academic and philanthropic partners, to identify potential next steps for these areas.

36.5 Adopt resilient building criteria for City-sponsored housing recovery and capital improvement projects.

The development and full adoption of new resilient building criteria and standards can be a lengthy process. However, the City has a unique opportunity to take advantage of ongoing Harvey recovery efforts, bridging the gap between the City's current design standards and future modernized building codes. Multiple building typologies, including multi-family, single family, mixed use, and office, are part of current City post-Harvey recovery programs, and can demonstrate the benefit of resilient building practices. These programs will establish a baseline to track future benefits of today's resilient designs. Through these efforts, the City will ensure that recovery is preparing Houstonians for future storm events and incorporating long-term resilience to build Houston forward.

36.6 Identify additional critical and essential facilities for fortification.

The City will identify critical and essential facilities, including hospitals, fire and police stations, senior housing, and daycares, and develop a strategy for fortifying them. Although mitigating flooding is a priority, critical and essential facilities will also need to mitigate losses of power through microgrids, rainwater harvesting, and other self-sustaining strategies to prevent disruption of operation for weeks after an event. The City will work with various partners to identify critical facilities and their systems and equipment that need to be protected.

36.7 Review and amend watershed-based regulations for detention and drainage requirements.

The City will review current detention and drainage regulations and requirements in the *Infrastructure Design Manual* to ensure that they promote watershed-based planning for detention and storage. Taking recent changes to rainfall data into account, existing detention calculations should be reviewed to incorporate regional and downstream impacts. The City will continue to coordinate with HCFCD to evaluate the effectiveness of basin development at a regional scale. Rather than require each new development to incorporate detention, a basin development factor looks at the basin as a whole, maximizing detention in a defined area that supports the whole neighborhood. The City will advance the proposals from the Living with Water Workshop and evaluate whether a watershed-approach to detention is feasible and replicable in all Houston neighborhoods.

Implementing these proposals would require the creation of a program for fees in lieu of site-specific detention, proposed by the Redevelopment and Drainage Task Force, which could promote neighborhood storage. This sub-regional detention program could be supported through modifications to the existing Developer Participation Contract program or other similar changes to policy. The City will identify locations based on hydrology and new development areas; create criteria on how to manage neighborhood detention (e.g. pocket parks, detention ponds, wetlands, underground detention) and how developers can "buy into" a detention program; prepare a pilot program to test out the fee-in-lieu program; update the *Infrastructure Design Manual* to include specific guidance on this program and where it applies; and build out the City's administrative capacity to implement the program.

37 ADVANCE AND MODERNIZE HOUSTON'S INTEGRATED RESOURCE RECOVERY MANAGEMENT.

Enhance Houston's environment, encourage reduced per-capita disposal, and ensure long-term disposal capacity through Houston's solid waste management program.

The lifecycle of any product has three stages: upstream, midstream, and downstream. Upstream refers to the manufacturing of the product as well as its packaging. Midstream focuses on the longevity of the product, including the reuse and repurposing of products. Downstream focuses on recovery, including recycling or energy recovery. Local governments have the largest impact on the downstream stage of a product's lifecycle because of their role in waste and recycling systems. However, local governments can, to some degree, influence the upstream and midstream segments of a product's lifecycle, before the materials arrive at a local government facility, by promoting waste prevention, reduction, and reuse as well as leading by example through purchasing policies.

SHOCKS/STRESSES



TIMEFRAME



Medium Term (2030)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / Private Sector / Housing Organizations / Community Organizations / Recycling Facilities / Academic Institutions

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



37.1 Increase long-term landfill sustainability.

The City will ensure that waste is properly addressed and that the long-term plan is one that maintains the environmental health of Houston and Houstonians. A sustainable landfill can be described as a technique, such as a bioreactor landfill or repository, or as a long-term goal of managing for acceptable environmental risk. Ultimately, a sustainable landfill safely assimilates the waste materials deposited into the surrounding environment in such a way as to minimize the environmental impact. Overall, the City generates approximately 4.2 million tons of municipal solid waste (MSW) per year. By 2040, with no major changes to City policies or programs, this is anticipated to increase to 5.4 million tons per year. Most of the City's waste currently goes to the McCarty Road Landfill. This facility has between 10 and 14 years of remaining capacity. Securing new capacity can take approximately 15 years to site, permit and construct.

37.2 Develop a cost recovery plan for waste.

The financial performance of waste management is key to maximizing service capacity. The City should develop a cost recovery plan to pay for increased demand in services as Houston grows in population and determine the best approach to keep these services financially sustainable. This plan will analyze the costs of labor, vehicles, fuel, vehicle maintenance, and facility operations, and make critical decisions that will allow the City to collectively recover a portion of the Solid Waste Management Department's overall costs associated with service. The amount or percentage of the cost recovery does not have to be specifically tied to the direct or indirect costs to service a customer, but rather to the Solid Waste Management Department's overall applicable regulatory costs for all customers.

37.3 Increase multi-family and commercial recycling.

A comprehensive multi-family recycling program can reduce landfill waste and reduce the City's disposal costs realized from the diversion of recyclable materials. Approximately 23% of U.S. households living in buildings with 10 or more dwelling units have access to recycling services, according to a study by the U.S. Environmental Protection Agency (EPA). In Houston, the City's curbside recycling collection service is limited to apartment complexes containing eight or fewer units. The commercial and multi-family sectors account for 80% of Houston's current 4.2 million tons of waste deposited in landfills. These sectors will account for similar percentages as the total amount of landfill waste is expected to increase to 5.4 million tons.

37.4 Expand capacity for waste reduction through entrepreneurship.

There are between 150 and 200 businesses in Houston that provide recycling services for materials including paper, metals, plastics, glass, organics, electronics, tires, shingles, used oil, and construction and demolition material. Businesses that only accept source separated materials, such as scrap dealers, are not required to secure a Texas Commission on Environmental Quality (TCEQ) authorization. However, facilities that separate recyclable materials from an MSW stream must be authorized by TCEQ. Only 41 of the aforementioned businesses are authorized recycling facilities.

37.5 Improve and expand the *Emergency Debris Removal Plan*.

If appropriately separated, some disaster debris, including uncontaminated and untreated wood and vegetation, can be diverted from the landfill. In the aftermath of Hurricane Ike, a storm defined by high sustained winds, more than 90% of all debris could have been diverted, because it consisted of tree limbs and other vegetative debris. Flooded debris is much more challenging to handle and presents opportunities for the private sector; some businesses in Houston already accept and dispose of hard-to-handle materials like construction and demolition material. Though emergency debris removal is challenging, Houston should develop improved practices and technologies for post-disaster waste management. The City can also codify requirements for new construction and redevelopment projects to include recycled materials, potentially increasing consumer demand for these materials.



WASHINGTON, D.C., UNITED STATES

DISTRICT STORMWATER

Washington, D.C.'s new stormwater regulations mandate that new developments manage four times more stormwater than previously required. The regulations allow up to 50% of the requirement to be achieved offsite through the acquisition of Stormwater Retention Credits (SRCs) through a marketplace managed by the D.C. Department of Energy & Environment. In 2016, Prudential invested $1.7 million in District Stormwater, a wholly-owned subsidiary of The Nature Conservancy, to assist developers and land owners with compliance with the new stormwater regulations. District Stormwater finances, designs, installs, and maintains green stormwater infrastructure projects that generate D.C. government-certified SRCs. These stormwater management projects are helping D.C. increase the number of green infrastructure projects that also improve beautification, cooling effects for urban heat islands, wildlife habitat, and community health and wellness.

38 INCREASE PARTNERSHIPS THAT CREATE AND INCENTIVIZE INFRASTRUCTURE MAINTENANCE.

Prioritize maintenance activities and enhance maintenance programs to ensure assets and systems are reliable.

Houston's infrastructure is critical to the functioning of our growing city, supporting our economy and ensuring reliable access to goods and services. Yet, this infrastructure is currently in need of significant repair, rehabilitation, and investment. Many systems, including our roads, sewer systems, and natural infrastructure, have deferred maintenance activities, impacting their reliability and lifespan. These activities are also typically underfunded. This initiative aims to enhance maintenance activities for all assets to allow for better coordination between agencies. It brings various partners together to find innovative approaches and leverage resources to address the maintenance and operations challenges that the City faces. Maintenance will need to become a part of the planning process from the earliest phases, rather than an afterthought. This will help extend the life of our current assets, improve the reliability of our systems, obtain the highest level of performance for the least cost, and alleviate various stresses caused by aging infrastructure.

SHOCKS/STRESSES



TIMEFRAME



Medium Term (2030)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HCFCD / Trees for Houston / Conservation Flood Mitigation Working Group / KHB / Community Organizations / Neighborhoods

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



38.1 Conduct an accurate asset inventory and evaluate maintenance cycles.

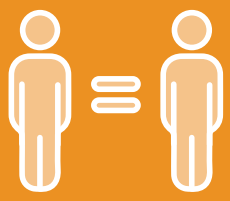
The City will prepare an asset inventory and conduct an assessment of maintenance status for all assets within city limits. Houston Water has advanced a Strategic Asset Management Program that will serve to identify the reliability and integrity of current water and waste assets. This process will allow the City to be more proactive and prioritize maintenance through a data-driven process. A similar process will be used to obtain an accurate inventory of all stormwater assets. This will help the City become more proactive and shift away from providing services based on a complaint-driven process. The same methodology can be applied across all departments to inventory assets including buildings, parks, streets, and bridges. Updating the information on the condition of our assets will help extend their useful life to continue to provide uninterrupted services to Houstonians.

38.2 Streamline asset management between the City and Harris County Flood Control District to improve drainage maintenance.

Building on 25.7, Houston will continue to exchange assets with Harris County Flood Control District (HCFCD), where the City will take on ownership of all storm sewers while HCFCD will accept all channels. Although this program is already underway, it only addresses channels where there are existing easements in place and omits channels where ownership is unknown or there is overlapping private property. The City and HCFCD will continue to develop strategies to reclaim rights-of-way and transfer ownership to the agencies that can leverage their expertise to best maintain each asset. The City will couple these efforts with education and enforcement campaigns to reclaim rights-of-way and remove encroachments.

38.3 Partner to enhance maintenance capacity of neighborhood assets.

The City will strengthen partnerships with local agencies, non-profit organizations, and communities to enhance the maintenance capacity of neighborhood assets. The City will work with partners to increase maintenance, keep drainage ditches clear and free of debris, and promote prairie restoration. The City will also lead efforts to understand how to better collaborate with partners to maintain neighborhood access including leveraging resources and exploring potential equipment sharing opportunities for maintenance vehicles that are more difficult to procure. Additionally, the City will continue to empower Houstonians to play a role in keeping our streets and waterways clean and free of trash and debris. Revamping the Adopt-a-Drain and Adopt-a-Ditch programs can help leverage neighborhood resources and provides an educational opportunity on the importance of maintenance for the longevity of our City's infrastructure.



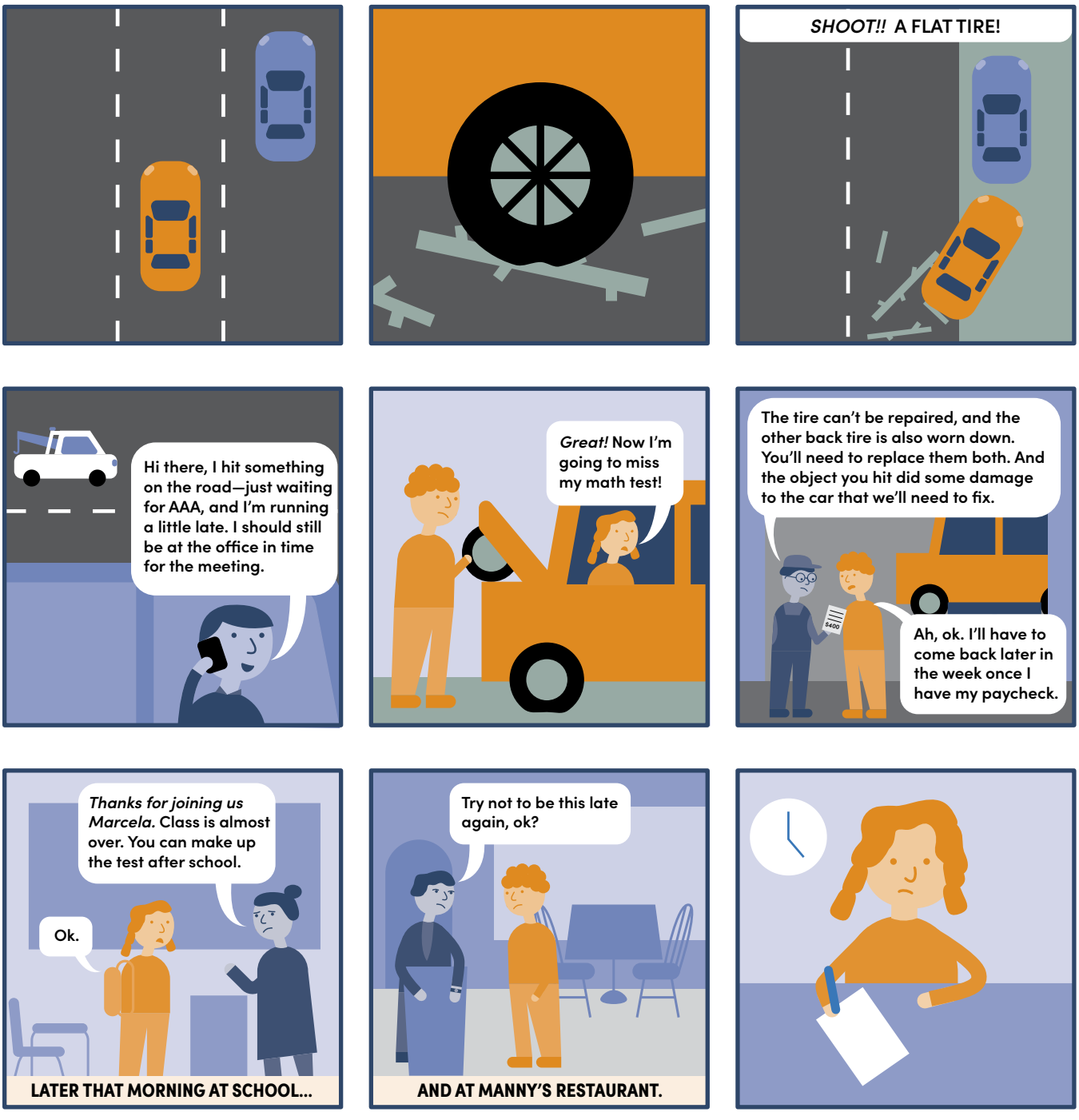
GOAL 12

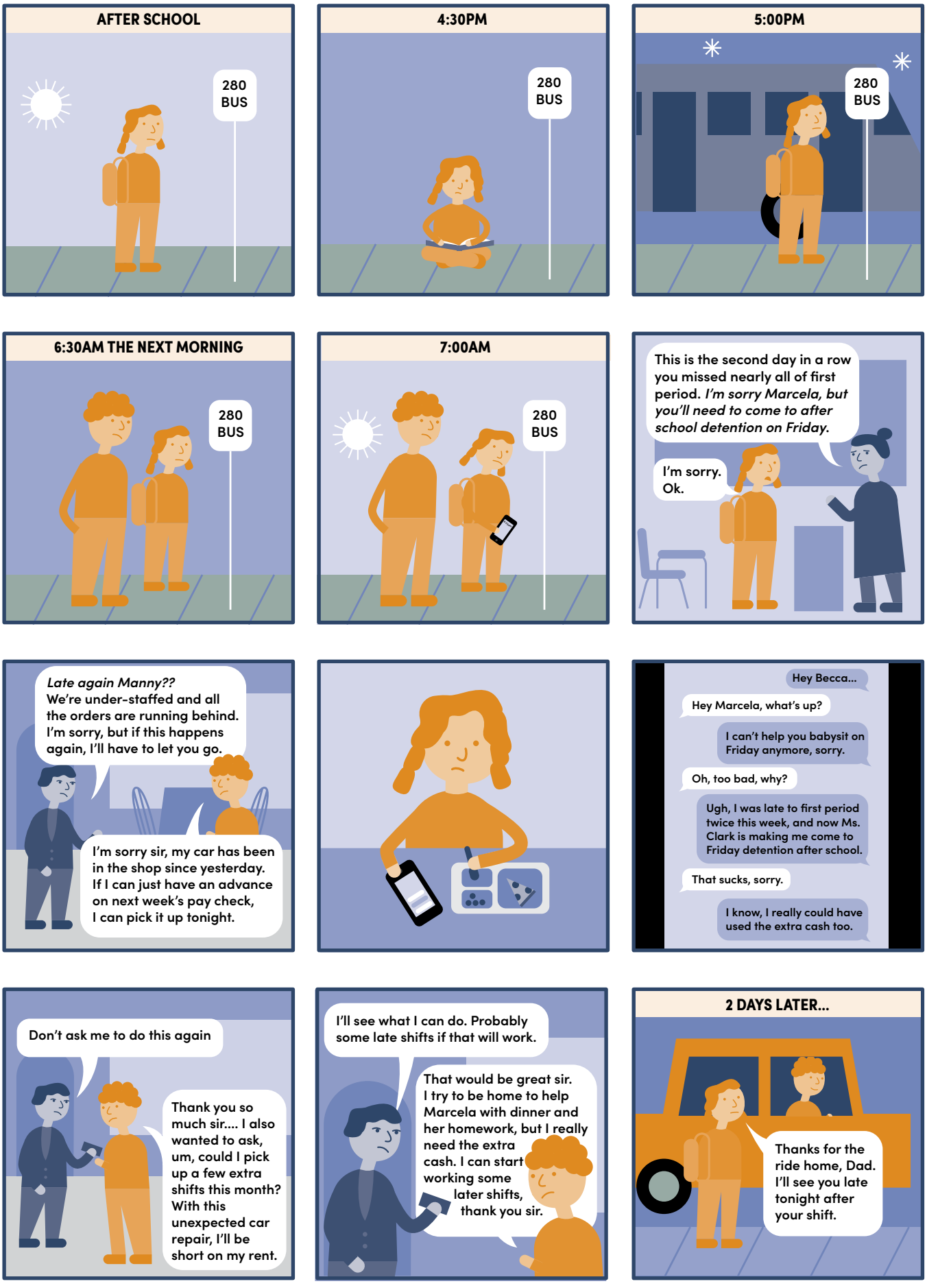
WE WILL ADVANCE EQUITY AND INCLUSION FOR ALL.

Houston refuses to be a "tale of two cities." We take pride in our diversity and multiculturalism. We also acknowledge our disparities and strive to narrow them. Houston prioritizes equity as a driving principle of our core resilience values. The City has an opportunity to demonstrate a model for the region that promotes shifts in policy—from equality to equity—impacting millions of lives. Houston launched the Complete Communities initiative in 2017, a program focused on transforming historically under-resourced communities by developing solutions tailored to each neighborhood in partnership with residents and leaders. The goal is to expand access to quality affordable homes, jobs, parks, improved streets and sidewalks, grocery and retail stores, good schools, and transit options. Through these initiatives, Houston can facilitate a broader conversations on equity and inclusion and take active steps to measure disparities and be held accountable for acting to increase equitable outcomes for all Houstonians.

12 **Eliminate geographic disparities in life expectancy by 2050.**

MANNY AND MARCELA:
A STORY ABOUT THE CASCADING EFFECTS OF INEQUITY




AFTER SCHOOL
280 BUS
4:30PM
280 BUS
5:00PM
280 BUS
6:30AM THE NEXT MORNING
280 BUS
7:00AM
280 BUS
This is the second day in a row you missed nearly all of first period. *I'm sorry Marcela, but you'll need to come to after school detention on Friday.*
I'm sorry. Ok.
Late again Manny?? We're under-staffed and all the orders are running behind. I'm sorry, but if this happens again, I'll have to let you go.
I'm sorry sir, my car has been in the shop since yesterday. If I can just have an advance on next week's pay check, I can pick it up tonight.
Hey Becca...
Hey Marcela, what's up?
I can't help you babysit on Friday anymore, sorry.
Oh, too bad, why?
Ugh, I was late to first period twice this week, and now Ms. Clark is making me come to Friday detention after school.
That sucks, sorry.
I know, I really could have used the extra cash too.
Don't ask me to do this again
Thank you so much sir.... I also wanted to ask, um, could I pick up a few extra shifts this month? With this unexpected car repair, I'll be short on my rent.
I'll see what I can do. Probably some late shifts if that will work.
That would be great sir. I try to be home to help Marcela with dinner and her homework, but I really need the extra cash. I can start working some later shifts, thank you sir.
2 DAYS LATER...
Thanks for the ride home, Dad. I'll see you late tonight after your shift.

39 PROMOTE EQUITY THROUGH CITYWIDE POLICIES AND PROGRAMS.

Improve equitable outcomes for Houstonians by developing and institutionalizing equity trainings, assessing equity indicators, and creating an equity framework that will guide future citywide policies and programs.

Houstonians do not share equal access to opportunity and do not experience the city and its systems in the same ways. Some areas have experienced disinvestment over generations. Some Houstonians have been discriminated against based on who they are, where they live, or what language they speak. Enshrining equity and equitable outcomes in all policies and programs is an essential step toward addressing root causes of inequity, including historical disinvestment and disproportionate negative impacts for communities of color and our most vulnerable residents. The City will build upon existing efforts, including the Mayoral Task Force on Equity's September 2017 report, to acknowledge, define, and understand the full range of equity challenges confronting Houston. Critically, this will include reflection on the role that public policy at the local, state, and federal level has played in the proliferation of inequities. By documenting gaps and inequities, the City can create targeted interventions and the set a range of equity goals across departments. A robust community-informed approach to creating equitable policies will mitigate negative impacts, spread benefits, and ensure that policies are flexible enough to adapt to future needs.

SHOCKS/STRESSES



TIMEFRAME



Immediate (2020)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / GARE / Academic Institutions / Kinder Institute / Community organizations / Houston's Boards and Commissions / Houstonians

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



39.1 Increase equity training opportunities.

In 2020, the Mayor's Office will become a member of the Governmental Association for Racial Equity (GARE), using and integrating GARE's training and resources into existing and future City programs co-led by the Mayor's Office for Resilience, Mayor's Office of Complete Communities, and Department of Economic Opportunity. In early 2020, the City of Houston will pilot formal racial equity trainings with executive staff and department directors. The City will work with other Texas municipalities that are members of GARE to learn and share best practices in integrating equity—specifically racial equity—into government programs and practices. This will build upon existing efforts to train City employees on implicit bias that is already part of some City departments' practices. For example, the Houston Police Department has been holding implicit bias trainings since 2006 and the Houston Health Department began implicit bias training for their senior staff in 2016.

39.2 Develop and adopt an equity atlas and framework.

The City will work with internal and external partners to develop an equity atlas and framework that compiles existing data and maps that comprehensively illustrate disparities in health, the economy, infrastructure, climate and the environment, safety, and education that are accessible to City departments and partner organizations and agencies. This data will be used to develop an equity framework that builds on existing efforts, most notably Complete Communities and 50/50 Park Partners, to document a clear approach to defining and identifying opportunities for equity in Houston and assessing and allocating resources toward underinvested community assets. The framework will also include clear targets and outcomes that will inform next steps in creating an equity indicators program and tracking system and developing a process for policy review.

39.3 Establish an equity indicators program and tracking system.

The next step in addressing the wide range of equity concerns in Houston is to measure and document what the issues are and who they are impacting. This effort will start with a community engagement process, including multilingual community dialogues, to identify key issue areas and disparities raised by Houstonians. This will then inform a thorough research effort to understand the full scope of equity challenges in the city. The program will be recurring so that progress can be tracked and reported over time through an annual report card or a standing indicators website. The City will enlist local and national research institutions in the execution of the data collection and analysis. The indicators program will also leverage community engagement on a rolling basis to ensure that changes in the most pressing issue areas are captured.

39.4 Create an equitable policy analysis approach.

The City will lead a policy review to identify existing City policies and programs that reinforce historical disparities and limit socio-economic opportunities for some Houstonians, particularly vulnerable populations and historically disinvested neighborhoods. The City will also lead a cross-department effort to develop a process of reviewing the equity outcomes of new programs, policies, and City investments for vulnerable populations and historically disinvested neighborhoods. This approach will incorporate best practices from Boston, Seattle, and Dallas.

39.5 Further diversify Houston's boards and commissions.

The City of Houston has 150 boards and commissions with 1,500 separate volunteer positions from the Automotive Board to the Planning Commission. Currently, according to Texas Organizing Project research, appointees to local boards and commissions in the largest Texas cities are overwhelmingly men and overwhelmingly white. The City will ensure that Houstonians of different races and cultural backgrounds, those under 35 years of age, women, LGBTQ, immigrants, and other underrepresented communities actively serve as members on City of Houston boards, commissions, and task forces advising on issues directly related to their communities and issues affecting Houston more broadly. The Mayor's Office will begin to track and publish diversity statistics, so that the boards and commissions will reflect the diverse communities they serve. Increased participation on boards and commissions would give young people, immigrants, and communities of color a larger voice for their community and help guide policies set by boards, commissions, committees, councils, and various departments and elected officials.

DALLAS, TEXAS, UNITED STATES

DALLAS EQUITY INDICATORS

The Dallas Equity Indicators project was developed in collaboration with the City University of New York's Institute for State and Local Governance (CUNY ISLG) and the University of Texas at Dallas' Institute for Urban Policy Research (UTD IUPR) as a comprehensive tool to help Dallas understand and measure equity. The Equity Indicators tool is designed to measure disparities faced by marginalized or disadvantaged groups, such as people of color, immigrants, and individuals living in poverty, and whether those disparities are improving or worsening. Disparity is measured across six thematic areas: Economic Opportunity, Education, Housing and Neighborhood Quality, Justice and Government, Public Health, and Transportation and Infrastructure. From 2018 to 2019, the city's equity score increased from 38.75 to 39.77 (out of 100).

Equity Indicators have also been developed in Tulsa, Louisville, Oakland, St. Louis, Pittsburgh, and New York.



40 REACH ALL HOUSTONIANS THROUGH EQUITABLE COMMUNITY ENGAGEMENT.

Develop and adopt equitable community engagement practices to better reach all Houstonians.

The City will target outreach efforts to underrepresented groups and seek to remove barriers to participation, including language, socio-cultural, economic, or related barriers.

Equity-driven engagement should empower community members to help build healthier, more resilient communities and strengthen relationships between community and government. Public engagement processes do not always employ culturally competent strategies that reach everyday residents. Equitable engagement aims for participation that is representative of a community's geography, race and ethnicity, age, gender, and other demographic characteristics. A more comprehensively inclusive engagement process will produce better investments, stronger governance, and will strengthen bonds of trust between the City and its residents.

SHOCKS/STRESSES



TIMEFRAME



Immediate (2020)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / Academic Institutions / Community Organizations / VOAD / Philanthropy / Media / School Districts

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



40.1 Develop a sustainable model to ensure adequate resources for authentic community engagement.

The City will develop and adopt an equity-driven community engagement policy to create a standard for all City projects, plans, programs, and initiatives. The policy will identify the key components of an equitable engagement process and allocate resources to support consistent implementation across all departments. The City will work with partners to identify best practices in the areas of visual messaging, technology applications, and incentives for participation.

40.2 Grow the city's comprehensive language access program.

By any measure, Houston is staggeringly diverse: 1.6 million immigrants call this city home, 140 languages are spoken in Houston homes, 35% of Houstonians do not speak English well or at all, and almost 50% of our undocumented population and people with permanent residency status lack English proficiency. To address our language gaps and ensure that all Houstonians can thrive, the City will build on the existing comprehensive language access program to train all permanent and temporary City staff on the existing language access resources and develop disaster preparedness and resilience information in the top six languages spoken in the Houston area—targeted at a sixth-grade reading level—to increase access to information and improve the security of all residents. The program will also ensure that all departments, especially Houston's first responders, have a non-English media plan and maintain good relationships with non-English print, radio, and TV stations. The City will also partner with school districts to push out requests to sign up for alerts through the school call and text services, which include all families by default.

40.3 Enhance multilingual communication and engagement opportunities.

Our region's resilience is reliant on the success of its immigrant population. Without case management set up to serve our entire community, services are slower and less equitably provided. The Greater Houston area is the country's most diverse, requiring frontline government employees, non-profit professionals, and volunteers to understand how to work with multicultural populations and how to recognize and respond to a wide range of concerns that face such a diverse community. The City's ability to withstand shocks and stresses relies on our ability to build trust and communicate with residents. Dedicated case managers are critical to the long-term recovery and resilience efforts of any city (see Action 1.8). These case managers must be reflective of—and accountable to—the population they are working to serve. For instance, many individuals without legal status have been victims of violence and past trauma related to their migration story. When case management is oriented toward the most vulnerable Houstonians—those without legal status, those who do not speak English well, those without transportation, and those who have suffered complex trauma—then the system will also work for residents who do not face those challenges.



GOAL 13

WE WILL TRANSFORM CITY GOVERNMENT TO OPERATIONALIZE RESILIENCE AND BUILD TRUST.

The City must fundamentally transform the way it operates if it is to respond effectively to all Houstonians, especially its most vulnerable populations. Each City agency must take steps to become more responsive and transparent to establish trust among the people who call Houston home. Many of the policies, programs, and practices identified in the earlier Chapters should be integrated into citywide planning efforts and enshrined within the appropriate agencies that can be tasked with implementing and institutionalizing lasting change.

Integrating resilience principles and practices into everyday government operations and decision making will facilitate policies that prioritize our most vulnerable Houstonians, the places they live, and the systems they rely upon. Empowered with a greater understanding of the risks of climate change and existing initiatives and resources, Houstonians will become better prepared to cope with potential shocks and stresses. By taking the actions below, the City of Houston will become a better communicator, optimize City financing and operational capacity, and institutionalize equity through the process.



Appoint Department Resilience Officers in every City of Houston Department in 2020.

41 MAKE RESILIENCE A PERMANENT PART OF HOUSTON'S SYSTEMS AND SERVICES.

The City will institutionalize building resilience in all City departments and hold itself and its partners accountable for advancing resilience actions.

Proactively addressing the acute shocks and chronic stresses of today and tomorrow—especially in the face of increasing inequality, a changing climate, a transitioning economy, and a growing region—will require everyone's expertise, attention, and support. Given the increasing frequency and intensity of shocks we face and the magnitude of the challenges ahead, implementation must be both swift and coordinated while also incorporating strategic long-range planning for an uncertain future. The City of Houston will evolve the way it does business to support this work. City departments will be encouraged not to "stay in their lane" but rather "carpool" or "take transit," collaborating to deliver services that are greater than the sum of their parts. This approach will better address the complex challenges of the future with integrated and interdisciplinary solutions. The City will lead by example, use its convening power, and learn with and from partners to advance the implementation of *Resilient Houston* and other aligned research, policies, and programs.

SHOCKS/STRESSES



TIMEFRAME



Immediate (2020)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / Departmental Resilience Officers / Resilience Advisory Committee Members / Academic Institutions / Philanthropy / Private Sector / Community Organizations

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



41.1 Grow the Mayor's Office for Resilience to lead the implementation of *Resilient Houston*.

The Chief Resilience Officer will lead the implementation of *Resilient Houston*; foster partnerships that advance the City's resilience goals; and engage Houstonians in resilience-building actions that increase their preparedness, safety, and well-being and promote equity, security, and stewardship. The Office of Resilience will act as a delivery team, helping agencies overcome barriers to implementation, tracking implementation progress, and problem solving with partners for increased resilience outcomes.

41.2 Appoint resilience officers in every City department to coordinate resilience efforts.

Implementing *Resilient Houston* will require each of Houston's 23 City departments to innovate, collaborate, and plan for greater resilience outcomes. Each department director will appoint a Departmental Resilience Officer (DRO) to collaborate across City government. The Chief Resilience Officer will lead and coordinate with the DROs on implementation of *Resilient Houston* and the integration of resilience priorities and practices into departmental policies and programs. The DROs will receive additional training and support from the Mayor's Office of Resilience to work cross-departmentally to lead and communicate the City's resilience-building actions.

41.3 Track progress on the implementation of *Resilient Houston* through an annual report and a strategy update every five years.

Measuring, tracking, and communicating the progress and outcomes of *Resilient Houston* implementation will hold the City and its partners accountable for the targets and commitments set in the Strategy. An annual report and a strategy update every five years will also reinforce that building resilience must be a practice that is flexible and can be adapted to new data and emerging challenges and opportunities.

41.4 Develop and lead a resilience advisory committee.

To continue to adapt in the face of change and uncertainty, the City of Houston will need to consistently engage and work with partners. The City will form a resilience advisory committee to advise on implementation strategies and leverage allied and complementary efforts whenever possible. These partners will be committed to the advancement of the actions outlined in *Resilient Houston* as well as the advancement of Houston as a safe, strong, and equitable city and region.

42 PRIORITIZE RESILIENCE IN CITY BUDGETING, PROCUREMENT, AND CAPITAL IMPROVEMENTS.

Institutionalize resilience as a practice in the City budget, capital improvement projects, and procurement to streamline implementation of *Resilient Houston* and prioritize funding programs and projects that achieve multiple resilience benefits.

The City will look for opportunities to increase and leverage resilience funding for infrastructure, planning and programs, and engagement and outreach. And as the City budget process transitions to program-based budgeting over time, budget priorities that advance Houston's resilience goals will be highlighted and tracked. The City will also work with all City departments to identify programs and projects that advance resilience and will develop incentives for cross-departmental collaboration. By integrating resilience measures into the Capital Improvement Plan (CIP) process, the City will explore ways to monetize the value of co-benefits in the procurement process, using case studies from other cities with similar programs. The City will also work with partners to establish sustainable funding sources to support integrated holistic resilience measures, including increasing public-private partnerships, and state, federal, and philanthropic support to prepare for, mitigate, and adapt to Houston's most urgent resilience challenges.

SHOCKS/STRESSES

TIMEFRAME

Short Term (2025)

IMPLEMENTATION THEMES

IMPLEMENTATION PARTNERS

COH / Departmental Resilience Officers / Resilience Advisory Committee / Academic Institutions / Philanthropy

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



PORTO ALEGRE, BRAZIL

CEZAR BUSATTO LAW

A number of cities around the world are formalizing resilience through changes to city charters. In 2019, the City of Porto Alegre adopted the Cezar Busatto Law, named in honor of the city's first Chief Resilience Officer (CRO). CRO Cezar Busatto completed the resilience strategy in 2016 and passed away in 2018. The implementation of the resilience strategy, its goals and initiatives are now mandatory to all departments in the city government. Resilience will from now on be mainstreamed into future city planning.

43 LEVERAGE SMART CITY INVESTMENTS TO ADDRESS OUR MOST CRITICAL RESILIENCE CHALLENGES.

Lead transformative change in a digital age by prioritizing smart city investments to solve our most critical resilience challenges.

A smart city leverages data and emerging technologies to improve quality of life for residents, share information with the public, drive economic growth, increase safety, and build a more equitable and inclusive city. The Smart City Houston program will help Houston improve its disaster response and recovery systems by better integrating data between departments and City partners. The program will also advance equity by allowing better connectivity between the City and Houstonians. Smart City Houston will increase the effect of public and private sector investment; address risk related to data security, privacy, and interoperability; and improve Houston's image as a smart and resilient city.

Houston's *Smart City Charter* was developed in 2019 to serve as a unified framework for how Houston will lead and coordinate its smart and resilient city objectives to improve the overall quality of life for Houstonians. Four principles guide the integration and implementation of Greater Houston's smart cities initiatives: improve the safety and quality of life for residents, empower the public with shared information, drive sustainable economic growth, and build a more equitable and inclusive society.

As one example of smart city efforts supporting resilience priorities, Houston researchers have built flood detection sensors for light poles and elevated surfaces to transmit data and quickly alert the public of dangerous conditions. The sensors are currently being tested on the campus of Rice University with the goal to scale to areas with frequent localized street flooding. Data collected through these sensors will flow to TransStar, Houston's regional transportation hub.

Smart city technology can also support our efforts to improve transportation access, options, and quality. As Houston continues to expand METRO services and ridership, providing riders with real time arrival information is increasingly important. Through Smart City Houston, Microsoft and METRO will pilot Wi-Fi on public buses and light-rail with the goal of increasing the accuracy of Metro's GPS location services and arrival information, while also providing a service for riders.

SHOCKS/STRESSES

TIMEFRAME

Short Term (2025)

IMPLEMENTATION THEMES

IMPLEMENTATION PARTNERS

COH / Accenture / CenterPoint Energy / Center for Houston's Future / GHP / Harris County / Houston Exponential / Houston First / H-GAC / LDR / METRO / Station Houston / Academic Institutions / Private Sector / Community Organizations

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



44 ADVANCE OPEN DATA POLICIES.

Create platforms for open and accessible City and other public data to support public engagement, accountability, and government transparency in the region.

This action aims to improve the City of Houston's communication with Houstonians to rebuild trust, facilitate government accountability, and ensure access to crucial information, especially for the City's most vulnerable populations. An open data platform will serve as a conduit for ensuring all Houstonians have access to crucial information and a breakdown of the City budget. Increasing Houstonians' access to resilience and preparedness information can save lives, reduce danger and uncertainty, help Houstonians cope with stress, speed recovery, and establish a sense of safety and security. Creating an open data system also increases public access to information and creates opportunities for small businesses, non-profit organizations, and individuals to analyze existing conditions and develop innovative solutions to current problems.

SHOCKS/STRESSES



TIMEFRAME



Short Term (2025)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / Academic Institutions / Private Sector

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



44.1 Develop additional open data and mapping capabilities.

The City will analyze and expand upon its existing Open Data Portal to increase the data sets available, make data sets available on other platforms, and convert data sets to a map format, making it easier for the public to engage with government data. This accessibility supports transparency and illustrates to the public both how and where agencies are implementing infrastructure and resilience efforts. The City will work with the Office of Innovation to take an inventory of existing data and standardize their classification. The City will hire an Enterprise Data Officer to lead the development of the open data network. The City will then set up a schedule for the automatic update of existing open data sets and work with departments to identify new open data sets, coordinating with the Kinder Institute's Houston Community Data Connections and current public data portals. A critical component of this work will be up-to-date and accessible maps that share information about infrastructure, demographics, water and environment, jurisdictional boundaries, policies, and programs.

44.2 Create dashboards to show the status of City goals.

The City will work with partners to develop a performance dashboard template illustrating annual City goals and up-to-date metrics defining the progress toward these goals. An analysis of high priority issues for increased transparency will determine the areas of focus. This initiative will create a legible and transparent platform for residents and businesses to see quantifiable evidence of the City's progress toward its goals, where the City fell short, and any associated financial implications.

44.3 Coordinate and collaborate on a resilience data network.

The City of Houston will develop a collaborative network to expand and enhance the sharing of resilience data throughout the Gulf Coast region. Special focus will be on reaching our region's most vulnerable populations, including Houstonians with disabilities, poor and working-class Houstonians, and any other population most at risk during and after disasters. This action aims to establish a data network of partners from the non-profit, faith-based, and public sectors that work collaboratively to continuously identify and track vulnerable populations needing access to resilience information. The network will meet on a regular basis to develop and implement data protocols and strategies that expand and strengthen the communication between Houston's local government and the City's vulnerable communities about preparedness, recovery, and resilience efforts.



CHAPTER 5

INNOVATIVE & INTEGRATED REGION



GOAL 14 We will continue to invest in the region's diverse economy.



GOAL 15 We will increase regional transportation choice.



GOAL 16 We will manage our land and water resources from prairie to bay.



GOAL 17 We will enhance regional emergency preparedness and response.



GOAL 18 We will leverage existing and new investments and partnerships.



GOAL 14

WE WILL CONTINUE TO INVEST IN THE REGION'S DIVERSE ECONOMY.

From its central role in space exploration to growing some of the world's major energy sector corporations to the development of the largest medical complex in the world at Texas Medical Center, Greater Houston has a long and rich history at the forefront of American innovation, science, and business.

Greater Houston boasts a growing economy, diverse population, and innovation cluster assets across distinctive rural, suburban, urban, and coastal communities. Houston's 14 world-class regional higher-education institutions are home to more than 215,000 enrolled students, contributing to a skilled talent pool of more than 240,000 STEM workers and investing in innovative research.[49,50]

However, Houston was ranked 20th nationwide in preparedness for the digital economy, indicating that there is room for improvement.[51] Continued investment is required to solidify Houston as an interconnected and inclusive innovation ecosystem that continues to attract and retain top talent while supporting access to jobs and opportunities for Houstonians at all skill levels. Investment must be supported with collaborative partnerships across industries, academic institutions, startups, small businesses, and the non-profit and public sectors to ensure that our regional economy remains innovative and competitive for all Houstonians.



Attract or incubate 50 Energy 2.0 companies in Greater Houston by 2025.

45 LEVERAGE HOUSTON'S ENERGY CAPITAL ROLE TO LEAD INNOVATION IN THE GLOBAL ENERGY TRANSITION.

Lead long-term structural changes in global energy systems and use Houston's unique position to balance energy transition to greener and cleaner energy solutions with maintaining economic interests in the energy industry that contributes to regional prosperity.

A major part of Houston's economy is derived from upstream (offshore and shale oil and gas), midstream (gathering and pipelines), and downstream (refining and chemicals) fossil fuel activities. Houston has rapidly diversified its economy from energy through growth in sectors such as health care and professional services; the energy industry is anticipated to evolve considerably in its utilization of renewable sources and away from oil and gas consumption. If left unprepared, Houston risks losing its competitive edge in the global energy industry. Companies may relocate, resulting in a loss of jobs and an exodus of skilled employees. Houston is already well-positioned to lead the energy transition. Rather than think of this as a threat, we should consider this a golden opportunity to ensure Houston remains the global epicenter of the energy industry by setting a new standard for transitioning to renewable energy and the development of carbon management technologies. The co-benefits of leading the energy transition are significant. New renewable energy and carbon management technologies can be piloted and rolled out locally to help reduce our greenhouse gas emissions and improve air quality; new sectors of the energy industry less susceptible to the historic boom-bust cycle of global energy markets will help insulate Houston's economy from future recessions; and new jobs can create equitable employment opportunities for all Houstonians. Houston can leverage the energy transition to remain a leader in global energy through the following key sub-actions.

SHOCKS/STRESSES



TIMEFRAME



Long Term (2050)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HCJO / GHP / Center for Houston's Future / Shell / Wood Co-Lab Innovation Hub / Academic Institutions / National Laboratories / Energy Companies / Innovators / Professional Associations

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



45.1 Lead the energy transition.

Houston is the "oil and gas capital of the world," but as society undertakes the global energy transition, oil and gas will no longer be the predominant components of the global energy system. Renewables, energy storage, nature-based solutions, energy efficiency, carbon capture and storage, and distributed energy resources will all have a larger role in the evolving energy industry. For Houston to remain the "energy capital of the world," it must be a leader in all these fields. Houston will take actions to attract investment, talent, and innovation in cleaner, more efficient technologies and power alongside our continued attraction of talent and investment in the greater energy industry. Houston's strategy will aim to diversify our energy industry and leverage our academic and corporate institutions to attract future generations of energy innovators as also described in Houston's *Climate Action Plan*.

45.2 Host an energy transition scenario planning workshop with local partners.

To help position Houston to lead the global energy industry of the future, Shell has committed to facilitate an energy transition scenario planning workshop in 2020. This strategic planning exercise will bring together a broad array of key stakeholders to develop future scenarios to understand the potential local impacts and opportunities of global trends in energy consumption over time—away from a dependency on oil and gas and toward renewable sources. This exercise will provide government officials and business and community leaders with a suite of potential pathways Houston could take to sustain economic growth and maintain leadership in energy production through the global energy transition.

45.3 Conduct research to develop a competitive advantage strategy for energy transition and carbon management.

In coordination with the energy transition scenarios workshop, the City will work with partners to conduct additional research on how Houston can best keep its competitive advantage for energy transition and carbon management. Additional research will inform the City on actions that it can take to encourage energy transition and educate Houstonians on the steps that will need to be taken between 2020 and 2050 to meet global and local energy and climate targets.

45.4 Integrate renewable energy, energy storage, and cleaner, more efficient vehicles and infrastructure into Houston's built environment.

Key drivers of the global energy transition will be the electrification of systems and affordable storage of energy. To support innovation and growth in renewables and new energy technologies by local Houston businesses, the City will advance efforts to accommodate these trends within the built environment and continue to lead by example. New infrastructure systems will be designed to integrate and support renewable energy technologies, and existing infrastructure will be retrofitted where economically feasible. New building standards, for example, could require all new homes be pre-wired for electric vehicle charging—supported by tax incentives to drive the initiative. Other cities have implemented phased zero-emissions new building strategies to make all buildings carbon neutral. Houston will initiate a future-proofing infrastructure study in concert with state partners to develop new engineering and construction standards as well as legislative tools to help incentivize adoption and implementation.

We will work with partners to pilot energy transition technology for smart mobility and develop a return on investment (ROI) output that can accelerate multi-stakeholder collaboration across City agencies. We will also leverage the Wood Co-Lab Innovation Hub to promote and advance energy transitions for communities and academia.

PITTSBURGH, PENNSYLVANIA, UNITED STATES

ROADMAP FOR INCLUSIVE INNOVATION

Pittsburgh has made impressive strides to transform its economy and environment over the past 30 years, following the collapse of the domestic steel industry. Pittsburgh's economy today is bolstered by innovation-driven sectors like advanced manufacturing, clean tech, education, and health sciences. But not everyone has benefited equally from Pittsburgh's transformation. To continue to promote innovation and the incubation of new technologies and businesses while advancing equity priorities, the City of Pittsburgh developed the *Roadmap for Inclusive Innovation*. Specific action steps have been established to address the digital divide, empower City-to-citizen engagement, provide open data, improve internal City operations and capacity, advance the clean tech sector, and promote the local business environment. Pittsburgh held its first Inclusive Innovation Week in 2017 to celebrate, connect, and promote organizations, people, and partners who practice inclusive innovation.



46 INCUBATE, CONNECT, AND SUPPORT ESTABLISHED AND EMERGING INDUSTRIES.

Expand and strengthen Houston's new business ecosystems and leverage pathways between our renowned academic institutions and the startup community to cultivate and incubate the next pipeline of successful new businesses.

While Houston is home to the United States' third-largest concentration of STEM workers, the city has struggled to attract venture capital and retain entrepreneurial talent.[52] Out of 25 startup ecosystems ranked nationally, Houston was ranked 20th in 2017. But in 2019, another report ranked Houston 4th in both economic growth potential and in startup ecosystems.[53] Investments in the built environment, real estate, and programs can establish a foundation to attract and retain talent and investment. By supporting the innovation economy with innovation district planning and leveraging the unique convergence of world-class institutions and business sectors, Houston can further diversify its overall economy and insulate it from future recessions.

SHOCKS/STRESSES



TIMEFRAME



Medium Term (2030)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HCJO / GHP / Academic Institutions / Station Houston / TMC / Innovation Districts / Startups and Entrepreneurs / Small Businesses

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



46.1 Create connected, vibrant, live-work innovation districts that attract and retain top talent.

Successful innovation districts are anchored by dynamic institutions within vibrant physical places to help unlock the underlying potential of the local startup and small business economy. The TX/RX Lab, launched in 2009, is a non-profit maker space on Houston's East End that is developing the new 60,000-square-foot East End Maker Hub scheduled to open in 2020. The Founder's District in West Houston is a mixed-use innovation district being developed to target entrepreneurs and innovators—anchored by The Cannon, a startup hub with a 120,000-square-foot campus.

The Ion innovation hub, the cornerstone of Rice University's new innovation district in Houston's Midtown, is transforming a historic Sears building into an incubator that will support businesses at all stages of their innovation lifecycle and provide resources for Houstonians seeking to participate in the innovation economy. Industry and university partners will provide academic programming within the Ion. The University of Houston has invested in its Technology Bridge and Innovation Center and Labs, and the Texas Medical Center's Innovation Institute is yet another major contribution to the vibrancy and growth of the local innovation economy. Supporting the co-location of businesses in an innovation district will help to spur creativity and develop a cluster for innovative businesses. Houston Exponential recently raised $25 million to support the local tech economy and help attract additional venture capital investment. By supporting investments in public infrastructure, real estate, and academic programs, the City can leverage the region's unique economic and community strengths, bolstered by nearby educational, cultural, and commercial institutions, to create a cutting-edge environment that fosters Houston's innovation cluster.

46.2 Increase connections between the members of Greater Houston's innovation ecosystem.

While Houston is home to large corporations that invest in research and development (R&D), more collaboration is needed between entrepreneurs and corporations to accelerate innovation. For example, startups are not as skilled as larger companies in navigating relationships within the city to successfully implement projects. They could also benefit from large corporations' financing of R&D. Increased collaboration between differently-sized businesses would help startups scale their operations. Since its formation in 2016, Station Houston, a regional accelerator and coworking center located in Downtown Houston, has become the largest enterprise startup acceleration hub in Houston. The City will continue to support initiatives and programs that encourage industry interaction and collaboration and build on the successes of Station Houston. Houston is also home to world-class health care and higher education institutions, which invest in R&D, attract world-class businesses and talent, and generate revenue for the City. The importance of these institutions will only grow as Houston surges in population and demand for health care and higher education increases. The City will support institutional partners in a strategy to both attract and retain talent in these sectors and expand access to jobs for residents.



47 PARTNER WITH ANCHOR INSTITUTIONS TO FURTHER RESILIENCE INNOVATION THAT STRENGTHENS AND PROTECTS THE REGION.

Encourage Greater Houston's anchor institutions to develop their own resilience policies and plans to ensure that they can survive, adapt, and thrive to support their employees and their neighbors.

Houston is home to numerous world-renowned institutions, including universities; hospitals; energy, engineering, aviation and real estate companies; and government facilities like NASA's Johnson Space Center (JSC), that are all well-positioned to lead by example in resilience practices. Building on existing efforts at JSC, the City will partner with these anchor institutions to share best practices in campus resilience planning, promote knowledge sharing across institutions, and communicate risk awareness to their employees and their surrounding neighborhoods. Establishing a network of local anchor institutions that are developing their own resilience policies and plans can have an exponential impact on advancing resilience across Greater Houston.

SHOCKS/STRESSES

TIMEFRAME

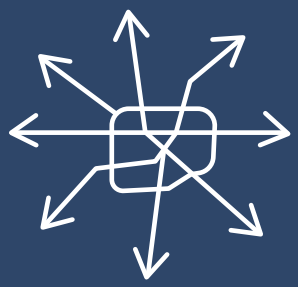
Medium Term (2030)

IMPLEMENTATION THEMES

IMPLEMENTATION PARTNERS

COH / HCJO / H-GAC / Academic Institutions / Anchor Institutions / Community Organizations

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



GOAL 15

WE WILL INCREASE REGIONAL TRANSPORTATION CHOICE.

With a regional population projected to grow from 7 million to more than 11 million people in the next 30 years, Greater Houston will require an integrated regional transportation system to remain livable and competitive.

To keep up with these growth projections, the City of Houston, Harris County, and surrounding jurisdictions will need to work together to identify interventions and prioritize resources to increase mobility choices with maximum impact. This begins with implementing the METRONext *Moving Forward Plan*, an initiative aimed at expanding and improving transportation infrastructure to accommodate the region's projected growth. Additionally, this Goal identifies mobility initiatives that require a collaborative approach to implementation in order to maximize their benefits for all. This entails targeting major employment centers and commercial destinations with interventions that strengthen last-mile solutions, increasing the viability of mass transit options, and incentivizing non-single occupancy vehicle travel.

Provide 100% of Houstonians access to high-frequency public transportation choices within a half-mile by 2050.

48 WORK WITH REGIONAL PARTNERS TO INVEST IN AN INTEGRATED MOBILITY NETWORK.

Support the advancement of a comprehensive transportation network that increases mobility choices and connects more Houstonians to opportunity.

The Houston region is making great strides in increasing mobility options through investments such as METRO's bus improvements, METRONext, Houston's Bike Plan, Bayou Greenways 2020, Beyond the Bayous, and B-Cycle bike share expansion. As future investments are made, the priority will be to link them through a comprehensive mobility system for Houston. This will ensure that more Houstonians have access to a variety of mobility options that are safe, connected, convenient, and high quality.

SHOCKS/STRESSES



TIMEFRAME



Short Term (2025)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HCJO / H-GAC / GHP / METRO / Regional Transportation Organizations / Developers / Financial Institutions / State and Federal Government / Mobility Organizations / HPB / B-Cycle

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



48.1 Support METRONext *Moving Forward Plan* implementation.

The METRONext planning process engaged thousands of Houstonians on the best future transit investments for Houston and the region. The plan recommends more than 20 miles of new light rail investment, 290 miles of signature bus service (BOOST), five corridors with more than 75 miles of bus rapid transit (BRT) projects, and 200 miles of two-way HOV lanes. This new network will offer significantly greater coverage in terms of capacity and frequency. It will also connect more Houstonians to opportunity, with nearly 250% more people and 60% more jobs that are estimated to be within a half-mile walk of a BRT or Light Rail station. In autumn 2019, voters approved a bond to implement many of the identified projects. The City will actively support the implementation of the plan and will coordinate planning, housing, and infrastructure investments to target high-capacity and high-frequency transit corridors.

48.2 Expand Houston's high-comfort bike network and become a Gold-level Bicycle-Friendly Community.

The City will continue to expand the low-stress, high-comfort bikeway network throughout Houston, building on the recent progress made through the Build 50 Challenge, which set a goal of 50 miles of high-comfort bikeways. High-comfort facilities will be designed to ensure users of all ages, abilities, and backgrounds are able to navigate safely and securely on the bikeway network. The City will become a League of American Bicyclists Gold-level Bicycle-Friendly Community by 2027, expand bicycle ridership, and decrease crashes and fatalities by focusing on enforcement, education, engineering, evaluation, and encouragement strategies.

48.3 Upgrade Houston's highway network with two-way HOV and HOT lanes.

Expanding two-way high-occupancy vehicle (HOV) and high-occupancy toll (HOT) lanes will encourage more Houstonians to choose sustainable transportation choices when commuting to regional job centers. We will upgrade the area's major highways with two-way HOV and HOT lanes as capital projects arise throughout Greater Houston. TxDOT, METRO, HCTRA, and the City will partner on project design to ensure HOV and HOT lanes are timed appropriately with METRO's 200-mile investment in two-way HOV and 110-mile upgrade for the Regional Express Network.



48.4 Target transportation demand management (TDM) programs to the area's largest employment centers.

The City will partner with the Houston-Galveston Area Council (H-GAC) to expand their Commute Solutions program with the area's largest employment centers and employers. The program will coordinate infrastructure improvements, pilot policies and commuter programs and identify short- and long-term investment priorities to reduce single-occupancy-vehicle travel and better manage demand on our transportation network. The program will share resources with employers on commuting options and incentives, including tax benefits, parking management, parking cash-out, end-of-trip facilities, guaranteed ride home programs, shared commuting services, apps and technology, and telework and flexwork arrangements.

48.5 Leverage regional and state financing tools to improve mobility.

Leveraging valuable real estate, pricing finite transportation resources, and advocating for regional and state interventions can make a tremendous difference in obtaining additional federal investment grants and will determine how fast we are able to build the ambitious mobility network we have set out to achieve for an economically competitive region. Conventional funding sources are often insufficient to finance large-scale transit infrastructure projects. Rising land values, contentious rights-of-way, and rapidly rising demand through population growth add additional pressure to competing needs. The City will work to develop broad-based partnerships across public, private, philanthropic, and non-profit sectors to identify innovative ways to leverage assets to accelerate implementation of mobility improvements.



EL PASO, TEXAS, UNITED STATES

INTERNATIONAL BELTWAY PROJECT

The City of El Paso is introducing multi-modal transportation options to its residents, with the International Beltway project providing connectivity between the international port of entry, to the south of Downtown, and the Medical Center of the Americas (MCA) to the north. The MCA has been identified as a primary investment area supportive of transit-oriented development—for both commercial and residential development. A potential county-line-to-county-line trail system may link to the Beltway as well, and the Alameda corridor of Brio, El Paso's bus rapid transit network, was recently completed.

49 IMPROVE FIRST- AND LAST-MILE CONNECTIONS.

Increase transit ridership by making it easier, safer, and more efficient for Houstonians to get from their home, work, or school to a nearby transit stop.

The "first and last mile" describes the distance between a transit stop and a person's starting point or destination, such as their home, work, or school. Most people are willing to walk one-quarter to one-half mile to reach a transit stop, and to bicycle significantly farther.[54] Longer distances reduce people's desire and ability to walk or bike to public transit. The City and its partners will work with mobility providers and neighborhoods to prioritize last-mile transportation choices, including support for business innovation among public and private transit providers who are working to meet this challenge.

SHOCKS/STRESSES

TIMEFRAME

Short Term (2025)

IMPLEMENTATION THEMES

IMPLEMENTATION PARTNERS

COH / HCJO / METRO / Regional Transportation Organizations / B-Cycle / LINK Houston / HPB Mobility Organizations / TIRZs / Management Districts / Community Organizations / Neighborhoods

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

49.1 Improve bicycle and pedestrian connections to METRO stations.

First- and last-mile investments could extend the catchment area for METRO stops and stations, making it easier for Houstonians to walk, bike, or roll to access public transit. METRONext proposes investments in first- and last-mile connections to rail stations, transit centers, park & rides, and high-frequency bus stops. The City will work with METRO to leverage resources toward last-mile solutions and ensure that investments are prioritized through an evidence-based approach that quantifies need based on transit dependency factors, safety risk, and accessibility needs to see where improvements would make the biggest impacts.

49.2 Expand bikeshare in major activity centers and throughout the city.

The City will continue to support the expansion of micro-mobility devices, including dockless bikes, e-bikes, and scooters, to reduce car trips and enhance access to METRO stops, employers, and destinations. Currently, B-Cycle has 99 bikeshare stations in service and is projected to reach 128 by 2020. The City will pursue cost-sharing and grant opportunities to expand the bikeshare network—including e-bikes—in Houston's major activity centers to offset car trips and provide more alternatives in areas with higher transportation demand.

49.3 Regulate the use of micro-mobility devices as a safe first- and last-mile solution.

The City will develop an ordinance to regulate the use of micro-mobility devices, such as dockless bikes, e-bikes, and scooters, to provide a safe environment for users of all ages and abilities and to limit potential conflicts between modes. Factors to be considered in the ordinance include allowable geographies and facilities, safety requirements, data collection and sharing provisions, and maintenance standards.



50 ENABLE HOUSTONIANS TO MAKE MOBILITY CHOICES THAT IMPROVE WELL-BEING AND REDUCE THE COST OF LIVING.

Engage Houstonians in the design of mobility infrastructure and advance affordable transportation options for residents to get wherever they need to go—school, work, shopping, services, or home.

As Greater Houston grows, Houstonians are experiencing rising transportation costs. These costs can be measured in dollars spent on gasoline and car insurance, in total minutes spent commuting, and in vehicle emissions that affect air quality and the environment. Reducing these impacts requires providing residents with more mobility options that are safe, convenient, and affordable—and that still get people where they need to go. By improving transit, solving for the first and last mile, fixing sidewalks and bike lanes, and reducing cost barriers, we will enable average Houstonians to spend fewer dollars on maintaining a car and spend more time with their families. As regional partners make significant investments in increased mobility options in the coming years, it is imperative that Houstonians who will be impacted most have a voice in the planning process.

SHOCKS/STRESSES

TIMEFRAME

Short Term (2025)

IMPLEMENTATION THEMES

IMPLEMENTATION PARTNERS

COH / HCJO / METRO / Regional Transportation Organizations / Employers / Community Organizations / Philanthropy

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

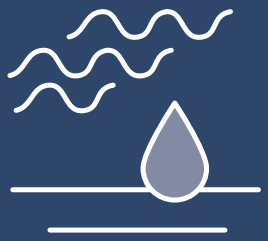
50.1 Reduce costs and barriers to greater mobility choices.

In addition to ensuring that transit is present near affordable housing (see Goal 7), the City will seek to reduce costs and barriers for alternative transportation among vulnerable populations, as described in Houston's *Climate Action Plan*. Language and technology barriers can also keep Houstonians from successfully boarding and navigating the transit system. Partnering with transit agencies to reduce these barriers will be essential. As electric vehicles (EVs) become more common, promoting these vehicles and ensuring a robust second-hand market for EVs will also help reduce emissions and transportation costs for low- and moderate-income households.

50.2 Coordinate community engagement around mobility with regional partners.

Investments in mobility infrastructure can have major impacts on our neighborhoods and how we get around the city. It is critical that Houstonians continue to have a voice in the planning and design of these investments throughout the region. The City will work with regional partners to form a collective community engagement framework that consists of shared principles, coordinated processes, common tactics, and measurable outcomes for infrastructure projects within the city.





GOAL 16

WE WILL MANAGE OUR LAND AND WATER RESOURCES FROM PRAIRIE TO BAY.

Greater Houston's resilience is directly tied to the ecological health of the entire region. As big as our region is, our land is finite. Houston's environmental assets, such as the region's prairies, wetlands, woodlands, bayous, and waterways, play critical roles that mitigate flooding, extreme heat, and water and air pollution. These resources—and our resilience—are jeopardized by an ongoing pattern of unchecked development. We must be proactive, deliberate, and bold in how we use our land moving forward and establish a new tradition of ecological stewardship—from the Katy Prairie to Galveston Bay.

As our region extends across multiple jurisdictions, so too must our efforts to manage complex ecological systems. Solutions for our land and water resources must account for the full extent of our watersheds and will require new and inclusive strategic partnerships supported by thoughtful, ongoing coordination to achieve maximum impact. Failure to coordinate our actions will undermine our efforts and waste time, money, and precious environmental resources.

16

Conserve 24% of undeveloped regional lands as natural spaces by 2040.

51 CONSERVE REGIONAL UNDEVELOPED LAND FOR FLOOD MITIGATION, ENVIRONMENTAL HEALTH, AND RECREATION.

Protect critical undeveloped land to serve as nature-based infrastructure for the region.

The region's prairielands, wetlands, and woodlands serve as nature-based infrastructure that provide multiple services—detaining floodwaters, providing recreation for people and habitat for wildlife, capturing carbon, and improving air and water quality. Yet, only 9% of the eight-county region's land area is currently set aside as conserved or preserved land, while 26% of land is already developed and significant pressure exists to expand development further and further. Whereas the region's natural landscapes increase our resilience, impervious surfaces in urbanized areas intensify stormwater runoff and the urban heat island effect—making us less resilient in the face of extreme weather and climate change. As our region continues to grow and our climate changes, it will be imperative to protect and enhance more of our remaining undeveloped lands to serve as nature-based infrastructure. The *Gulf-Houston Regional Conservation Plan*, a collaboration between environmental, business, and governmental entities, sets a goal of increasing the area of preserved or conserved land in the eight-county region to 24% by 2040. We will work within city limits and in collaboration with regional partners to advance the implementation of this goal.

SHOCKS/STRESSES



TIMEFRAME



Long Term (2050)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HCJO / HCFCD / State and Federal Government / Houston Wilderness / KPC / TPWD / Community Organizations

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



51.1 Lead by example by conserving city park land as nature preserves.

To further support and accelerate the region's 24% land conservation goal by 2040, the Houston Parks and Recreation Department will move forward with conserving 20% of Houston public park land in 2020. These conservation areas will remain undeveloped in perpetuity, providing ecological value to the community and passive recreation opportunities for park users. A match from other public or private entities will be sought to protect an equivalent amount of land—approximately 7,150 acres—in conservation easements or other protection measures throughout Greater Houston by 2025.

The Houston Parks and Recreation Department system includes 380 developed parks and more than 167 green spaces totaling more than 39,501 acres. A total of 21 park nature preserves have been identified for open space conservation, representing 19.4% of the 20% conservation goal. To reach the remaining 0.6%, the City of Houston will work with land conservancies and counties that have maintenance agreements in parks to identify additional target areas. A City of Houston ordinance would place protection on these areas to prevent future development and limit any construction on the nature preserve area to trails and green stormwater infrastructure (GSI) for water retention and flood mitigation purposes.

51.2 Support regional land conservation and discourage development in sensitive upstream areas.

In partnership with regional land trusts and private landowners, we will promote the preservation and restoration of the Katy Prairie tallgrass prairie ecosystem, whose 2,500 acres of wetlands serve as "nature's kidneys" for the Houston region, offering stormwater retention, water filtration, groundwater replenishment, wildlife habitat, and recreational land. We will also support efforts such as the Headwaters to Baywaters Initiative to protect and restore the region's riparian corridors.

51.3 Restore land to native prairie, wetlands, and woodlands.

Native grasslands, wetlands, and woodlands can generally absorb floodwaters more effectively than other types of vegetation, while also improving environmental health and providing other co-benefits. In addition to supporting the conservation of existing native landscapes, we will work with regional partners to revegetate, restore, and enhance native habitats within our urban environment. An ecosystem toolkit for bayou and floodplain restoration, described further in Action 28, will be a first step toward this effort. We will also identify rapid revegetation methods and plant materials for restoration of large public areas, including rights-of-way, esplanades, parks, and utility easements. Additionally, we will promote the use of native grass species for turf re-establishment in residential and commercial areas.

52 DEVELOP LONG-TERM STRATEGIES WITH COUNTY PARTNERS TO BUILD THE RESILIENCE OF AREAS WITHIN HOUSTON'S EXTRATERRITORIAL JURISDICTION.

Work with partners in the extraterritorial jurisdiction (ETJ) to increase sustainability and resilience to economic, environmental, and social shocks and stresses.

Houston's ETJ, which extends into a five-county region, is made up of 370 municipal utility districts (MUDs) that together comprise more than 400 square miles, outside of the 667 square miles within Houston city limits. The City will work with partners from the five Counties and from the MUDs to advance the sustainability and resilience goals of Greater Houston and to determine policy recommendations that could be applied to new and existing MUDs. Following five years of repetitive flooding events that exposed weaknesses in the built infrastructure of the region, the City will take a leading role to improve public safety, sustainable design and development, and natural land conservancy in its ETJ. Greater coordination and planning between agencies will improve the resilience and future quality of life of people living in the ETJ.

SHOCKS/STRESSES

TIMEFRAME

Medium Term (2030)

IMPLEMENTATION THEMES

IMPLEMENTATION PARTNERS

COH / HCJO / H-GAC / MUDs / METRO / Regional Counties / Academic Institutions / Community Organizations / Private Sector / Neighborhoods

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

DA NANG, VIETNAM

TRANSBOUNDARY RIVER BASIN MANAGEMENT

Several tributaries of the Vu Gia-Thu Bon river basin flow through the city of Da Nang, across a flat coastal floodplain that experiences frequent flooding. The City is investigating ways to better manage its floodplains by restructuring urban design in high risk areas, exploring resettlement options, and developing a model of a flood-resilient community. The City has also created an experimental regional collaborative river basin organization with the province of Quang Nam, where the river originates, to coordinate data and decision making related to the basin across jurisdictions.





GOAL 17

WE WILL ENHANCE REGIONAL EMERGENCY PREPAREDNESS AND RESPONSE.

Disasters and emergencies do not happen according to boundaries on a map. The vast majority of our essential systems and "lifelines"—our roads and transit system, our bayous and waterways, our energy grid and drinking water supplies, and our communications systems—are regional. The City of Houston, regional counties, and the surrounding jurisdictions must therefore work together to prepare our region for the various shocks and stresses that may lie ahead.

This Goal focuses on two types of regional actions that can reduce the impact of emergencies. First, the City and its partners will undertake coordinated preparedness actions, such as improving the ability to alert residents about disasters and attacks, enhancing the capacity to respond to physical threats and cyber or communications threats, and taking tighter control of our hazardous materials and emissions. Second, there are response actions that improve our regional coordination and ability to conduct a highly effective short-term response to assist all who may be affected in an emergency.



Ensure that 100% of Houstonians and visitors have access to accurate, real-time emergency alerting by 2030.

53 ENHANCE REGIONAL PREPAREDNESS.

Improve emergency preparation through enhanced communications by addressing gaps in message coordination and capabilities across the region.

Houston is heavily populated, diverse, sprawling, and faces numerous hazards. Our population includes people with limited English proficiency, access and functional needs, students, commuters, travelers, and low-income people—many with unique needs and barriers with respect to timely and effective public communication during an emergency. Houston routinely issues emergency alerts for public safety threats, such as severe weather, missing persons, and incidents concerning hazardous materials, as well as lower-tier alerts, such as traffic and transit advisories, special events, and post-disaster recovery information. The City has made considerable improvements to our alerting capabilities since Hurricane Harvey and will continue to look for ways to improve the effectiveness of emergency alerts.

Houston's ability to withstand and recover quickly from acute shocks is a product of its preparation in advance. Emergencies do not adhere to jurisdictional boundaries; Houston's emergency preparation efforts must cross those same boundaries.

SHOCKS/STRESSES



TIMEFRAME



Short Term (2025)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HCJO / GHP / UASI / Public Safety Agencies / State and Federal Government / Private Sector / Community Organizations

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



53.1 Improve the effectiveness of regional emergency alert system.

All jurisdictions in Greater Houston region are supported in both public emergency alerting and inter-agency coordination by a federal program called the Integrated Public Alert & Warning System (IPAWS), which administers various emergency messaging. The region also participates in the U.S. Department of Homeland Security's Urban Area Security Initiative (UASI), which supports multi-jurisdictional and multi-disciplinary emergency preparedness planning in high-threat communities.

At the regional scale, we will improve the effectiveness of regional emergency alert systems by incorporating a warning coordination section to the *UASI Emergency Public Information Plan* to ensure consistent messaging across impacted jurisdictions and reduce confusion due to redundant alerting. In addition, we will strengthen Joint Information Center (JIC) coordination, developing the tools, frameworks, and collaborative resources required for effective coordination of public communications during multi-jurisdictional emergency responses.

The City will also work to enhance its own emergency alert capabilities by simplifying subscriber opt-in in order to reach more people, particularly those with cellphones but not internet access; allowing for temporary opt-ins to better reach visitors and special event attendees; translating alert templates into the City's Language Access Plan-designated languages (Spanish, Vietnamese, Chinese, Arabic, and French) as well as ASL videos; and implementing an effective tool to monitor internet data in real-time to improve reaction time to no-notice events and threats by City officials.

Finally, the City and its regional partners will increase public awareness of alert services. In addition to enhancing subscriber opt-in capabilities at the city level, jurisdictions across the region could benefit by obtaining buy-in from local media and local elected officials as well as conducting cross-promotion across jurisdictional lines in order to improve subscriber bases.

53.2 Prepare for hostile threat emergencies.

The City will develop a terrorism preparedness strategic plan that will bridge current terrorism-related initiatives, including the *Houston Urban Area Homeland Security Strategy* for UASI; plans for academic institutions, schools, hospitals, and public spaces; and local terrorism plans for the City and County. This comprehensive plan would address key current initiatives, such as the local Countering Violent Extremism (CVE) project Building Resilience to Extremism in the Greater Houston Region and the Complex Coordinated Terrorist Attack Planning Initiative.

54 INCREASE PROTECTION OF CRITICAL DIGITAL ASSETS FROM CYBERATTACKS.

Work with partners to enhance cybersecurity capabilities, training, and cross-industry coordination to proactively identify, detect, protect, respond, and recover from cyber threats.

Cities all over the world are targets for cyberattacks. Houston, like Dallas, Atlanta, New Orleans, and many others, has been the victim of hacks in the past and has taken precautionary measures, such as upgrades to technology, training, and a $30 million cyber insurance policy first taken out in 2018, to thwart attacks in the future. But further advancements in cyber preparedness, response, and recovery need to be taken, both by the City and by local and regional partners. The City will work with local governments, residents, businesses, faith-based institutions, academic institutions, private sector organizations, and other potential targets of cyberattacks to ensure that they have the most up-to-date resources to fortify their systems, that individuals have broader access to cybersecurity training, and that there is a network prepared to respond and recover should a cyberattack occur.

SHOCKS/STRESSES



TIMEFRAME



Short Term (2025)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HCJO / GHP / Local Government Agencies / Academic Institutions / Community Organizations / Faith-Based Institutions / Houston Businesses / Houstonians

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



54.1 Strengthen the City of Houston's cyber resilience.

The City of Houston should complete implementation of its *Cyber Security Master Plan* to further strengthen cyber resilience. The City must implement tools, policies, and procedures to further enhance defenses against malicious attempts to disrupt City services, steal and/or corrupt both City and individual data, and adversely impact the reputations of the local government, businesses, and residents in the Greater Houston area.

54.2 Expand cybersecurity collaboration among regional partners to improve incident response capabilities.

Greater Houston should take a proactive stance in strengthening the region's cyber resilience. This includes proactive coordination to prepare for and respond to cyber incidents affecting the overall operation of the City and Greater Houston region, including impacts to public safety, transportation, utilities, community services, and financial operations. The City of Houston will engage in preparation and incident response activities with regional partners in law enforcement, Homeland Security, other governmental organizations, and corporations to strengthen cyber-related notifications, information sharing, cyber assessments, and practice exercises to enhance incident response capabilities.

54.3 Promote cyber preparedness.

The City of Houston and Greater Houston should support programs that ensure regional businesses are continuously informed, educated, and prepared to conduct day-to-day cyber activities in a safe, secure, and private manner so that they can continue to thrive.

Many businesses do not have IT personnel with cutting-edge cybersecurity skills and are falling victim to ransomware, malware, compromised email systems, fraud, theft of personally identifiable information, and more. There are actions that businesses of any size can take to be prepared, including assessing current conditions and making a plan. The City will promote cyber awareness and preparedness through its partnerships with regional, federal, and corporate entities.

55 IMPROVE EMERGENCY RESPONSE AND POST-DISASTER RECOVERY COORDINATION.

Establish a regionally coordinated emergency communications system and network to enable all Greater Houston jurisdictions to collaboratively report, monitor, and update events in real time.

Across Greater Houston, a chemical explosion, fire, or toxic release occurs every six weeks.[55] According to EPA data, more than 100 different industrial facilities have violated the Clean Water Act in at least six of the past 12 quarters since January 2016. Despite impacts on air and water quality and public health, environmental laws along the Houston Ship Channel and the region's intricate network of bayous are often unenforced or under-enforced.

Hazard mitigation and emergency management planning is critical to identify and reduce hazard risks and vulnerabilities that threaten to damage or disrupt Houston's social, physical, economic, and environmental resources. Hazard mitigation planning is a central tenet of creating, promoting, and maintaining community resilience and sustainability. Mitigation and emergency management planning results in the development of long- and short-term strategies to reduce hazard vulnerability, which serve as a springboard for positive and creative change to the way risk is managed within communities. A mitigation plan for the petrochemical corridor throughout Houston is a repository for detailed information on community hazard risks, existing capabilities or actions, and planned risk management strategies. A regional emergency communications system would improve disaster response and enforcement of violations, ultimately leading to fewer incidents and better environmental quality.

SHOCKS/STRESSES



TIMEFRAME



Short Term (2025)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HCJO / GHP / H-GAC / TCEQ / EPA / FEMA / FCC / Community Organizations / Ready Houston / Ready Harris / VOAD

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



55.1 Improve hazardous materials management.

Through local emergency planning for chemical spills, we will adopt hazardous material emergency management recommendations from FEMA's *Guide for All-Hazard Emergency Operations Planning*, with an emphasis on on-scene management and control; notification to and coordination with the U.S. Coast Guard National Response Center; communication with the public around health hazards, protective actions, and potential evacuation; and emergency equipment procurement, stockpiling, and distribution. The flow of accurate and timely emergency information is critical to the protection of lives and property immediately following a hazardous materials release. Emergency public information guidelines should be included in the plan for the preparation and dissemination of notifications, updates, and instructional messages as a follow up to an initial warning.

55.2 Improve regional response to and enforcement of environmental emergencies.

Following recent emergency events, such as the Intercontinental Terminals Company (ITC) Fire, Spring Branch Fire, and the Houston Ship Channel barge collision, emergency responders' efforts were undermined by insufficient cross-jurisdictional communications resulting from city, county, state, and federal agencies operating in silos. This segmented communication limited authorities' ability to hold responsible parties accountable, both through fines as well as environmental remediation.

To improve emergency communications, we will inform relevant agencies of an ongoing response at the time of incident, with an emphasis on impacts to overlapping and nearby jurisdictions; document and address associated enforcement efforts to hold responsible parties accountable; and ensure consistency in enforcement.

55.3 Improve enforcement of air quality regulations through enhanced coordination and collaboration with TCEQ.

Currently, air pollution violations of state and federal environmental regulations are addressed separately and differently by the Houston Health Department and the Texas Commission on Environmental Quality (TCEQ). A lack of coordination between agencies can lead to blind spots in enforcement, inefficiencies in compliance monitoring, overlapping case development, and ineffective regulation. To improve coordination, the City will contract with TCEQ to receive EPA funding via an interlocal enforcement contract.



56 DEVELOP A REGIONAL CRITICAL INFRASTRUCTURE CATALOG.

Develop a critical infrastructure catalogue that includes a comprehensive risk assessment and protection program.

Over the past several years, Houston has implemented a critical infrastructure and risk protection program, as well as detailed hazard mapping with GIS. The ongoing project is a collaboration between local public safety agencies and private sector partners to enhance the ability to predict, prepare for, protect against, respond to, and recover from a variety of threats and hazards. This initiative will be enhanced through the use of a platform that enables public safety agencies to catalog and assess critical infrastructure and allows for the integration of real-time data and field reporting that supports public safety efforts. Through improved regional asset management and critical infrastructure cataloging, we will enhance situational awareness and will help cut down response times during disasters.

Building critical infrastructure resilience allows the region to shorten the duration and impact of disruptive events on the community. Creating a unified repository that combines hazard mapping and a risk assessment could issue protection recommendations in real time that will streamline resources and ensure that current capabilities can meet emergency service needs.

SHOCKS/STRESSES

TIMEFRAME

Immediate (2020)

IMPLEMENTATION THEMES

IMPLEMENTATION PARTNERS

COH / HCJO / GHP / Public Safety Agencies / Private Sector

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

57 FORTIFY GREATER HOUSTON'S LIFELINES AND SUPPLY CHAINS.

Proactively address interdependencies and cascading risks of lifelines and supply chains through additional research, analysis, planning, and innovation.

Houston is exposed to a range of natural, environmental, and human-caused hazards, and response support is provided by the State of Texas and the Federal Emergency Management Agency (FEMA) for severe disaster situations. FEMA's Community Lifelines Toolkit outlines seven critical government and business functions which are essential to health, safety, and the economy. These lifelines are Safety and Security; Food, Water, and Sheltering; Communications; Transportation; Health and Medical; Hazardous Materials Management; and Energy (Power and Fuel). While FEMA's lifelines framework is new, the concepts are well-understood in local plans and procedures and continuity processes.

To further align with this federal effort, the City of Houston and neighboring jurisdictions will benefit from identifying incident stabilization targets as well as conducting risk analyses of each community lifeline through mitigation planning and other deliberate planning processes.

SHOCKS/STRESSES

TIMEFRAME

Short Term (2025)

IMPLEMENTATION THEMES

IMPLEMENTATION PARTNERS

COH / HCJO / GHP / Public Safety Agencies / State and Federal Government / Private Sector / Philanthropy

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



MONTREAL, CANADA

MONTREAL COORDINATION OF EMERGENCY SERVICES

The Centre de sécurité civile de Montréal (Montreal Civil Protection Center) is working to improve information sharing among agencies and provide better data on existing resources during a major disaster or disruptive event. This involves annual updates of shelter data as well as an assessment of the energy independence of emergency shelters and centers. City departments and community-based authorities are working together to achieve integrated planning and a review of protocols.



GOAL 18
WE WILL LEVERAGE EXISTING AND NEW INVESTMENTS AND PARTNERSHIPS.

Over the next several years, the Houston region will be making significant investments in our recovery, infrastructure, and regional planning at a scale that happens once in a generation. We have a unique and critical opportunity to spend these resources wisely in order to accelerate the pace at which we address our resilience challenges and to create additional opportunities for all Houstonians to thrive.

Collectively, more than $50 billion is expected to be spent on major projects that could impact Houston's resilience in the next 15 years—including an estimated $3.8 billion in City of Houston Harvey recovery funds, $2 billion in city water and sewer upgrades, approximately $7.5 billion for the proposed I-45 expansion and reorientation project, and approximately $1 billion for widening of the Houston Ship Channel. Voters recently approved $3.5 billion for METRONext transit improvements and the $2.5 billion Harris County flood mitigation bond program. Across the region, the projected $28 billion investment in the "coastal spine" system that will protect the coast from storm surge will also enhance regional resilience. Leveraging these investments to address the challenges of the future and produce multiple benefits will accelerate the implementation of the visions, goals, and actions outlined in this strategy.



Invest $50 billion in major recovery, mitigation, and modernization projects that increase resilience by 2040.

58 LEVERAGE DISASTER RECOVERY EFFORTS TO ACCELERATE THE IMPLEMENTATION OF RESILIENCE MEASURES.

Coordinate across departments and collaborate with partners to ensure that investments go beyond recovery, focusing on building forward and achieving a resilient Houston.

The City of Houston will leverage Community Development Block Grant-Disaster Recovery (CDBG-DR) funding to advance resilience goals and actions and integrate resilience principles within all Harvey infrastructure and housing recovery efforts as well as future recovery programs. Hurricane Harvey caused an estimated $125 billion in damage, making it the second-most-costly hurricane to hit the U.S. mainland. It depleted more than half of the city's available affordable housing stock and caused an estimated $2.2 billion in damages to City assets alone. Harris County saw more than 440 square miles flooded—nearly 30% of total land area.

The City of Houston will receive approximately $3.8 billion in federal allocations for Harvey recovery. This includes $1.3 billion for housing reconstruction and rehabilitation, an estimated $2 billion to repair or replace damaged infrastructure and facilities, and approximately $1 billion to support long-term mitigation and adaptation. By spending this significant investment in a smart and strategic way—ensuring cross-departmental coordination of projects and goals, incorporating multiple benefits into project and program design, updating policies and procedures to align with resilience principles, and leveraging outside funding and partnerships—we can make every recovery dollar go further toward building resilience. The City has begun efforts to rebuild countless homes and neighborhoods and has helped families return to the properties they thought would be lost. We still have a long way to go before we can consider our work complete. The City will continue to work with federal, state, and local partners to build upon and improve our designs and prepare for future disasters. By incorporating resilience into our recovery, Houston can build forward.

SHOCKS/STRESSES



TIMEFRAME



Medium Term (2030)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HCJO / HCFCD / TDEM / GLO / FEMA / HUD / USACE / Office of the Texas Governor / Tetra Tech / GHP / Public Sector / Philanthropy

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



58.1 Make housing equitable and resilient through recovery investments.

As the City begins to award funding and develop single and multifamily residential projects, we will incorporate resilience-building practices and priorities outlined in *Resilient Houston*. We will encourage resilient design measures—such as green stormwater infrastructure (GSI), platform or podium construction, and elevating critical systems and back-up generators—that increase protection, improve adaptation, incorporate back-up measures, and build community. The City will start this process with the City's disaster recovery multifamily program to learn and develop best practices with the development community. We will then evaluate replication for other housing recovery projects. The City will coordinate with U.S. Housing and Urban Development (HUD) and Texas General Land Office (GLO) to ensure that the proposed projects and activities are eligible for reimbursement. The City will ensure that the funding available can be used to address Houston's challenges through a holistic approach to advance other *Resilient Houston* goals at all scales.

58.2 Incorporate resilient design into hazard mitigation projects.

To demonstrate the impact of incorporating resilience principles into a large-scale flood mitigation project, the City will work with Harris County Flood Control District (HCFCD) to design and construct a detention basin in the Inwood Forest neighborhood to serve as a pilot for resilient design that can be replicated in other Houston neighborhoods. The City will work in parallel with the Houston Parks Board to develop an integrated recreation and detention plan that maximizes flood reduction and provides connectivity, green space, and neighborhood beautification. The Inwood Forest project can serve as a model for identifying innovative sources of funding, leveraging partnerships, and creating a design for the area that works for all. In addition, the design of the Inwood Forest detention basin project should incorporate new rainfall data and be flexible to integrate

the results of the climate risk assessment. The construction of this project will be the first of its kind to measure and evaluate the impact of these activities and larger-scale projects on Houston's adaptation to climate change. This will determine whether future projects need to consider new design criteria or current engineering practices are enough to reduce risk.

58.3 Prioritize and invest in resilient infrastructure.

The City will create an infrastructure mitigation plan that identifies specific projects that are equitable; contribute to resilience building; and can be funded by Houston's allocations of HUD CDBG-DR and CDBG-MIT grants, FEMA Hazard Mitigation grants, and other funding streams. Projects that reduce flooding, address extreme heat, improve water quality, support mobility and transportation, incorporate green infrastructure, benefit low- and moderate-income communities, and drive economic growth will be prioritized. The City will convene a cross-departmental team to develop these project evaluation criteria. The City will work with the County and HCFCD to leverage this funding and identify areas of connectivity to bring a much larger impact and benefit to surrounding communities. This effort will help define similar action for other large-scale flood mitigation projects underway, such as North Canal, TIRZ 17, and Lake Houston Dam.

58.4 Transform City assets.

The City will finalize damage assessments for all Harvey-impacted facilities such as libraries, office buildings, parks, fire stations, police stations, wastewater treatment plants, lift stations, and distribution lines to capture the total repair costs. Although this is a long and cumbersome process that requires multiple rounds of reviews, it enables the City to identify specific actions to rebuild, repair, or even relocate facilities and assets. Some facilities will be eligible to receive funding beyond permanent repair work. The City will prioritize facility reconstruction and/or repair work based on previously identified areas of need. Additionally, the City will evaluate various options for mitigation that include integrating resilient building standards and GSI into repairs and reconstructions. This will have to be performed on a case-by-case basis and the City will work closely with FEMA to determine what may be authorized within each program. For the repair of the city's water systems, the City will coordinate efforts with ongoing consent decree activities as well as other potential federal funding programs.

58.5 Expand public communication on recovery efforts.

The City will coordinate communication efforts among all departments to ensure that a unified message of recovery is distributed to impacted communities. The City will create an internal dashboard to track program progress and specific targets will be created to evaluate local, state, and federal partner performance.

58.6 Plan for recovery from future disasters.

The City will continue to work with the Houston Urban Area Security Initiative (UASI) Regional Recovery Workgroup and partner with regional, state, and federal entities to standardize recovery where possible and tailor activities to meet the needs of Houstonians. Using the template made available by UASI, the City will work with internal departments to customize a recovery package that highlights short-, medium-, and long-term actions required to make the city whole after a disaster. This roadmap will help activate the right individuals and help the City proactively identify actions that need to be taken beforehand to expedite recovery processes. The City, for example, will continue to pre-position staff across departments for immediate activation of services following a disaster. The products created by the Regional Recovery Workgroup will be made available to engage with other local, state, and federal agencies as well as other key recovery partners. Standardizing procedures and capturing learnings from previous disasters will help Houston get out in front of recovery before a disaster occurs.

58.7 Partner with regional, state, and federal entities to expedite delivery of recovery programs.

Recovery is a long and bureaucratic process that takes years to implement. As the City continues to deliver projects and programs stemming from declared disasters in 2015, 2016, 2017, and 2019, we will partner with regional, state, and federal entities to identify opportunities to expedite the delivery of recovery programs by collaborating on innovative policies, jointly developing program guidelines and criteria, streamlining extensive review processes for environmental approvals, and providing open channels of communication. The City will continue to work with the congressional delegation to drive changes in FEMA's guidelines and requirements for early approval of construction projects. At the state level, the City will partner with local entities to develop coordinated project lists for when funding is made available.



59 LEVERAGE PLANNED AND PROPOSED TRANSFORMATIVE REGIONAL PROJECTS TO MAXIMIZE RESILIENCE BENEFITS.

Use a "resilience lens" when planning and implementing all Greater Houston infrastructure projects to achieve greater resilience outcomes.

Houston has a once-in-a-lifetime opportunity to increase resilience through transformative projects that are being planned today. Integrating resilience-building measures into these and future projects will maximize the co-benefits of each project and improve the outcomes of these investments. Incorporating climate projections from the City's *Climate Impact Assessment* (Action 32) will ensure that infrastructure investments we make today are designed for the future. We will advance equity and inclusion outcomes through equitable community engagement, local hire and procurement practices, addressing environmental injustices, and universal design practices. Integrating these approaches into regional investments could also accelerate or leverage neighborhood-scale resilience-building goals and targets.

SHOCKS/STRESSES



TIMEFRAME

Medium Term (2030)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HCJO / H-GAC / TxDOT / METRO / Port of Houston / USCE / GLO / SPEED Center / Texas A&M / Academic Institutions / GHP / Private Sector / State and Federal Government

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



59.1 Leverage all regional transportation planning, including the proposed I-45/North Houston Highway Improvement Project to increase mobility, equity, and resilience.

The City will work with stakeholders to ensure that the proposed I-45 Expansion—North Houston Highway Improvement Project/NHHIP—increases the resilience of Houstonians, adjacent neighborhoods, and the city rather than contributing to or exacerbating existing and historic stresses. The City will work with regional partners to advance a process for incorporating community priorities and concerns into ongoing and future regional mobility projects to ensure that they are designed with positive impacts for communities, the city, and the region.

59.2 Advance a resilient Houston Ship Channel Improvement project.

Many Houstonians do not think of Houston as a coastal port city, yet Houston's past, present, and future economy relies on having a modern port that can continue to safely and successfully keep Houston at the vanguard of maritime trade and commerce. Houston's Ship Channel plays a critical role in the national economy. It is the number one U.S. port by tonnage, sustains 3 million jobs, generates $802 billion in economic value annually, and houses a trillion-dollar refining and petrochemical complex.

Channel widening and improvements are necessary for the continued growth and security of regional and national commerce. The City will work with the Port of Houston to identify ways that this critical investment in the regional economy can provide a broad set of additional benefits to the health and safety of the region. This may include, for example, the beneficial reuse of dredged material to support coastal restoration and flood mitigation projects.

59.3 Integrate nature-based solutions and coastal protection infrastructure to provide greater storm surge protection.

According to NOAA, the Houston-Galveston area is due to be hit by a hurricane roughly every seven years. We know that hurricanes are moving more slowly and getting bigger, so they will affect more people for longer periods of time. A hurricane that directly hits the Houston Ship Channel has the potential of harming the lives and property of more than 5.5 million people, but it could also affect the national and global economy. Such a disaster could shut down petrochemical operations in Houston for 18–36 months, which would likely cause gas prices to spike to $7 or $8 per gallon or more and cause extended interruptions to the national aviation, military, transportation, and commercial sectors.

The Ike Dike, a "coastal spine" with 850-foot-wide floating gates named after the 2008 Hurricane Ike, and the Galveston Bay Park, a series of gates and levees, raised roadways, construction berms, dunes, and restoration of oyster reefs, are two coastal and storm surge protection concepts that are similar to infrastructure and nature-based solutions found in the Netherlands. The City will work with regional partners to accelerate the implementation of interventions that address these worsening risks to protect the people, property, and economic viability of the Houston Ship Channel and the region.

60 ADDRESS LEGAL AND LEGISLATIVE BARRIERS TO RESILIENCE BUILDING WITH LOCAL, STATE, AND FEDERAL PARTNERS.

Work with local, state, and federal elected officials to develop legislation that addresses existing barriers to resilience building for all and partner to further advance resilience building through opportunities to develop, lead, and implement best practices.

In 2019, the State of Texas legislature successfully passed Senate Bill 7 and Senate Bill 500 that collectively create and fund the $857 million Texas Infrastructure Resiliency Fund (TIRF) and the $793 million Flood Infrastructure Fund (FIF) to be administered by the Texas Water Development Board to address both immediate recovery needs and the future of mitigation. This shows how policymakers can lead the transformative change required to become a more resilient city and region.

We will need policy-level changes to incorporate co-benefits and leverage limited resources if we are to address the most difficult challenges—climate change, population growth, inequality, energy transition, aging infrastructure, and education. We need smarter, more adaptive policies that facilitate change and keep communities safer, stronger, and more resilient. We need resilience policies that invest in more mitigation to support our most vulnerable people, places, and systems proactively, rather than reactive policies and funding structures that only kick in after a disruption or disaster. We need leaders and partners at the local, state, and federal levels to continue to work with us to identify opportunities to be more resilient through bold policy innovation.

SHOCKS/STRESSES

TIMEFRAME

Short Term (2025)

IMPLEMENTATION THEMES

IMPLEMENTATION PARTNERS

COH / HCJO / State and Federal Government / Academic Institutions / Private Sector / Community Organizations / GHP / Philanthropy

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



61 UPDATE *PLAN HOUSTON* TO INTEGRATE RESILIENCE GOALS.

Reexamine and strengthen *Plan Houston*, the City's General Plan, to account for changes since its initial adoption in 2015 and to prioritize areas of enhanced coordination and planning.

Plan Houston, the city's first general plan, created a shared vision for Houston's future. Through dialogue and effective listening, a panel of civic leaders established a framework to guide the City. Some successful projects include the *Bike Plan*, the Complete Communities program, and the Walkable Places Program and transit-oriented development (TOD) standards. These projects have strengthened major employment and recreational areas. Now, five years on, the plan should be updated to address new issues in the city, such as recovery from Hurricane Harvey. It should also align with the Goals and Actions outlined in *Resilient Houston*. Areas for update include public safety education, environmental quality, and resilient design standards in all new construction projects. The City will update the Plan with a resilience lens to account for major changes, reflect new priorities, and improve the lives of all Houstonians.

SHOCKS/STRESSES

TIMEFRAME

Short Term (2025)

IMPLEMENTATION THEMES

IMPLEMENTATION PARTNERS

COH / Blueprint Houston / Academic Institutions / Community Organizations / GHP / Private Sector / Professional Organizations / Houstonians / Young Houstonians

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

MIAMI, FLORIDA, UNITED STATES

5-STEP GUIDE TO INNOVATIVE DISASTER RECOVERY FINANCING

The 5-Step Guide to Innovative Disaster Recovery Financing was produced by the Greater Miami and the Beaches partnership—a regional partnership between Miami-Dade County and the Cities of Miami and Miami Beach. The provided guidance goes beyond traditional FEMA and insurance funding sources and tackles funding shortfalls and time-frames for payouts. The guide lays out a cohesive, interdisciplinary team approach to financing recovery efforts across several funding mechanisms.



62 LEAD AND PARTNER NATIONALLY AND GLOBALLY TO BUILD RESILIENCE.

Advance best practices and collective leadership toward resilience and climate action.

Building resilience has quickly become a global movement, with cities leading the charge. Two-thirds of the global population will live in cities by 2050. Cities are centers of commerce and economic opportunity. The complex social, environmental, economic, and infrastructural systems of cities are uniquely impacted by shocks and stresses and face increasing challenges as our climate changes and urban areas continue to grow. But cities are also uniquely positioned to create livable and equitable environments for residents to thrive in the face of these challenges. Collectively, cities can meaningfully address global issues like climate change. Houston's effort to develop and implement this strategy launches our city into the global resilience movement, where we have an opportunity not only to learn from our peers, but also to demonstrate global leadership.

In many ways, Houston is the future. As a thriving multicultural metropolis, our demographics today look like what the country will be in future decades. As a coastal city already experiencing the impacts of climate change, the extreme weather events we have faced in the past decade will become more common for other cities as well. The efforts we take to build resilience here in Houston can serve as a roadmap for cities around the world.

SHOCKS/STRESSES



TIMEFRAME



Medium Term (2030)

IMPLEMENTATION THEMES



IMPLEMENTATION PARTNERS

COH / HCJO / GRCN / C40 / Climate Mayors / USDN / 10X / USWA / GARE / Texas Resilient Cities / New Orleans / GHP / GNO / The Netherlands / Denmark

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



62.1 Lead through membership in national and global networks.

Participation in national and global networks of resilience and sustainability practitioners—including the Global Resilient Cities Network (formerly 100 Resilient Cities), C40 Cities, Climate Mayors, Urban Sustainability Directors Network (USDN), Government Alliance on Race and Equity (GARE), U.S. Water Alliance, the 10 Across Water Summit (10X), and others—provides Houston with the opportunity to learn with and from our peers by sharing best practices, lessons learned, and proven tactics. These networks also provide an opportunity for collective leadership and impact in addressing global challenges like climate change, water resource management, and inequality. Houston is committed to playing a leadership role in the global resilience-building and climate action movement.

62.2 Coordinate resilience opportunities within Texas.

Regional and statewide coordination and action will be required to advance much of the work to build resilience in Houston. Texas also represents a unique context in which to implement resilience. Houston will also build resilience partnerships with Texas cities that are also members of 100 Resilient Cities, now the Global Resilient Cities Network, including El Paso and Dallas, as well as other Texas cities like Austin, San Antonio, Fort Worth, and cities in Greater Houston, to advance resilience-building actions and policies and to create forums for sharing best practices.

62.3 Continue resilience and recovery exchange with U.S. cities.

Houston has a lot to learn and share with other cities that have faced major disasters. Navigating the recovery process with local and federal partners can be incredibly challenging and building forward toward a more resilient future takes creativity and persistence. Houston business and government leaders participated in an exchange with the City of New Orleans to learn lessons from their long arc from recovery to resilience after Katrina and subsequent floods. Houston will continue to foster relationships with other U.S. cities to share best practices on building forward after disaster.

62.4 Further international partnerships to build greater resilience.

As part of the *Resilient Houston* strategy development process, the City partnered with the Royal Netherlands Embassy, The Water Institute of the Gulf, and New Orleans-based architecture firm Waggonner & Ball to host two Living with Water workshops to learn from the Dutch approach to water management and how similar strategies may be applied in Houston. The City recently participated in additional water management exchanges with Denmark. Houston will continue knowledge-sharing opportunities with international partners. As we implement resilience-building efforts here at home, we will seek to export our best practices around the globe.

GLOBAL CASE STUDIES



GOAL 14
PITTSBURGH, PENNSYLVANIA, USA
Roadmap for Inclusive Innovation
Page 142

GOAL 10
LOS ANGELES, CALIFORNIA, USA
One Water LA 2040 Plan
Page 117

GOAL 16
DA NANG, VIETNAM
Transboundary River Basin Management
Page 152

GOAL 15
EL PASO, TEXAS, USA
International Beltway Project
Page 147

GOAL 3
MEXICO CITY, MEXICO
Vision Zero CDMX and Mobility Law
Page 69

GOAL 12
DALLAS, TEXAS, USA
Dallas Equity Indicators
Page 131

GOAL 9
SINGAPORE
Active Beautiful Clean Waters
Page 107

GOAL 5
MEDELLÍN, COLUMBIA
Young Women's Talent Contest
Page 78

GOAL 6
MELBOURNE, AUSTRALIA
Metropolitan Urban Forest Strategy
Page 81



GOAL 17
MONTREAL, CANADA
Montreal Coordination of Emergency Services
Page 158

GOAL 2
BOSTON, MASSACHUSETTS, USA
Economic Mobility Lab
Page 59

GOAL 8
ROTTERDAM, THE NETHERLANDS
Water Sensitive Rotterdam
Page 101

GOAL 11
WASHINGTON, D.C., USA
District Stormwater
Page 125

GOAL 18
MIAMI, FLORIDA, USA
5-Step Guide to Innovative Disaster Recovery Financing
Page 164

GOAL 7
BELFAST, NORTHERN IRELAND
Belfast Vibrant City Centre
Page 88

GOAL 4
NEW ORLEANS, LOUISIANA, USA
Gentilly Resilience District
Page 75

GOAL 13
PORTO ALEGRE, BRAZIL
Cezar Busatto Law
Page 135

GOAL 1
CAPE TOWN, SOUTH AFRICA
Day Zero
Page 49

IMPLEMENTATION MATRIX

GOAL	ACTION	DESCRIPTION	ENGAGEMENT	FINANCE	METRICS	PARTNERSHIPS	POLICY	SMART CITIES
	1	Ensure Houstonians have the information, skills, and capacity to prepare for any emergency.	●	●		●	●	●
	2	Mobilize Houstonians to adapt in the face of climate change.	●			●		●
	3	Support small businesses to better withstand any disruption.	●		●	●		●
	4	Encourage community leadership, stewardship, and participation.	●		●	●		
	5	Maximize access to economic opportunity and prosperity for all Houstonians.		●		●	●	●
	6	Provide opportunities for more Houstonians to start, maintain, and grow small businesses.		●		●		●
	7	Prepare Houston's workforce and all young Houstonians for the jobs of the future.	●			●		●
	8	Make our streets 100% safe for all Houstonians.		●	●	●	●	●
	9	Shelter and house any Houstonian in need.		●	●	●	●	
	10	Proactively care for Houstonians' mental health.	●	●	●	●		
	11	Create a city where Houstonians of different ages and accessibility needs can thrive.	●			●		
	12	Support equitable neighborhoods through community planning and programs.	●		●	●		
	13	Accelerate investments in inclusive housing and neighborhood development.		●		●		●
	14	Invest in local arts and culture to build community cohesion and to celebrate neighborhood identity.	●	●		●		
	15	Leverage arts and culture to creatively engage Houstonians in risk awareness.	●		●	●		●
	16	Make Houston neighborhoods greener and cooler to combat extreme heat.	●		●	●		●
	17	Develop "Lily Pads" to serve as Neighborhood Resilience Hubs.	●	●	●	●		
	18	Ensure all neighborhoods have access to quality parks and nature.	●	●		●	●	●
	19	Grow equitable access to quality food to nourish Houston's status as a culinary capital.	●	●		●		
	20	Prevent, mitigate, and recover from the effects of environmental injustice in our communities.	●		●	●	●	●
	21	Create a citywide comprehensive housing study with neighborhood-specific recommendations.	●		●	●	●	

GOAL	ACTION	DESCRIPTION	ENGAGEMENT	FINANCE	METRICS	PARTNERSHIPS	POLICY	SMART CITIES
	22	Promote the need for safe, secure, and affordable homes and transportation access for all Houstonians.	●			●		
	23	Invest in transit-oriented and trail-oriented development.	●	●		●	●	●
	24	Protect and strengthen neighborhoods through appropriate infill development.	●	●	●	●	●	●
	25	Make room for water.	●	●	●	●	●	●
	26	Clean Houston's bayous and waterways.	●		●	●		●
	27	Advance research and technology to improve water management.	●		●	●	●	●
	28	Respect bayous and natural floodplains as an integral part of Houston's urban nature.		●	●	●		
	29	Increase access to our bayous for recreational, health, and other community benefits.		●		●		
	30	Encourage inclusive growth and economic development along bayou corridors.	●	●		●		
	31	Adopt and implement the Climate Action Plan goals and actions.	●		●	●		●
	32	Conduct a climate impact assessment to inform City policies and programs.	●		●	●		
	33	Holistically manage our water resources to be climate ready.	●	●	●	●	●	●
	34	Integrate green stormwater infrastructure into Houston's built environment.	●	●	●	●		●
	35	Equitably advance complete streets implementation to build resilient roads	●	●	●	●	●	●
	36	Advance and modernize building codes and standards.	●		●	●	●	●
	37	Advance and modernize Houston's integrated resource recovery management.	●	●	●	●	●	●
	38	Develop and improve partnerships that create and incentivize infrastructure maintenance.	●		●	●	●	●
	39	Promote equity through citywide policies and programs.	●	●	●	●	●	●
	40	Reach all Houstonians through equitable community engagement.	●			●		
	41	Make resilience a permanent part of Houston's systems and services.	●	●	●	●		

IMPLEMENTATION MATRIX

GOAL	ACTION	DESCRIPTION	ENGAGEMENT	FINANCE	METRICS	PARTNERSHIPS	POLICY	SMART CITIES
	42	Prioritize resilience in city budgeting, procurement, and capital improvements.	●	●	●	●		
	43	Leverage smart cities investments to address our most critical resilience challenges.	●		●	●		●
	44	Advance open data policies.	●		●	●		●
	45	Leverage Houston's energy capital role to lead innovation in the global energy transition.	●	●		●	●	●
	46	Incubate, connect, and support established and emerging industries.	●	●	●	●	●	●
	47	Partner with anchor institutions to further resilience innovation that strengthens and protects the region.	●	●		●		
	48	Work with regional partners to invest in an integrated mobility network.	●	●	●	●		●
	49	Improve first- and last-mile connections.	●	●		●	●	●
	50	Enable Houstonians to make mobility choices that improve well-being and reduce the cost of living.	●	●		●	●	
	51	Conserve regional undeveloped land for flood mitigation, environmental health, and recreation.		●	●	●		
	52	Develop long-term strategies with County partners to build the resilience of areas within Houston's extraterritorial jurisdiction.	●			●	●	
	53	Enhance regional preparedness.	●			●		●
	54	Increase protection of critical digital assets from cyberattacks.	●	●	●	●		●
	55	Improve emergency response and post-disaster recovery coordination.	●	●	●	●	●	●
	56	Develop a regional critical infrastructure catalogue.	.			●		
	57	Fortify greater Houston's lifelines and supply chains.	●		●	●		●
	58	Leverage disaster recovery efforts to accelerate the implementation of resilience measures.	●		●	●	●	●
	59	Leverage planned and proposed transformative regional projects to maximize resilience benefits.		●		●		
	60	Address legal and legislativebarriers to resilience building with local, state, and federal partners.	●			●	●	
	61	Update *Plan Houston* to integrate resilience goals.	●		●	●		
	62	Lead and partner nationally and globally to build resilience.				●		

UN SUSTAINABLE DEVELOPMENT GOALS MATRIX

1. No Poverty
2. Zero Hunger
3. Good Health and Well-Being
4. Quality Education
5. Gender Equality
6. Clean Water And Sanitation
7. Affordable and Clean Energy
8. Decent Work and Economic Growth
9. Industry, Innovation and Infrastructure
10. Reduced Inequalities
11. Sustainable Cities and Communities
12. Responsible consumption and production
13. Climate Action
14. Life Below Water
15. Life On Land
16. Peace, Justice and Strong Institutions
17. Partnerships for the Goals

GOAL	ACTION	DESCRIPTION	SD GOALS
	1	Ensure Houstonians have the information, skills, and capacity to prepare for any emergency.	
	2	Mobilize Houstonians to adapt in the face of climate change.	
	3	Support small businesses to better withstand any disruption.	
	4	Encourage community leadership, stewardship, and participation.	
	5	Maximize access to economic opportunity and prosperity for all Houstonians.	
	6	Provide opportunities for more Houstonians to start, maintain, and grow small businesses.	
	7	Prepare Houston's workforce and all young Houstonians for the jobs of the future.	
	8	Make our streets 100% safe for all Houstonians.	
	9	Shelter and house any Houstonian in need.	
	10	Proactively care for Houstonians' mental health.	
	11	Create a city where Houstonians of different ages and accessibility needs can thrive.	
	12	Support equitable neighborhoods through community planning and programs.	
	13	Accelerate investments in inclusive housing and neighborhood development.	
	14	Invest in local arts and culture to build community cohesion and to celebrate neighborhood identity.	
	15	Leverage arts and culture to creatively engage Houstonians in risk awareness.	
	16	Make Houston neighborhoods greener and cooler to combat extreme heat.	
	17	Develop "Lily Pads" to serve as Neighborhood Resilience Hubs.	
	18	Ensure all neighborhoods have access to quality parks and nature.	
	19	Grow equitable access to quality food to nourish Houston's status as a culinary capital.	
	20	Prevent, mitigate, and recover from the effects of environmental injustice in our communities.	

UN SUSTAINABLE DEVELOPMENT GOALS MATRIX

1. No Poverty
2. Zero Hunger
3. Good Health and Well-Being
4. Quality Education
5. Gender Equality
6. Clean Water And Sanitation
7. Affordable and Clean Energy
8. Decent Work and Economic Growth
9. Industry, Innovation and Infrastructure
10. Reduced Inequalities
11. Sustainable Cities and Communities
12. Responsible consumption and production
13. Climate Action
14. Life Below Water
15. Life On Land
16. Peace, Justice and Strong Institutions
17. Partnerships for the Goals

GOAL	ACTION	DESCRIPTION	SD GOALS
	21	Create a citywide comprehensive housing study with neighborhood-specific recommendations.	
	22	Promote the need for safe, secure, and affordable homes and transportation access for all Houstonians.	
	23	Invest in transit-oriented and trail-oriented development.	
	24	Protect and strengthen neighborhoods through appropriate infill development.	
	25	Make room for water.	
	26	Clean Houston's bayous and waterways.	
	27	Advance research and technology to improve water management.	
	28	Respect bayous and natural floodplains as an integral part of Houston's urban nature.	
	29	Increase access to our bayous for recreational, health, and other community benefits.	
	30	Encourage inclusive growth and economic development along bayou corridors.	
	31	Adopt and implement the Climate Action Plan goals and actions.	
	32	Conduct a climate impact assessment to inform City policies and programs.	
	33	Holistically manage our water resources to be climate ready.	
	34	Integrate green stormwater infrastructure into Houston's built environment.	
	35	Equitably advance complete streets implementation to build resilient roads	
	36	Advance and modernize building codes and standards.	
	37	Advance and modernize Houston's integrated resource recovery management.	
	38	Develop and improve partnerships that create and incentivize infrastructure maintenance.	
	39	Promote equity through citywide policies and programs.	
	40	Reach all Houstonians through equitable community engagement.	
	41	Make resilience a permanent part of Houston's systems and services.	

1. No Poverty
2. Zero Hunger
3. Good Health and Well-Being
4. Quality Education
5. Gender Equality
6. Clean Water and Sanitation
7. Affordable and Clean Energy
8. Decent Work and Economic Growth
9. Industry, Innovation, and Infrastructure
10. Reduced Inequalities
11. Sustainable Cities and Communities
12. Responsible Consumption and Production
13. Climate Action
14. Life Below Water
15. Life On Land
16. Peace, Justice, and Strong Institutions
17. Partnerships for the Goals

GOAL	ACTION	DESCRIPTION	SD GOALS
	42	Prioritize resilience in city budgeting, procurement, and capital improvement projects.	
	43	Leverage smart cities investments to address our most critical resilience challenges.	
	44	Advance open data policies.	
	45	Leverage Houston's energy capital role to lead innovation in the global energy transition.	
	46	Incubate, connect, and support established and emerging industries.	
	47	Partner with anchor institutions to further resilience innovation that strengthens and protects the region.	
	48	Work with regional partners to invest in an integrated mobility network.	
	49	Improve first- and last-mile connections.	
	50	Enable Houstonians to make mobility choices that improve well-being and reduce the cost of living.	
	51	Conserve regional undeveloped land for flood mitigation, environmental health, and recreation.	
	52	Develop long-term strategies with County partners to build the resilience of areas within Houston's extraterritorial jurisdiction.	
	53	Enhance regional preparedness.	
	54	Increase protection of critical digital assets from cyberattacks.	
	55	Improve emergency response and post-disaster recovery coordination.	
	56	Develop a regional critical infrastructure catalogue.	
	57	Fortify greater Houston's lifelines and supply chains.	
	58	Leverage disaster recovery efforts to accelerate the implementation of resilience measures.	
	59	Leverage planned and proposed transformative regional projects to maximize resilience benefits.	
	60	Advocate for addressing legal and legislative barriers and opportunities for resilience-building with local, state, and federal partners.	
	61	Address legal and legislative barriers to resilience building with local, state, and federal partners.	
	62	Lead and partner nationally and globally to build resilience.	

10X	10 Across Water Summit
AAH	Air Alliance Houston
AARP	American Association of Retired Persons
ADA	Americans with Disabilities Act
ADU	Accessory Dwelling Unit
AIA	American Institute of Architects
ALICE	Asset-Limited, Income-Constrained, and Employed
ARC	American Red Cross
BBI	Better Building Initiative
BBP	Buffalo Bayou Partnership
BCW	Bayou City Waterkeeper
BLC	Bayou Land Conservancy
BOMA	Building Owners and Managers Association
BPA	Bayou Preservation Association
BRT	Bus Rapid Transit
C40	C40 Cities Climate Leadership Group
CAP	City of Houston Climate Action Plan
CCCN	Cities Connecting Children to Nature
CDBG-DR RECOVERY	HUD Community Development Block Grant-Disaster
CDFI	Community Development Financial Institutions
CDS	Community Development Strategies
CEER	Coalition for Environment, Equity, and Resilience
CERT	Community Emergency Response Team
CIP	Capital Improvement Project
COH	City of Houston
CPA	City Parks Alliance
CRS	FEMA Community Rating System
DFPS	Texas Department of Family and Protective Services
DGC	Discovery Green Conservancy
DHS	United States Department of Homeland Security
DOE	United States Department of Energy
DOJ	United States Department of Justice
DRTX	Disability Rights Texas
EJ	environmental justice
EJSCREEN	EPA Environmental Justice Screening and Mapping Tool
EPA	United States Environmental Protection Agency
EPPP	Environmental Preferable Purchasing Policy
ETJ	Extraterritorial Jurisdiction
EV	electric vehicle
FCC	Federal Communications Commission
FEMA	United States Federal Emergency Management Administration
FRBNY	Federal Reserve Bank of New York
GARE	Government Alliance on Race and Equity
GBAN	Galveston Bay Action Network
GBF	Galveston Bay Foundation
GHCF	Greater Houston Community Foundation
GHFMC	Greater Houston Flood Mitigation Consortium
GHP	Greater Houston Partnership
GILE	Green Infrastructure Leadership Exchange
GLO	The State of Texas General Land Office
GNO	Greater New Orleans, Inc.
GRCN	Global Resilient Cities Network
GREAT	Gang Resistance Education Awareness Training
GSI	green stormwater infrastructure
HAA	Houston Arts Alliance
HARC	Houston Advanced Research Center
HAS	Houston Airport System
HC	Harris County
HCC	Houston Community College

HCE	Harris County Engineering
HCFCD	Harris County Flood Control District
HCIL	Houston Center for Independent Living
HCJO	Harris County Judge's Office
HCLT	Houston Community Land Trust
HCPCS	Harris County Pollution Control Services
HCSO	Harris County Sheriff's Office
HCT	Harris County Transit
HCTRA	Harris County Toll Road Authority
HFC	Houston First Corporation
HFSC	Houston Food System Collaborative
H-GAC	Houston-Galveston Area Council
HHA	Houston Housing Authority
HHC	Houston Housing Collaborative
HHR	Hurricane Harvey Registry
HHS	Harris Health System
HHSC	Texas Health and Human Services Commission
HISD	Houston Independent School District
HLB	Houston Land Bank
HOA	homeowner association
HOT	high-occupancy toll
HOV	high-occupancy vehicle
HPB	Houston Parks Board
HPC	Houston Permitting Center
HPD	Houston Police Department
HUD	United States Department of Housing and Urban Development
ICC	International Code Council
ID	identification
ISD	Independent School Districts
ITC	Intercontinental Terminals Company
JSC	NASA Johnson Space Center
KHB	Keep Houston Beautiful
KPC	Katy Prairie Conservancy
LDR	LDR Growth and Innovation Advisors
LEED	Leadership in Energy and Environmental Design
LINK	LINK Houston
LISC	Local Initiatives Support Corporation
MAAPNEXT	Harris County Modeling, Assessment, and Awareness Project
MBDA	Minority Business Development Agency
METRO	Metropolitan Transit Authority of Harris County
MMD	Management Districts
MPC	Memorial Park Conservancy
MUD	Municipal Utility District
NAHB	The National Association of Home Builders
NAMI	National Alliance on Mental Illness
NASA	National Aeronautics and Space Administration
NFIP	National Flood Insurance Program
NGO	non-governmental organization
NIST	National Institute of Standards and Technology
NLC	National League of Cities
NOAA	National Oceanic and Atmospheric Administration
PPP	public-private partnerships
PSH	permanent supportive housing
SBA	Houston Small Business Association
SCORE	SCORE Association
SMWBE	Small, Minority-owned, and Women-owned Business Enterprises
SPARK	SPARK School Park Program
SSPEED	Severe Storm Prediction, Education, & Evacuation from Disasters Center at Rice University
STEM	Science, Technology, Engineering, and Mathematics
SWADA	Southwest ADA Center

TCA	Texas Commission on the Arts
TCEQ	Texas Commission on Environmental Quality
TCH	Texas Children's Hospital
TDEM	Texas Division of Emergency Management
TDHCA	Texas Department of Housing and Community Affairs
TDM	Transportation Demand Management
TEA	Texas Education Agency
THC	Texas Historical Commission
THEA	Texas Health and Environment Alliance
TIRZ	Tax Increment Reinvestment Zone
TMC	Texas Medical Center
TNC	The Nature Conservancy
TOP	Texas Organizing Project
TPWD	Texas Parks & Wildlife Department
TRC	Texas Railroad Commission
TWCB	Texas Water Conservation Board
TWDB	Texas Water Development Board
TXDOT	Texas Department of Transportation
UASI	DHS Urban Area Security Initiative
ULI	Urban Land Institute
UNICEF	The United Nations Children's Fund
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USDN	Urban Sustainability Directors Network
USWA	U.S. Water Alliance
UTHSC	City The University of Texas Health Science Center
VOAD	Voluntary Organizations Active In Disaster
WBENC	Women's Business Enterprise National Council
WCAG	Web Content Accessibility Guidelines
WHA	West Houston Association

END NOTES

1 Sebastian, A., Gori, A., Blessing, R. B., Wiel, K. van der, & Bass, B. (2019). Disentangling the impacts of human and environmental change on catchment response during Hurricane Harvey. Environmental Research Letters, 14(12), 124023. *https://doi.org/10.1088/1748-9326/ab5234*

2 Risser, M. D., & Wehner, M. F. (2017b). Attributable Human-Induced Changes in the Likelihood and Magnitude of the Observed Extreme Precipitation during Hurricane Harvey. Geophysical Research Letters, 44(24), 12,457-12,464. *https://doi.org/10.1002/2017GL075888*

3 Knutson, T., Camargo, S. J., Chan, J. C. L., Emanuel, K., Ho, C.-H., Kossin, J., Mohapatra, M., Satoh, M., Sugi, M., Walsh, K., & Wu, L. (2019). Tropical Cyclones and Climate Change Assessment: Part I: Detection and Attribution. Bulletin of the American Meteorological Society, 100(10), 1987–2007. *https://doi.org/10.1175/BAMS-D-18-0189.1*

4 Greater Houston Partnership. (2019). Houston Facts (p. 56).

5 Houston State of Health. (n.d.). Houston :: Indicators :: Disparities Dashboard. Retrieved January 13, 2020, from *http://www.houstonstateofhealth.com/indicators/index/dashboard?alias=disparities*

6 Dug Begley, & St. John Barned-Smith. (2018, August 31). Fatal crashes in the Houston area. Houston Chronicle. *https://chronpremium.carto.com/builder/1e54c16f-e758-4a2d-8d88-bed469b8fbb8/embed*

7 Mark Collette, Matt Dempsey, Susan Carroll. (2016, May 7). Chemical Breakdown. Houston Chronicle. *https://www.houstonchronicle.com/local/texas/chemical-breakdown/*

8 University of Texas Southwestern Medical Center, & University of Texas System Population Health. (n.d.-a). Life Expectancy in Texas. Texashealthmaps.Com. Retrieved January 13, 2020, from *https://www.texashealthmaps.com*

9 Institute for Health Policy, UTHealth School of Public Health, & Health Policy, UTHealth School of Public Health. (2018). Health and Recovery in the New Year: A County-Wide Snapshot.

10 Greater Houston Partnership. (n.d.-a). Cost of Living Comparison | Houston.org. Retrieved January 13, 2020, from *https://www.houston.org/houston-data/cost-living-comparison*

11 Rice Kinder Institute for Urban Research. (2019). The 2019 Kinder Houston Area Survey. *https://kinder.rice.edu/houstonsurvey2019*

12 U.S. Census Bureau. (2018). American Community Survey.

13 Frey, W. H. (2019, January 31). How migration of millennials and seniors has shifted since the Great Recession. Brookings. *https://www.brookings.edu/research/how-migration-of-millennials-and-seniors-has-shifted-since-the-great-recession/*

14 U.S. Census Bureau. (2019). Older Population and Aging.

15 Kerby, S., & Burns, C. (2012, July 12). The Top 10 Economic Facts of Diversity in the Workplace. Center for American Progress. *https://www.americanprogress.org/issues/economy/news/2012/07/12/11900/the-top-10-economic-facts-of-diversity-in-the-workplace/*

16 Rock, D., & Grant, H. (2016, November 4). Why Diverse Teams Are Smarter. Harvard Business Review. *https://hbr.org/2016/11/why-diverse-teams-are-smarter*

17 Gompers, P., & Kovvali, S. (2018, July 1). The Other Diversity Dividend. Harvard Business Review, July–August 2018. *https://hbr.org/2018/07/the-other-diversity-dividend*

18 University of Texas Southwestern Medical Center, & University of Texas System Population Health. (n.d.-b). Life Expectancy in Texas. Texashealthmaps.Com. Retrieved January 13, 2020, from *https://www.texashealthmaps.com*

19 G. Scott Thomas, & Jen Para. (2018, June 15). Houston ranks among top U.S. metros for private-sector job growth. Houston Business Journal. *https://www.bizjournals.com/houston/news/2018/06/15/see-how-houston-ranks-among-top-metros-for-private.html*

20 Igor Popov. (2019, April 24). Housing Markets and Income Inequality. Apartment List: Rentonomics. *https://www.apartmentlist.com/rentonomics/housing-markets-and-income-inequality/*

21 Mayoral Task Force on Equity. (2017). Rising Together: A Roadmap to Confront Inequality in Houston [Report]. *https://scholarship.rice.edu/handle/1911/98863*

22 U.S. Census Bureau. (2018). American Community Survey.

23 Bullard, R. D. (2014). The Mountains of Houston: Environmental Justice and the Politics of Garbage. Cite, 93, 6.

24 Risser, M. D., & Wehner, M. F. (2017a). Attributable Human-Induced Changes in the Likelihood and Magnitude of the Observed Extreme Precipitation during Hurricane Harvey. Geophysical Research Letters, 44(24), 12,457-12,464. *https://doi.org/10.1002/2017GL075888*

25 Oldenborgh, G. J. van, Wiel, K. van der, Sebastian, A., Singh, R., Arrighi, J., Otto, F., Haustein, K., Li, S., Vecchi, G., & Cullen, H. (2017). Attribution of extreme rainfall from Hurricane Harvey, August 2017. Environmental Research Letters, 12(12), 124009. *https://doi.org/10.1088/1748-9326/aa9ef2*

26 Kristina Dahl, Erika Spanger-Siegfried, Rachel Licker, Astrid Caldas, John Abatzoglou, Nicholas Mailloux, Rachel Cleetus, Shana Udvardy, Juan Declet-Barreto, & Pamela Worth. (2019). Killer Heat in the United States: Climate Choices and the Future of Dangerously Hot Days. Union of Concerned Scientists. *https://www.ucsusa.org/resources/killer-heat-united-states-0*

27 National Oceanic and Atmospheric Administration (NOAA). (2018, September 27). NOAA updates Texas rainfall frequency values. *https://www.noaa.gov/media-release/noaa-updates-texas-rainfall-frequency-values*

28 Brown, V. (2019). Hourly Precipitation Climatology of the Southeast United States. LSU Doctoral Dissertations. *https://digitalcommons.lsu.edu/gradschool_dissertations/4983*

29 USGCRP. (2018).

30 Hayden, M. H., Wilhelmi, O. V., Banerjee, D., Greasby, T., Cavanaugh, J. L., Nepal, V., Boehnert, J., Sain, S., Burghardt, C., & Gower, S. (2017). Adaptive Capacity to Extreme Heat: Results from a Household Survey in Houston, Texas. Weather, Climate, and Society, 9(4), 787–799. *https://doi.org/10.1175/WCAS-D-16-0125.1*

31 Texas A&M Forest Service. (2012, September 25). Texas A&M Forest Service survey shows 301 million trees killed by drought TFS. *https://tfsweb.tamu.edu/content/article.aspx?id=27436*

32 Susan Combs. (2012). The Impact of the 2011 Drought and Beyond (p. 16). Texas Comptroller of Public Accounts.

33 Electric Reliability Council of Texas (ERCOT). (2017). ERCOT Responds to Hurricane Harvey. *http://www.ercot.com/help/harvey*

34 USGCRP. (2018). Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II (p. 1515). U.S. Global Change Research Program.

35 Office for Coastal Management, National Oceanic and Atmospheric Administration (NOAA). (n.d.). Hurricane Costs. Retrieved January 13, 2020, from *https://coast.noaa.gov/states/fast-facts/hurricane-costs.html*

36 Todd Litman. (2015). Analysis of Public Policies That Unintentionally Encourage and Subsidize Urban Sprawl. Victoria Transport Policy Institute, Supporting paper commissioned by LSE Cities at the London School of Economics and Political Science, on behalf of the Global Commission on the Economy and Climate *(www.newclimateeconomy.net)* for the New Climate Economy Cities Program.

37 Greater Houston Partnership. (n.d.-b). The Energy Industry in Houston. Retrieved January 13, 2020, from *https://www.houston.org/why-houston/industries/energy*

38 City of Houston. (n.d.). Business Overview - Economy and Trade. Retrieved January 13, 2020, from *https://www.houstontx.gov/abouthouston/economytrade.html*

39 Texas Medical Center, Houston. (n.d.). TMC Medical Statistics. Retrieved January 13, 2020, from *https://www.tmc.edu/about-tmc/facts-and-figures/*

40 Coy Davidson. (2019, August 8). Houston Healthcare Market Report | Mid-Year 2019. The Tenant Advisor. *http://www.coydavidson.com/healthcare/houston-healthcare-market-report-mid-year-2019/*

41 Bauer College of Business, University of Houston. (2018, December 11). The Economic Outlook for Houston in 2019: Oil Prices Are Up Again, But Oil Risk Continues. *https://www.bauer.uh.edu/centers/irf/houston-updates.php*

42 KPMG and Center for Houston's Future. (2018). Center for Houston's Future Energy Project Results.

43 U.S. Census Bureau. (2017). American Community Survey, 5-Year Estimates.

44 American Forests. (2000). Urban Ecosystem Analysis for the Houston Gulf Coast Region: Calculating the Value of Nature (p. 12).

45 Center for Neighborhood Technology. (n.d.). Housing and Transportation Affordability Index. Retrieved January 13, 2020, from *http://htaindex.cnt.org/map/*

46 Assumptions: 20 units per acre; ea. site avg 20 acres; 25 jobs per acre, based on Nelson Nygaard. (2011). TOD Framework, Chapter 4: TOD Toolbox. *https://cmt-stl.org/app/uploads/2011/10/TOD-Framework-Chapter-4-TOD-Toolbox.pdf*

47 National Academies of Sciences, Engineering, and Medicine. (2016). Transit Supportive Parking Policies and Programs, Synthesis 122. The National Academies Press. *https://doi.org/10.17226/23493*

48 Energy Star. (2012). DataTrends: Benchmarking and Energy Savings. *https://www.energystar.gov/buildings/tools-and-resources/datatrends-benchmarking-and-energy-savings*

49 Texas Higher Education Coordinating Board. (2019). Texas Higher Education Enrollments.

50 Accenture & The Greater Houston Partnership. (2017). Innovation in Houston: A Study of the Bayou City's Startup Ecosystem.

51 U.S. Chamber of Commerce Foundation, 1776, & Free Enterprise. (2016). Innovation That Matters 2016. *https://www.1776.vc/reports/innovation-that-matters-2016/*

52 U.S. Chamber of Commerce Foundation, 1776, & Free Enterprise. (2016).

53 Business Facilities. (2019, July 24). Business Facilities' 2019 Metro Rankings Report. *https://businessfacilities.com/2019/07/business-facilities-2019-metro-rankings-report/*

54 Dan Nabors, Robert Schneider, Dalia Leven, Kimberly Lieberman, Colleen Mitchell. (2008). Pedestrian Safety Guide for Transit Agencies. U.S. Department of Transportation, Federal Highway Administration. *https://safety.fhwa.dot.gov/ped_bike/ped_transit/ped_transguide/*

55 Mark Collette, Matt Dempsey, Susan Carroll. (2016, May 7). Chemical Breakdown. Houston Chronicle. *https://www.houstonchronicle.com/local/texas/chemical-breakdown/*

Resilient Houston **was the first resilience strategy to be funded by local support. Thank you to Shell Oil Company and Jason Klein, Vice President, U.S. Energy Transition Strategy for their generous support of Houston's participation in 100 Resilient Cities—Pioneered by the Rockefeller Foundation.**

MAYOR'S OFFICE OF RESILIENCE

Marissa Aho, Chief Resilience Officer

MAYOR'S OFFICE OF RECOVERY

Stephen Costello, Chief Recovery Officer / Laura Patiño / Ryan Slattery / Cynthia Castro

OFFICE OF MAYOR SYLVESTER TURNER

Marvalette Hunter, Chief of Staff / Andy Icken / Bill Kelly / Brandon Denton / Christa Stoneham / Deborah McNulty / Gabe Cazares / George Buenik / Jack Hanagriff / Jackie Miller / James Koski / Jesse Bounds / Juliet Stipeche / Marc Eichenbaum / Maria Montes / Maria Town (former) / Shannon Buggs / Stephen Hall / Steven David (former) / Suzane Abedi

CITY OF HOUSTON DEPARTMENTS

Department of Planning and Development:
Margaret Wallace-Brown / Misty Staunton / Lauren Grove / Melissa Beeler / Peter Eccles / Abraham Zorrilla / Davonte Caldwell / Jennifer Ostlind / Tonya Sawyer / Velyjha Southern / Eriq Glenn / Lynn Henson / Annette Mitchell / Nicole Smothers / David Welch

Houston Public Works:
Carol Haddock / Jeffrey Weatherford / Sharon Citino / Maureen Crocker / Paula Pineda

Housing and Community Development Department:
Tom McCasland / Sara Labowitz (former) / Jessica Preheim / Ray Miller

Administrative and Regulatory Affairs Department:
Tina Paez / Lara Cottingham / Larissa Williams / Nicholas Hadjigeorge

Finance Department: Tantri Emo

Department of Neighborhoods:
TaKasha Francis / Rhonda Sauter

Office of Business Opportunity:
Marsha Murray / Lalla Morris / Paula Pineda / Carlecia Wright (former)

Office of Emergency Management:
Melanie Bartis / Shelli Carter

Houston Health Department:
Stephen Williams / Loren Hopkins

Houston Information Technology Services:
Lisa Kent / Ray Webb / Summer Xiao

Houston Parks and Recreation Department:
Steve Wright / Kelli Ondracek

Solid Waste Management:
Harry Hayes / Sarah Mason

ROCKEFELLER FOUNDATION

Otis Rolley / Rachel Isacoff

100 RESILIENT CITIES

Corinne LeTourneau / Peter Jenkins / Anna Friedman / Paul Lillehaugen / Paul Nelson

GLOBAL RESILIENT CITIES NETWORK

Stewart Sarkozy-Banoczy / Laurian Farrell

THE WATER INSTITUTE OF THE GULF

Justin Ehrenwerth / Colleen McHugh / Allison DeJong

HR&A ADVISORS

Jeff Hebert / Jared Press / Taylor McClain / Phoebe Willett

ASAKURA ROBINSON

Alexandra Miller / Keiji Asakura / Luis Guajardo / Katie Coyne

THE KINDER INSTITUTE FOR URBAN RESEARCH

Kyle Shelton / Bill Fulton

BLOOMBERG ASSOCIATES

Amanda Burden / Olivia Rokotuiveikau / Lauren Racusin

DESIGN

Place & Page:

Colleen Corcoran / Bliss Parsons / Tiffanie Tran

LIVING WITH WATER

Waggonner & Ball Architecture / Environment:

David Waggonner / Janice Barnes / Andy Sternad / Ramiro Diaz / Lex Agnew / Donald Del Cid / Mac Ball

The Water Institute of the Gulf:

Dale Morris / Hugh Roberts / Colleen McHugh / Ryan Clark / Lauren Grimley / Christine DeMyers / Huy Vu

Royal Netherlands Embassy: Bart de Jong

RESILIENT HOUSTON WORKING GROUP MEMBERS

Abraham Zorrilla / Ali Mostafavi / Allison Pate / Amanda Timm / Ann Lents / Anne Gatling Haynes / Anne Olson / Ashley Allen / Auggie Campbell / Bakeyah Nelson / Beth White / Beverly Brownlow / Bob Mitchell / Brett Perlman / Chang Chiu / Chase Kronzer / Cheryl Mergo / Chris Hensman / Chrishelle Palay / Christa Stoneham / Christof Spieler / Clint Harbert / Craig Maske / Daisy James / Dan Snare / David Kim / Deborah McNulty / Deborah January-Bevers / DeVon Douglass / Edmund Petry / Elaine Morales / Elizabeth Love / Elizabeth Brock / Erica Brown / Eva Thibaudeau / Frances Valdez / Gabe Baker / Greg Simpson / Guy Hagstette / Harrison Humphreys / Henry Van de Putte III / Iris Gonzalez / Isabel Longoria / Jaime Gonzalez / Jamie Brewster / Janis Burke / Jeff Taebel / Jessica Preheim / Jordan Macha / Juan Muñoz / Judson Robinson / Kate Vickery / Kim Mickelson / Lara Cottingham / LaShaunda Rene / Laura Goldberg / Laura Rodriguez / Laura Patiño / Lauren Grove / Lauren Hainley / Lisa Graiff / Marcus Martinez / Mardie Paige / Maria Town / Mark Solano / Mary Vazquez / Mary Anne Piacentini / Maureen Crocker / Melanie Bartis / Melissa Beeler / Meredith Jennings / Michael Bloom / Michael Huffmaster / Michi Bruns Clay / Misty Staunton / Norma Bradley / Oni Blair / Paula Pineda / Peter Eccles / Rachel Powers / Roksan Okan-Vick / Ryan Slattery / Sarah Labowitz / Sasha Marshall / Scott Jones / Shangjia Dong / Shannon Buggs / Sharon Citino / Shelli Carter / Stephanie Thomas / Susan Rogers / Zoe Middleton

REGIONAL PARTNERS

Harris County Judge's Office / Harris County Flood Control District / Houston-Galveston Area Council / METRO

GLOBAL CITIES AND CHIEF RESILIENCE OFFICERS

Cape Town / Boston / Mexico City / New Orleans / Medellín / Melbourne / Belfast / Rotterdam / Singapore / Los Angeles / Washington, D.C. / Dallas / Porto Alegre / Pittsburgh / El Paso / Da Nang / Montreal / Miami / Miami Beach / Miami-Dade County and many more.

FEBRUARY 2020

houstontx.gov/mayor/chief-resilience-officer.html