

0. Introduction

(0.1) Please give a general description and introduction to your city including your city’s reporting boundary in the table below.

	Administrative boundary	Description of city
Please complete	City / Municipality	Houston is known as the Space City, Bayou City and Energy Capital of the World. Houston is one of the nation’s fastest-growing (among cities with a population of 50,000 or more) and most diverse cities. Houston’s economy includes a broad industrial base in the energy, aeronautics, and technology industries, and ranks third among metro areas in Fortune 500 headquarters. Houston is also home to NASA’s Johnson Space Center, several educational research institutions and colleges, and the Texas Medical Center, the largest medical complex in the world. Houston is the fourth largest city in the United States, with an estimated population of 2.3 million (2019 Population Estimates, May 2020) and a land area of 671 square miles (1,738 sq. kilometers). Houston’s record high temperature is 109 °F (set August 27, 2011 and September 4, 2000) and record low temperature of 5 °F (set January 18, 1930). Houston averages approximately 50 inches of rain per year. During the past few years, Houston experienced several federally declared flood disasters, most notable of which was Hurricane Harvey in 2017. In 2021, Houston, and Texas, experienced another extreme weather event, Winter Storm Uri. Winter Storm Uri, along with its frigid temperatures, caused widespread power outages and disruptions in water service in Houston and throughout Texas. PJ21779_City_Limit_ETJ.pdf

(0.2) If you have not previously submitted your Letter of Commitment to the Global Covenant of Mayors, either through the relevant regional covenant or through the Global Covenant secretariat, please attach the letter signed by an appropriately mandated official (e.g. Mayor, City Council) to this question.

Houston’s commitment has already been acknowledged by the Global Covenant per <https://www.globalcovenantofmayors.org/our-cities/?search-city=Houston>. As a result, per the CDP Cities Guidance, Houston does not need to reattach its letter.

City Details

(0.3) Please provide information about your city’s Mayor or equivalent legal representative authority in the table below.

	Leader title	Leader name	Current term end year
Please complete	Mayor	Sylvester Turner	2023

(0.4) Please select the currency used for all financial information disclosed throughout your response.

USD US Dollar

(0.5) Please provide details of your city’s current population. Report the population in the year of your reported inventory, if possible.

	Current population	Current population year	Projected population	Projected population year
Please complete	2320268	2019	2691080	2030

US Census Population Estimates (v2019): <https://www.census.gov/quickfacts/fact/table/houstoncitytexas,US/LND110210> Population Projections: <https://datalab.h-gac.com/rgf2018/>

(0.6) Please provide further details about the geography of your city.

	Land area of the city boundary as defined in question 0.1 (in square km)
Please complete	1737.88

<https://www.houstontx.gov/planning/Demographics/>

1. Governance and Data Management

Governance

(1.0) Please detail sustainability goals and targets (e.g. GHG reductions) that are incorporated into your city's master plan and describe how these are addressed in the table below.

Sustainability goals and targets	Description
Adaptation targets	Resilient Houston is a framework for collective action that links new and existing efforts to protect Houston against future disasters—from hurricanes and flooding to extreme heat waves—and chronic stresses such as aging infrastructure, poor air quality, and climate change. The strategy frames five key Visions for Houston's future along with 18 goals and 62 actions describing timeframes, partners, implementation opportunities, and corresponding U.N. Sustainable Development Goals. The master plan includes a goal to create resilient man-made and natural systems that protect citizens and assets from disasters and other risks. This goal measures and aims to reduce the number of structures at-risk in the floodplain, percent of residences inside floodplain, and percent of power distribution that is underground or fortified. During the FY 2022 budget process, departments identified, and included in budget presentations to City Council, 'high priority' resilience and climate action initiatives. The incorporation of resilience and climate action initiatives into the budget process reinforces the City's commitment to integrate resilience and implementation actions into city-wide planning and city operations. Another adaptation measure is to implement 100 green stormwater infrastructure projects by 2025, and remove all habitable structures from the floodway by 2030.
Emissions reduction targets	In April 2020, the City of Houston launched its Climate Action Plan (CAP) which establishes an overall goal to achieve carbon neutrality by 2050. Houston City Council adopted the Houston CAP October 2020. The Houston CAP sets interim greenhouse gas emissions reduction goals for 2030 (40% reduction) and 2040 (75% reduction) from the 2014 baseline, with the final goal of a 100% reduction by 2050. The CAP outlines the additional goals, targets and actions designed to assist the City in reaching its overall GHG emissions goal. During 2020, the City formed and kicked-off the CAP implementation working groups. The City also partnered with BP to advance major CAP goals and entered into a contract with the Rocky Mountain Institute (RMI) to assist with implementation of the Houston CAP. During the FY 2022 budget process, departments identified, and included in the budget presentations to City Council, 'high priority' resilience and climate action initiatives. The incorporation of resilience and climate action initiatives into the budget process reinforces the City's commitment to integrate resilience and implementation actions into city-wide planning and city operations. https://www.houstontx.gov/council/committees/fy2022budgetworkshops.html http://greenhoustontx.gov/climateactionplan/
Renewable energy targets	The Houston Climate Action Plan includes a target to power municipal operations with 100% renewable energy by 2025 (as of July 1, 2020, Houston began purchasing 100% renewable energy through a contract with NRG, achieving its CAP goal). The CAP also includes a target to generate 5 million MWh from local rooftop and community solar projects per year by 2050. In April 2021 Mayor Turner and Solar United Neighbors (SUN) announced the launch of Houston's citywide solar co-op. Additional CAP goals, targets, strategies and actions include: grow Houston's investment in renewable and resilient energy • assess opportunities for microgrids, solar, and battery storage at municipal properties and under-used land by 2025 • develop and enforce standards to accommodate solar and battery installation in new commercial and industrial buildings by 2025; support and promote retail renewable energy opportunities • provide Houston specific educational resources about renewable retail product options by 2025; advocate for renewable energy policies at the local, state, and federal levels • lobby for federal policies that facilitate renewable energy for the US Power Sector by 2025. Additional renewable energy goals and targets can be found in the Houston Climate Action Plan. Several of the CAP targets and goals also align with the Houston Resilient Plan and are cross-referenced in the CAP. http://greenhoustontx.gov/climateactionplan/ https://www.houstontx.gov/mayor/chief-resilience-officer.html
Energy efficiency targets	Houston Climate Action Plan energy efficiency targets include: adopt the 2021 ICC model building code by 2025 with minimum 5-year update and double the current number of PACE projects by 2025. The City achieved its PACE target December 2020. Additional CAP goals, strategies and actions include: update energy code and increase compliance • increase capacity and training for plan review and code inspection staff by 2025; develop programs that improve building energy efficiency • adopt a municipal benchmarking and disclosure policy for municipal buildings by 2021 • develop benchmarking and audit programs for commercial, industrial and residential buildings by 2030; reduce water and wastewater energy consumption by 10%; promote clean energy financing programs • expand utility energy financing and incentive programs • promote weatherization programs to reduce residential energy consumption by 2025; provide training in the operation, management, and maintenance of relevant building systems • promote existing building owner/operator trainings and certifications and identify programs that need to be developed. http://greenhoustontx.gov/climateactionplan/CAP-April2020.pdf State law (Texas Health and Safety Code §388.005(c)) requires certain political subdivisions, such as the City of Houston, to establish a goal to reduce electric consumption by at least five percent each state fiscal year. The City of Houston actively strives to meet this 5% target each year. In 2021, the City of Houston reported a 7% reduction in its electric consumption for municipal operations. The City also participates in the Department of Energy Better Buildings Challenge and was ranked number 7 in the EPA 2021 Top Cities for Energy Star Certified Buildings list. City Council increased the LEED Tax abatement program incentives to nearly double. The City also offers a LEED incentive program, which allows buildings registered for LEED certification to take part in the Quick Start program. The Quick Start program provides a means for expediting the plan review of certain large commercial design projects. https://comptroller.texas.gov/programs/seco/reporting/local-gov.php
Water security targets	Houston has a water use reduction goal of 1.6% every five years. Houston plans to reduce water loss by 1% every year with the long-term target of 10% or less of water loss. This goal is reasonable given Houston's water loss trends in the last decade, and the target is consistent with the water loss target adopted by the Region H Water Planning Group in the 2016 Region H Water Conservation Plan. City of Houston Water Conservation Plan: https://www.publicworks.houstontx.gov/water-conservation-plan
Waste management targets	The Houston CAP includes a target to reduce residential waste 50% by 2040 and to adopt the Long Range Solid Waste Plan, a 20-year long range solid waste management plan (the Long Range Solid Waste Plan was finalized February 2021). The plan proposes to among other things, right-size collection's operations with necessary collections equipment and staffing, increase the number of inspectors needed to address illegal dumping enforcement in a more substantial way, and provide first class programs designed to reduce waste generation and improve quality of recycling programs. For additional Houston CAP waste management goals and targets: http://greenhoustontx.gov/climateactionplan/ Proposed Long Range Solid Waste Plan: http://www.houstontx.gov/solidwaste/longrange/01plan.html
Other, please specify (Transporation/Mobility/Walkability)	The Houston Climate Action Plan establishes a goal to reduce vehicle miles traveled (VMT) per capita, with a corresponding target to reduce VMT per capita of 20% by 2050. The CAP also includes a target of zero traffic-related fatalities and serious injuries on Houston streets by 2030 and to build 500 miles of high-comfort bike lanes by 2025. In 2020, City Council passed the Walkable Places and Transit Oriented Development Ordinance to encourage more walkable development. November 2020, the City released the Vision Zero Action Plan, which identifies 50 actions the City will take to eliminate traffic deaths and serious injuries by 2030. The City's Bicycle Plan sets a goal to become a Gold Level Bike Friendly City with almost 1,800 miles of high comfort bikeways by 2027. The Bicycle Plan was adopted by City Council in 2017. Additional CAP strategies and actions include: implement integrated multi-modal transportation systems • expand use of micro-mobility devices by 2025 • support METRONext Moving Forward Plan implementation, particularly BRT and two-way HOV lanes by 2025 • empower TIRZ and management districts to champion multi-modal transportation • coordinate regional transit operations and payment systems; build and retrofit complete, transit-oriented neighborhoods • adopt proposed Walkable Places and Transit-Oriented Development Ordinance Amendment (Adopted August 2020) • implement price strategies for public parking • broaden geography of Transit Corridor Ordinance, Complete Communities, and H-GAC Livable Centers Program. http://greenhoustontx.gov/climateactionplan/CAP-April2020.pdf https://www.houstontx.gov/visionzero https://houstontx.gov/visionzero/pdf/VZAP_Final%20Report.pdf

Houston has established a broad range of sustainability goals and targets, which are detailed in various plans, including the Resilient Houston Plan and the Houston Climate Action Plan. Plan Houston is the City's general plan to help guide future development.
<http://greenhoustontx.gov/climateactionplan/CAP-April2020.pdf>
<https://www.houstontx.gov/mayor/Resilient-Houston-20200518-single-page.pdf>
<http://www.houstontx.gov/planhouston/index.html>

(1.6) Please provide information on the overall impact of COVID-19 on climate action in your city.

	Impact of COVID-19 on climate action in your city	Comment
Response	Other, please specify (Diverted Resources)	The Coronavirus decreased internal capacity on sustainability, energy efficiency, renewable energy and climate action work, and slowed down the city's ability to engage with the community. However, it has highlighted the necessity to prioritize health as climate action projects and programs are implemented.

(1.7) Please provide information specifically on the impact of the COVID-19 economic response on climate action in your city and synergies between COVID-19 recovery interventions and climate action.

	Impact of COVID-19 economic response on city's budget for financing climate action in your city	COVID-19 recovery interventions and climate action synergies	Explanation
Response	Other, please specify (Reallocation of Resources & Integration into resilience work)	Other, please specify (Reallocation of Resources & Integration into resilience work)	To effectively navigate through the global coronavirus pandemic, Houston updated the Resilient Houston plan to include a COVID-19 addendum to guide the city's response to this public health crisis and associated economic impacts. With the COVID-19 global pandemic and associated economic challenges, this vision and associated goals, targets, and actions are more critical than ever. The COVID-19 addendum to Resilient Houston helps Houston to manage the crisis while building its future. The COVID-19 addendum identifies 42 of Resilient Houston's 62 actions and how they apply to ongoing COVID-19 response and recovery phases, including emergency response, stabilization, adaptive recovery, and institutionalization. It provides short tangible examples of how the COVID-19 global pandemic has amplified our existing resilience challenges and created new challenges to address. Examples include how COVID-19 impacts employment and workforce development, supporting small businesses and products made locally, increasing equitable access to open recreational space for physical and mental health, equitable community engagement during recovery, and leveraging smart city infrastructure to better track public health data.

2. Climate Hazards and Vulnerability

Climate Risk and Vulnerability Assessment

(2.0) Has a climate change risk and vulnerability assessment been undertaken for your city?

Yes

Climate Impact Assessment for the City of Houston: <https://www.houstontx.gov/mayor/Climate-Impact-Assessment-2020-August.pdf> Heat Mapping Assessment: <https://www.h3at.org/> <https://www.houstontx.gov/mayor/press/climate-action-summit.html>

(2.0a) Please select the primary process or methodology used to undertake the risk and vulnerability assessment of your city.

	Primary methodology	Description
Risk assessment methodology	Other, please specify (C40's Climate Risk Assessment Guidance)	https://cdn.locomotive.works/sites/5ab410c8a2f42204838f797e/content_entry5ab410fb74c4833febe6c81a/5b17dd2614ad660612c5dc54/files/C40_Cities_Climate_Change_Risk_Assessment_Guidance.pdf?1541689629

(2.0b) Please attach and provide details on your climate change risk and vulnerability assessment. Please provide details on the boundary of your assessment, and where this differs from your city's boundary, please provide an explanation.

Publication title and attach the document

Climate Impact Assessment for the City of Houston; and Houston and Harris County Texas Heat Watch Report
ClimateImpactAssessment2020August.pdf
Summary Report_Heat Watch Houston Harris County_112320.pdf

Web link

<http://www.greenhoustontx.gov/reports/Climate-Impact-Assessment-2020-August.pdf> and <https://www.h3at.org/>

Year of publication or approval from local government

2020

Boundary of assessment relative to city boundary (reported in 0.1)

Larger – covers the whole city and adjoining areas

Explanation of boundary choice where the assessment boundary differs from the city boundary

The boundary was expanded beyond the city boundaries based on a partnership with a local research firm. The data is based on 11 individual weather stations across the Greater Houston area.

Primary author of assessment

Consultant

Does the assessment identify vulnerable populations?

No

Areas/sectors covered by the risk and vulnerability assessment

Energy
Water Supply & Sanitation
Education
Public health
Emergency Management

Please explain

The Climate Impact Assessment presents and analyzes historical and projected trends in 27 different climate indicators, from the temperature of the hottest day of the year to projected changes in heavy precipitation at all 11 weather station locations. Sectors selected are the most relevant for the 27 different indicators. Phase 2 of the Climate Impact Assessment is in process and scheduled for completion in 2021. The scope for Phase 2 includes: using data from the City's Climate Impact Assessment (CIA), Resilience Assessment, and Urban Heat Mapping Project (H3AT), Houston Advanced Research Center (HARC) will deliver: 1 online Climate Impacts story map that fulfills C40's essential elements for Houston's Climate Impact Assessment, including visualizations and descriptions pertaining to: □ Demographic and Socioeconomic Context □ Current environmental quality: e.g. water quality, air quality, biodiversity and green areas □ When relevant to climate change, extra information on resource management: e.g. solid waste volume and management, food sources and consumption, deforestation, alien plant invasions □ Vulnerable population groups and relevant sectors, assets, or services most affected by previous and future climate hazards □ Factors that will most greatly affect the jurisdiction's adaptive capacity 3 topical summaries from CIA results focused on community impacts and social vulnerability and to cover urban heat, drought, and intensified precipitation

(2.0d) If the city's climate change risk assessment has been conducted more than 4 years ago, what update/revision process does your city have in place?

Update/revision process

Update/revision process in place

Other, please specify (N/A)

Provide more details on the update / revision process for your climate risk or vulnerability assessment

Climate Hazards

(2.1) Please list the most significant climate hazards faced by your city and indicate the probability and consequence of these hazards, as well as the expected future change in frequency and intensity. Please also select the most relevant assets or services that are affected by the climate hazard and provide a description of the impact.

Climate Hazards

Extreme hot temperature > Extreme hot days

Did this hazard significantly impact your city before 2021?

Yes

Current probability of hazard

High

Current magnitude of hazard

Medium

Social impact of hazard overall

Fluctuating socio-economic conditions
Increased risk to already vulnerable populations

Most relevant assets / services affected overall

Energy
Water supply & sanitation
Transport
Tourism
Public health
Emergency services

Please identify which vulnerable populations are affected

Women & girls

Children & youth
Elderly
Indigenous population
Marginalized groups
Persons with disabilities
Persons with chronic diseases
Low-income households
Unemployed persons
Persons living in sub-standard housing

Future change in frequency

Increasing

Future change in intensity

Increasing

Future expected magnitude of hazard

High

When do you first expect to experience those changes in frequency and intensity?

Immediately

Please describe the impacts experienced so far, and how you expect the hazard to impact in the future

Extreme hot days increase energy use in buildings, contribute to higher ozone levels, cause brownouts which can lead to increased levels of PM 2.5 and PM 10, and lead to heat-related illnesses/death. Between 2003 to 2008, there were 31 heat-related deaths in Harris County. The National Center for Atmospheric Research estimates that by 2050 more than half of summer nights in Houston may qualify as high heat stress nights and the number of summer days that qualify for heat advisories may increase. Increased energy usage also means increased water usage for the energy production at power plants. Additionally, hot and sunny conditions paired with increased electricity usage can lead to greater ozone formation, and the greater Houston region is currently failing to meet its federal and state ozone standards.

Climate Hazards

Water Scarcity > Drought

Did this hazard significantly impact your city before 2021?

Yes

Current probability of hazard

High

Current magnitude of hazard

Medium

Social impact of hazard overall

Fluctuating socio-economic conditions

Most relevant assets / services affected overall

Water supply & sanitation
Transport
Food & agriculture

Please identify which vulnerable populations are affected

Children & youth
Elderly
Persons with disabilities
Persons with chronic diseases
Low-income households
Persons living in sub-standard housing

Future change in frequency

Increasing

Future change in intensity

Increasing

Future expected magnitude of hazard

High

When do you first expect to experience those changes in frequency and intensity?

Immediately

Please describe the impacts experienced so far, and how you expect the hazard to impact in the future

More frequent droughts deplete water resources for people and wildlife and cause infrastructure problems. It also leads to drought-stressed trees and vegetation which reduces the urban forest that would normally provide cooling and improve air quality.

Climate Hazards

Extreme hot temperature > Heat wave

Did this hazard significantly impact your city before 2021?

Yes

Current probability of hazard

High

Current magnitude of hazard

Medium

Social impact of hazard overall

Fluctuating socio-economic conditions
Increased risk to already vulnerable populations

Most relevant assets / services affected overall

Energy
Water supply & sanitation
Public health

Please identify which vulnerable populations are affected

Children & youth
Elderly
Persons with disabilities
Persons with chronic diseases
Low-income households
Persons living in sub-standard housing

Future change in frequency

Increasing

Future change in intensity

Increasing

Future expected magnitude of hazard

High

When do you first expect to experience those changes in frequency and intensity?

Immediately

Please describe the impacts experienced so far, and how you expect the hazard to impact in the future

Heat waves increase energy use in buildings, contribute to higher ozone levels, can be potential causes for brownouts which lead to increased levels of PM 2.5 and PM 10, and lead to heat-related illnesses/death. Between 2003 to 2008, there were 31 heat-related deaths in Harris County. Increased energy usage also means increased water usage for energy production at power plants.

Climate Hazards

Flood and sea level rise > Flash / surface flood

Did this hazard significantly impact your city before 2021?

Yes

Current probability of hazard

High

Current magnitude of hazard

High

Social impact of hazard overall

Fluctuating socio-economic conditions
Increased incidence and prevalence of disease and illness
Increased demand for public services
Increased demand for healthcare services
Increased risk to already vulnerable populations
Increased resource demand
Population displacement

Most relevant assets / services affected overall

Water supply & sanitation
Transport
Food & agriculture
Waste management
Public health
Emergency services

Please identify which vulnerable populations are affected

Women & girls
Children & youth
Elderly
Marginalized groups
Persons with disabilities
Persons with chronic diseases
Low-income households
Unemployed persons
Persons living in sub-standard housing

Future change in frequency

Increasing

Future change in intensity

Increasing

Future expected magnitude of hazard

High

When do you first expect to experience those changes in frequency and intensity?

Immediately

Please describe the impacts experienced so far, and how you expect the hazard to impact in the future

Houston has experienced 6 federally declared flooding disasters in 5 years, including Hurricane Harvey and Tropical Storm Imelda. Flooding can disrupt mobility, damage buildings and assets in the community assets, and increase risk of a water-borne illnesses. Flooding in the area also increases risk of environmental contamination. In the aftermath of Hurricane Harvey, Escherichia coli was found in flood waters at 4 times the level considered safe. Additionally, elevated levels of lead and arsenic were found in flood water. Flooded houses also face risk of mold growth which can irritate or damage the respiratory tract and exacerbate chronic conditions such as asthma and some

pulmonary conditions.

Climate Hazards

Storm and wind > Cyclone (Hurricane / Typhoon)

Did this hazard significantly impact your city before 2021?

Yes

Current probability of hazard

High

Current magnitude of hazard

High

Social impact of hazard overall

Fluctuating socio-economic conditions
Increased incidence and prevalence of disease and illness
Increased demand for public services
Increased demand for healthcare services
Increased risk to already vulnerable populations
Increased resource demand

Most relevant assets / services affected overall

Energy
Transport
Waste management
Information & communications technology
Residential
Public health
Emergency services

Please identify which vulnerable populations are affected

Children & youth
Elderly
Persons with disabilities
Persons with chronic diseases
Low-income households
Persons living in sub-standard housing

Future change in frequency

Increasing

Future change in intensity

Increasing

Future expected magnitude of hazard

High

When do you first expect to experience those changes in frequency and intensity?

Immediately

Please describe the impacts experienced so far, and how you expect the hazard to impact in the future

Tropical storms can disrupt mobility, damage buildings and assets in the community assets, and disrupt the power supply to homes and buildings. It is estimated that a "Hurricane Katrina-like" storm would cause aggregate losses to the Texas economy of \$73 billion in gross product, \$61.3 billion in income and 863,000 jobs. Hurricane Ike in 2008 cost the region \$30 billion in damages and Hurricane Harvey is estimated to have cost \$125 billion. Additionally, hurricanes such as Hurricane Harvey can have dramatic impacts on public health and safety. Eighty-two people are believed to have died as a result of Hurricane Harvey. Flood waters and damaged buildings can also have lasting impacts on public health due to contamination and increased growth of mold which can trigger asthma attacks or allergic reactions. As some of the largest refineries in the nation are located in the greater Houston area, hurricanes and tropical storms have the ability to greatly impact the nation's gasoline prices and an extended shutdown of Houston-area refineries would likely cause shortages of fuel and pose a national security risk. About 13% of the nation's petroleum products are refined in the Houston area. Additionally, the high concentration of refineries and chemical manufacturing operations can cause toxic releases into the air and water. After Hurricane Harvey, more than 90 chemical releases were reported and estimated to have involved more than 700,000 gallons of pollutants being released into the water, and 38,000 pounds of pollutants being released into the air.

Climate Hazards

Storm and wind > Storm surge

Did this hazard significantly impact your city before 2021?

Yes

Current probability of hazard

High

Current magnitude of hazard

Medium High

Social impact of hazard overall

Fluctuating socio-economic conditions
Increased demand for public services
Increased risk to already vulnerable populations

Most relevant assets / services affected overall

Water supply & sanitation
Transport
Waste management
Commercial
Public health

Emergency services

Please identify which vulnerable populations are affected

Children & youth

Elderly

Persons with disabilities

Persons with chronic diseases

Low-income households

Persons living in sub-standard housing

Other, please specify (Residential, commercial and industry could be impacted in the event of a storm surge)

Future change in frequency

Increasing

Future change in intensity

Increasing

Future expected magnitude of hazard

High

When do you first expect to experience those changes in frequency and intensity?

Immediately

Please describe the impacts experienced so far, and how you expect the hazard to impact in the future

Storm surges can disrupt mobility, damage buildings and community assets, increase salt water intrusion, and affect water quality. It is estimated that a "Hurricane Katrina-like" storm would cause aggregate losses to the Texas economy of \$73 billion in gross product, \$61.3 billion in income and 863,000 jobs. Hurricane Ike in 2008 cost the region \$30 billion in damages and Hurricane Harvey is estimated to have cost \$125 billion. As some of the largest refineries in the nation are located within a short distance of Galveston Bay, storm surges have the ability to greatly impact the nation's gasoline prices and an extended shutdown of Houston-area refineries would likely cause shortages of fuel and pose a national security risk. About 13% of the nation's petroleum products are refined in the Houston area. Additionally, the high concentration of refineries and chemical manufacturing operations can cause toxic releases into the air and water. After Hurricane Harvey, more than 90 chemical releases were reported and estimated to have involved more than 700,000 gallons of pollutants being released into the water, and 38,000 pounds of pollutants being released into the air.

Climate Hazards

Mass movement > Subsidence

Did this hazard significantly impact your city before 2021?

Yes

Current probability of hazard

Medium Low

Current magnitude of hazard

Medium

Social impact of hazard overall

Increased demand for public services

Increased resource demand

Most relevant assets / services affected overall

Water supply & sanitation

Transport

Land use planning

Please identify which vulnerable populations are affected

Low-income households

Future change in frequency

Decreasing

Future change in intensity

Decreasing

Future expected magnitude of hazard

Medium Low

When do you first expect to experience those changes in frequency and intensity?

Immediately

Please describe the impacts experienced so far, and how you expect the hazard to impact in the future

Historically in Harris County, subsidence has been worse in areas where groundwater, oil, and gas are removed from the ground, causing the land to sink by fractions of an inch a year, and in some places by feet over many years. Groundwater withdrawals have caused about 3,200 square miles of the Houston-Galveston area to subside (or sink) more than a foot, with some areas subsiding as much as 12 to 13 feet. Over the last century, aquifers in this area have lost between 300 and 400 feet, leaving some of the land to collapse. Spring Branch, where Interstate 10 and Beltway 8 meet, has dropped four feet since 1975. Jersey Village, at US 290 and Beltway 8, is almost two feet lower than it was in 1996. And Greater Greenspoint, where Interstate 45 intersects with Beltway 8, has given up about two feet in the last decade, according to USGS data. Also according to the USGS, while some areas in Houston have significantly reduced their groundwater pumping (particularly with the creation of subsidence and groundwater districts, whose purpose is to regulate groundwater pumping), subsidence remains a threat for the region.

Climate Hazards

Extreme cold temperature > Extreme winter conditions

Did this hazard significantly impact your city before 2021?

Yes

Current probability of hazard

Low

Current magnitude of hazard

High

Social impact of hazard overall

Increased demand for public services
Increased risk to already vulnerable populations
Increased resource demand
Population displacement
Loss of tax base to support public services

Most relevant assets / services affected overall

Energy
Water supply & sanitation
Transport
Food & agriculture
Waste management
Information & communications technology
Public health
Emergency services

Please identify which vulnerable populations are affected

Children & youth
Elderly
Persons with disabilities
Persons with chronic diseases
Low-income households
Persons living in sub-standard housing

Future change in frequency

Increasing

Future change in intensity

Increasing

Future expected magnitude of hazard

Do not know

When do you first expect to experience those changes in frequency and intensity?

Immediately

Please describe the impacts experienced so far, and how you expect the hazard to impact in the future

Winter Storm Uri moved across North America from February 13-17, causing blackouts for over 9.7 million people in the U.S. and Mexico, most notably in Texas where power supply and grid failures led to prolonged outages, culminating in an energy and water crisis. As some power outages rolled and some persisted, 4.8 million Texans were without power in frigid temperatures. More than 14.9 million people in Texas, about half of the state's population -- experienced disruptions to their primary source of clean, potable water. Millions of pounds of pollutants and greenhouse gasses were released as oil refineries and petrochemical facilities were forced to shut down across the state. <https://harcresearch.org/research/uri/>

Climate Hazards

Extreme Precipitation > Rain storm

Did this hazard significantly impact your city before 2021?

Yes

Current probability of hazard

High

Current magnitude of hazard

High

Social impact of hazard overall

Fluctuating socio-economic conditions
Increased demand for public services
Increased risk to already vulnerable populations
Increased resource demand
Population displacement

Most relevant assets / services affected overall

Transport
Environment, biodiversity, forestry
Industrial

Please identify which vulnerable populations are affected

Women & girls
Children & youth
Elderly
Indigenous population
Marginalized groups
Persons with disabilities
Persons with chronic diseases
Low-income households

Future change in frequency

Increasing

Future change in intensity

Increasing

Future expected magnitude of hazard

High

When do you first expect to experience those changes in frequency and intensity?

Immediately

Please describe the impacts experienced so far, and how you expect the hazard to impact in the future

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 and, in at least some measured cases, the effects of climate change. 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.

(2.2) Please identify and describe the factors that most greatly affect your city's ability to adapt to climate change and indicate how those factors either support or challenge this ability.

Factors that affect ability to adapt	Indicate if this factor either supports or challenges the ability to adapt	Level of degree to which factor challenges/supports the adaptive capacity of your city	Please describe how the factor supports or challenges the adaptive capacity of your city
Government capacity	Challenges	Significantly challenges	There is limited government capacity to fund projects, materials, and emergency personnel. City government budget cuts have led to many vacant positions being eliminated and forced some departments to continue to operate short-handed. Houston lacks regulatory authority to make changes in electricity market, emissions control, transportation system, and other sectors.
Political engagement / transparency	Challenges	Significantly challenges	Political engagement/ transparency becomes another conflict when the issue itself becomes politically polarized by party politics. Political involvement withdraws when monetary donations to politicians and government agencies are at risk. Political involvement withdraws often to promote business and political motives nullifying intervention or regulatory changes that can help the cities to mitigate causes. Transparency slows the city's ability to adapt when FEMA or other government agencies remove informative text and material from their websites that hinder education to citizens.
Budgetary capacity	Challenges	Significantly challenges	Budgetary capacity becomes problematic when the importance of adapting the city to climate change is not prioritized.. For three consecutive years the City of Houston has faced budget cuts, approximately \$80 million each year, due to the revenue cap, hurricane recovery spending, and COVID-19-related impacts. In 2021, the budget gap reached approximately \$200 million, but was filled with federal recovery funds that came just in time. The budget shortfalls that the city has faced has made it difficult to undertake projects requiring capital, even if these projects would improve efficiency and save the city money in the long run. In some cases, lack of budgetary capacity directly prevents the city and region from undertaking necessary adaptation measures. Refineries around the Houston Ship Channel and Galveston Bay produce 40% of the nation's petroleum and half of the country's jet fuel. Storm surges and flooding in this region pose two grave risks: 1) Serious environmental contamination, and 2) huge shortages of petroleum products. As a result of Hurricane Ike in 2008, 500,000 gallons of crude oil were spilled causing \$29 billion in damages. A group of universities and partners have led the planning for the "Ike Dike," a defensive barrier designed to protect this key area. The project would extend an existing sea wall, construct a 17 ft revetment near the beach and add flood gates. Gates and barriers would likely be modelled after those used in the Netherlands' Delta Works project. The project is estimated to cost \$15 billion and has been stalled due to lack of funding. This project is necessary to protect public health and national security as a hurricane wiping out oil production ability in the region could cause fuel shortages and greatly impair transportation in the United States.
Rapid urbanization	Challenges	Significantly challenges	Rapid urbanization over the years, with the population doubling in the last 50 years along with unsatisfactory infrastructure capacity, building code regulations, and inadequate land use planning has caused streets, channels, river, dikes, drainage ditches, levees, dams and reservoirs to flood or overflow and cause extreme flooding throughout the Houston area. Additionally, rapid development and urbanization has exacerbated the extreme heat and heat wave impacts
Environmental conditions	Challenges	Significantly challenges	Houston's topography and soil type contribute to it being a flood prone region. The area is low lying and has clay-based soil with low permeability. The area has historically relied on natural wetlands and bayous for drainage. However, when severe storms occur these natural protections are unable to handle the inundation of water.
Infrastructure capacity	Challenges	Significantly challenges	Storm water infrastructure in Houston poses major difficulties. As Houston is located in a low-lying region with a clay-like soil that naturally has low-permeability, the region's bayous have functioned as the main drainage system, but many neighborhoods must have engineered storm water management systems in place. Aging infrastructure can limit the effectiveness of storm water drains. Additionally, as the frequency and intensity of storms increase, it becomes clear that the engineered capacity of such systems may not have been high enough to face the increased intensity of storms. Limited storm water capacity can lead to flooded streets impairing residents' ability to evacuate in emergency situations. The American Society of Civil Engineers 2017 Report Card gave the State of Texas a C- for infrastructure noting that the state earned a D for flood control and roadways.
Land use planning	Challenges	Significantly challenges	The City of Houston is the largest city in the United States to not have zoning laws in an effort to encourage development. Largely unobstructed either by rules or by natural features such as mountains, the Houston area sprawled. Nearly 25,000 acres of natural wetlands were developed between 1992 and 2010, mostly in Harris County. Between 1992 and 2010 alone nearly 30% of wetlands in Harris County were destroyed due to development. The region is low lying and with soil that is mostly clay-based, causing the region to be naturally prone to flooding and drainage problems. The area's bayous have largely functioned as storm water management and drainage systems. However, development in the area and over wetlands threaten this natural drainage mechanism. As Houston is rapidly expanding-- the population in Houston and the surrounding cities is expected to grow by 66.7% by 2040-- land use planning poses a huge challenge to manage the cities development and drainage needs, and to adapt to changing flood plains.

(2.3) Is your city facing risks to public health or health systems associated with climate change?

Yes

(2.3a) Please report on how climate change impacts health outcomes and health services in your city.

Area affected by climate change

Health outcomes

Health systems (service provision, infrastructure and technologies)

Areas outside the health sector (e.g. agriculture, water and sanitation, transport, power generation, built environment)

Health-related risk and vulnerability assessment undertaken

No

Identify the climate hazards most significantly impacting the selected areas

Extreme Precipitation > Rain storm

Storm and wind > Cyclone (Hurricane / Typhoon)

Storm and wind > Tropical storm

Extreme hot temperature > Heat wave

Extreme hot temperature > Extreme hot days

Water Scarcity > Drought

Flood and sea level rise > Coastal flood

Chemical change > Atmospheric CO2 concentrations

Biological hazards > Water-borne disease

Biological hazards > Vector-borne disease

Biological hazards > Air-borne disease

Biological hazards > Insect infestation

Identify the climate-related health issues faced by your city

Heat-related illnesses

Vector-borne infectious diseases (e.g. malaria, dengue, Lyme disease, tick-borne encephalitis)

Air-pollution related illnesses

Exacerbation of Non-Communicable Disease Symptoms (e.g. respiratory disease, cardiovascular disease, renal disease)

Mental health impacts

Direct physical injuries and deaths due to extreme weather events

Food & Nutrition Security

Disruption to water, sanitation and wastewater services

Disruption to health service provision

Overwhelming of health service provision due to increased demand

Lack of climate-informed surveillance, preparedness, early warning and response

Damage/destruction to health infrastructure and technology

Disruption of health-related services (e.g. roads, electricity, communications, emergency/ambulatory response, laboratories, pharmacies)

Timescale of climate-related issues for the selected health area

Current

Please identify which vulnerable populations are affected by these climate-related impacts

Women

Children and youth

Elderly

Marginalized groups

Outdoor workers

Persons with disabilities

Persons with pre-existing medical conditions

Low-income households

Persons living in sub-standard housing

Please explain

Climate change is projected to harm human health by increasing ground-level ozone and/or particulate matter air pollution in some locations. Ground-level ozone (a key component of smog) is associated with many health problems, such as diminished lung function, increased hospital admissions, emergency room visits for asthma, and increases in premature deaths. According to the City of Houston's Climate Action Plan, Tailpipe emissions, which comprise 47% of Houston's total GHG emissions, worsen air quality and threaten the public's overall health. Extreme heat events have constantly threatened public health in Houston. Heat is even more concerning in underserved communities that are less likely to have central air conditioning. Deaths result from heat stroke and related conditions, but also from cardiovascular disease, respiratory disease, and cerebrovascular disease. Extreme summer heat is increasing in Houston, and climate projections indicate that extreme heat events will be more frequent and intense in coming decades. 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. Flooding may be the most significant mass health issue Houston regularly faces. It is an ongoing threat and its consequences can be devastating. Sitting only 50 feet above sea level, streets tend to flood easily and often (Urban Flooding). Flooding poses a number of different public health risks, both during and after the event, including: Drowning incidents, injuries that can occur in areas covered by floodwater, such as falling into manholes or stepping on foreign objects; Infection or illness resulting from exposure to flood water containing bacteria, chemicals or human waste; Illness from drinking contaminated tap water or water from lakes and streams; Illness resulting from mold exposure due to growth on water-damaged surfaces in homes, schools, or businesses.

3. Adaptation

Adaptation Actions

(3.0) Please describe the main actions you are taking to reduce the risk to, and vulnerability of, your city's infrastructure, services, citizens, and businesses from climate change as identified in the Climate Hazards section.

Climate hazards

Extreme hot temperature > Extreme hot days

Action

Cooling centers, pools, water parks/plazas (including policies to support development)

Action title

Cooling Center

Status of action

Operation

Means of implementation

Awareness raising program or campaign

Co-benefit area

Enhanced resilience

Social community and labour improvements

Sectors/areas adaptation action applies to

Public Health and Safety

Action description and implementation progress

The City of Houston activates Heat the Emergency Plan and opens 98 cooling centers (e.g. city libraries, multi-service centers and park and recreation centers) to residents without access to air conditioning during heat waves. When the National Weather Service issues a Heat Advisory (Heat index of 108 F for two consecutive days), the City of Houston may open cooling centers in the interest of public health. The City also activates the Heat Emergency Management Group that publicizes the opening of the cooling centers. The cooling centers are City facilities open during normal business hours. On weekends, hours may be extended at a few locations. 311, the City's help and information hotline, takes calls for transportation and METRO provides free transportation to the cooling centers.

Finance status

Finance secured

Majority funding source

Local

Total cost of the project (currency)

60000

Total cost provided by the local government (currency)**Total cost provided by the majority funding source (currency)**

60000

Web link

https://www.houstonx.gov/health/NewsReleases/coh_heat_emergency_centers_open.html Cooling centers operate at City of Houston's facilities during normal operational hours. No additional costs are incurred. Additional costs may be incurred for staffing when cooling centers must be operated outside normal operational hours. Due to COVID-19, NRG's "Beat the Heat" program focuses on helping seniors and vulnerable populations with portable AC units instead of staffing City facilities. <https://www.houstonx.gov/mayor/press/2020/beat-the-heat.html>

Climate hazards

Storm and wind > Cyclone (Hurricane / Typhoon)

Action

Stormwater capture systems

Action title

Climate Hazards

Status of action

Operation

Means of implementation

Infrastructure development

Co-benefit area

Enhanced resilience

Disaster preparedness

Sectors/areas adaptation action applies to

Transport (Mobility)

Water

Action description and implementation progress

Build Houston Forward is the City of Houston's initiative to improve the quality of life and mobility for residents by rebuilding its drainage and street infrastructure. To support the initiative, the City has established a dedicated, pay-as-you-go fund to maintain the infrastructure and to plan upgrades to meet future needs as the City grows. Since the start of Build Houston Forward, Houston Public Works (HPW) has reconstructed 349 miles and rehabilitated 573 lane miles. In all, Build Houston Forward is responsible for more than 900 miles of roadway improvements across the City. The Fiscal Year 2017-2021 Capital Improvement Plan allows funding of \$63 million of the \$100 million commitment between the City of Houston and the Houston Parks Board for the Bayou Greenways Initiative. Previous appropriations equal \$37 million. The Houston Parks Board has committed \$88 million of \$120 million matching funds for the Bayou Greenways Initiative, which is being invested in linear parks land, design, and construction. HPW, with funding from ReBuild Houston, plans to: 1) Rehabilitate or reconstruct more than 483 miles of roadway; 2) Place more than 1.3 million feet (246 miles) of sidewalks throughout the City; 3) Add more than 20,288 feet of on-street bikeways and off-street trails; 5) Add 1,025 curb ramps as part of its safe sidewalks program; 4) Make 154 miles of storm water drainage improvements; 6) Build 4,663 storm water inlets; 7) Add 8 acre feet of in-pipe detention which will hold more than 2.6 million gallons of storm runoff water.

Finance status

Finance secured

Majority funding source

Local

Total cost of the project (currency)

188000000

Total cost provided by the local government (currency)

63000000

Total cost provided by the majority funding source (currency)

100000000

Web link<http://www.buildhoustonforward.org/>

Climate hazards

Water Scarcity > Drought

Action

Maintenance/repair – leaking infrastructure

Action title

Maintenance

Status of action

Implementation

Means of implementation

Assessment and evaluation activities

Co-benefit area

Enhanced resilience

Improved resource efficiency (e.g. food, water, energy)

Sectors/areas adaptation action applies to

Water

Action description and implementation progress

The City of Houston Water Conservation Plan (effective 2019-2024), highlights water conservation goals and continuous progress that will preserve long-term water supplies for the City of Houston and the greater Houston region. Water supply planning is important to the City of Houston in order to meet long term growth in demand and to comply with 30 TAC Chapter 288 that requires the City to prepare and implement a water conservation plan that meets certain requirements. This plan includes information to fulfill these requirements in addition to information specific to the City of Houston's water supply and treatment systems. The current plan includes measures to be taken internally at the City of Houston as well as programs for water customers. These include current programs such as an in-house public education program, continued enforcement of water-wise building and plumbing codes, and the Consumption Awareness Program which communicates real-time meter data to household users. This document also summarizes plans to develop an internal Water Loss Program, pilot a Mainline Leak Detection Program and expand the Consumption Awareness Program.

Finance status

Seeking funding

Majority funding source

Other, please specify (City Capital Projects)

Total cost of the project (currency)

1047000000

Total cost provided by the local government (currency)

1047000000

Total cost provided by the majority funding source (currency)

1047000000

Web linkhttps://www.publicworks.houstontx.gov/sites/default/files/assets/2019_water_conservation_plan_01132020.pdf

Climate hazards

Flood and sea level rise > Flash / surface flood

Action

Additional reservoirs and wells for water storage

Action title

Additional water storage

Status of action

Operation

Means of implementation

Infrastructure development

Co-benefit area

Disaster Risk Reduction

Enhanced resilience

Disaster preparedness

Resource conservation (e.g. soil, water)

Sectors/areas adaptation action applies to

Transport (Mobility)

Spatial Planning

Public Health and Safety

Action description and implementation progress

Bayou Greenways 2020 is a \$220 million project that is a public-private partnership between Houston Parks Board, the Houston Parks and Recreation Department and the Harris County Flood Control District. When complete, Houston will have added more than 3,000 acres of new and equitably distributed green spaces that can also serve the function of flood control and storm water quality enhancement. We will have also completed 80 new miles of continuous all-weather hike and bike trails that will meander through those greenways — an amenity unparalleled in the nation — that will provide a total network of 150 miles of greenspace and trails crisscrossing the city. When the project is complete, approximately 60 percent of Houstonians will live within 1.5 miles of a Bayou Greenway. There are numerous other benefits associated with utilizing

our bayou corridors for green space and recreation: 1) Reduced doctor visits due to increased access to recreation opportunities; 2) Increase in use of alternative transportation for commuting along the hike and bike trails; 3) Increase in property values along the corridor resulting in increased revenue to the city; 4) Increased flood prevention due to the opportunity for wet-bottom detention areas in the newly created green spaces; 5) Increased water quality due to the simple plantings located strategically along the bayous, the wet-bottom detention ponds, and reduced runoff; 6) Increased air quality due to increased CO2 sequestration by newly planted trees and grasses, and use of trails for alternative transportation; and 7) Change in Houston's image to attract the best and brightest to our city.

Finance status

Finance secured

Majority funding source

Local

Total cost of the project (currency)

220000000

Total cost provided by the local government (currency)

100000000

Total cost provided by the majority funding source (currency)

100000000

Web link

<https://houstonparksboard.org/about/bayou-greenways-2020>

Climate hazards

Storm and wind > Storm surge

Action

Flood defences – development and operation & storage

Action title

Development of flood defenses

Status of action

Pre-implementation

Means of implementation

Infrastructure development

Co-benefit area

Disaster Risk Reduction

Enhanced resilience

Disaster preparedness

Sectors/areas adaptation action applies to

Building and Infrastructure

Industry

Water

Public Health and Safety

Action description and implementation progress

Refineries around the Houston Ship Channel and Galveston Bay produce 40% of the nation's petroleum and half of the country's jet fuel. Storm surges and flooding in this region pose two grave risks: 1) Serious environmental contamination, and 2) huge shortages of petroleum products. As a result of Hurricane Ike in 2008, 500,000 gallons of crude oil were spilled causing \$29 billion in damages. A group of universities and partners have led the planning for the "Ike Dike," a defensive barrier designed to protect this key area. The project would extend an existing sea wall, construct a 17 ft revetment near the beach, and add flood gates. Gates and barriers would likely be modelled after those at use in the Netherlands' Delta Works project. The project is estimated to cost \$15 billion and has been stalled due to lack of funding. On 05/16/2018, US Senator John Cornyn introduced legislation that would expedite feasibility studies for the project and a coastal spine that would protect Houston and the greater region.

Finance status

Seeking funding

Majority funding source

Local

Total cost of the project (currency)

15000000000

Total cost provided by the local government (currency)

Total cost provided by the majority funding source (currency)

Web link

<http://www.tamug.edu/ikedike/>

Climate hazards

Flood and sea level rise > Flash / surface flood

Action

Restrict development in at risk areas

Action title

Restricted development in risk areas

Status of action

Pre-implementation

Means of implementation

Infrastructure development

Co-benefit area

Disaster Risk Reduction
Enhanced resilience
Shift to more sustainable behaviours

Sectors/areas adaptation action applies to

Building and Infrastructure
Spatial Planning
Public Health and Safety

Action description and implementation progress

Harvey flooded an unprecedented number of homes across the city. Many of these homes were destroyed or remain uninhabitable. Prior to the disaster, many communities had vacant lots in need of infill development. The Single Family Home Development Program provides \$200 million for recovery and reconstruction as well as opportunities for residents to move out of areas prone to repetitive flooding. Additionally, the Buyout Program authorizes \$40 million to demolish homes that have flooded repeatedly and create open spaces or detention areas.

Finance status

Finance secured

Majority funding source

(Sub)national

Total cost of the project (currency)

240000000

Total cost provided by the local government (currency)**Total cost provided by the majority funding source (currency)**

240000000

Web link

<http://houstontx.gov/housing/chdo.html>; <https://recovery.houstontx.gov/hsfdp/>

Climate hazards

Flood and sea level rise > Flash / surface flood

Action

Resilience and resistance measures for buildings

Action title

Building regulations

Status of action

Operation

Means of implementation

Infrastructure development

Co-benefit area

Enhanced resilience
Enhanced climate change adaptation

Sectors/areas adaptation action applies to

Building and Infrastructure

Action description and implementation progress

After the devastating flood damage caused by Hurricane Harvey, the City of Houston has resolved to leverage every opportunity to make the City more resilient to future flooding disasters. The City's floodplain regulations are an important tool for reducing the flooding risk to lives and property in new development and redevelopment projects. With the goal of informing a review of those regulations, Houston Public Works (HPW) has prepared a report, based on extensive analysis of data collected both before and after the storm. Work on the report began in September 2017. The data clearly shows that current floodplain regulations – which require only structures in the 100-year floodplain be elevated one foot above the 100-year flood elevation – were inadequate to protect homes from flooding in Harvey. While 33 percent of all homes in the 500-year floodplain flooded during Harvey, an even higher percentage (38 percent) of all the currently compliant homes in the 100-year floodplain flooded. Chapter 19 regulations were changed to require all new structures in the 100- and 500-year floodplains to be elevated 2 feet above the 500-year flood elevation. Houston Public Works is coordinating with other groups within the City and local and regional stakeholders on a variety of flood risk reduction efforts.

Finance status

Finance secured

Majority funding source

Other, please specify (HCFDC and FEMA)

Total cost of the project (currency)

709012000

Total cost provided by the local government (currency)

64012000

Total cost provided by the majority funding source (currency)

645000000

Web link

Hurricane recovery progress report January 2019- https://www.houstontx.gov/postharvey/public/documents/11.28.2018_progress_report_updated.pdf and 2020 progress report - <http://www.houstontx.gov/mayor/harvey-recovery-report-2020-q1.pdf>; <https://www.houstontx.gov/mayor/harvey-recovery-report-three-year.pdf>

Climate hazards

Flood and sea level rise > Flash / surface flood

Action

Flood defences – development and operation & storage

Action title

Develop flood defences

Status of action

Implementation

Means of implementation

Infrastructure development

Co-benefit area

Disaster Risk Reduction
Disaster preparedness
Enhanced climate change adaptation

Sectors/areas adaptation action applies to

Building and Infrastructure

Action description and implementation progress

Following Hurricane Harvey, the City of Houston submitted applications for flood risk reduction. These include channel improvements, detention basins, dam improvements, and home elevation. Three applications have been approved and funded for the design phase. These include 1) North Canal, a project creating a high-flow diversion channel in downtown Houston. The project will include utility relocation and bridge improvements. 2) Inwood, where the City of Houston purchased a 227 acre golf course for \$9.3 million and spent \$2.5 million building the first two detention basins, and plans to spend \$34 million to design and develop additional basins to produce a total 1300-acre feet of storm water storage. 3) Lake Houston, where several flood detention projects and planned improvements to improve the Lake Houston Dam gates are in progress.

Finance status

Seeking funding

Majority funding source

Other, please specify (FEMA)

Total cost of the project (currency)

230000000

Total cost provided by the local government (currency)

105000000

Total cost provided by the majority funding source (currency)

125000000

Web link

<https://www.houstontx.gov/mayor/cro-fema-grants/northcanal-2021january.pdf> <https://www.houstontx.gov/mayor/cro-fema-grants/lakehouston-2021january.pdf>
<https://www.houstontx.gov/mayor/cro-fema-grants/inwood-2021january.pdf>

Climate hazards

Extreme hot temperature > Heat wave

Action

Heat mapping and thermal imaging

Action title

Resilient Houston Action 16.1: Launch an urban heat island mapping campaign

Status of action

Implementation

Means of implementation

Awareness raising program or campaign

Co-benefit area

Enhanced resilience
Enhanced climate change adaptation
Improved public health
Ecosystem preservation and biodiversity improvement
Improved access to and quality of mobility services and infrastructure
Shift to more sustainable behaviours
Improved access to data for informed decision-making

Sectors/areas adaptation action applies to

Energy
Transport (Mobility)
Building and Infrastructure
Spatial Planning
Public Health and Safety

Action description and implementation progress

Houston was selected for the 2020 HeatWatch program to 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 modelled after similar efforts successfully executed in other cities.

Finance status

Seeking funding

Majority funding source

Other, please specify (NOAA, The Nature Conservancy)

Total cost of the project (currency)

35000

Total cost provided by the local government (currency)

10000

Total cost provided by the majority funding source (currency)

20000

Web link

www.h3at.org/http://www.greenhoustontx.gov/pressrelease20200805.html

Climate hazards

Flood and sea level rise > Flash / surface flood

Action

Resilience and resistance measures for buildings

Action title

Disaster Recovery Multi-Family Affordable Housing Resilience Matrix

Status of action

Implementation

Means of implementation

Capacity building and training activities

Infrastructure development

Development and implementation of action plan

Policy and regulation

Co-benefit area

Disaster preparedness

Enhanced climate change adaptation

Reduced GHG emissions

Shift to more sustainable behaviours

Improved access to data for informed decision-making

Sectors/areas adaptation action applies to

Building and Infrastructure

Action description and implementation progress

As part of the Houston Housing and Community Development Department's 2nd round Notice of Funding for Multi-family Housing as a part of Harvey Recovery efforts, a Resilience Matrix was developed to encourage multifamily developers to incorporate a minimum number (12) of resilience components to any project, including protection, adaptation, back up, community, green buildings, green infrastructure, solar, and EV, mostly aligned with the Strategies for Multifamily Building Resilience by Enterprise Green Communities.

Finance status

Finance secured

Majority funding source

(Sub)national

Total cost of the project (currency)

175000000

Total cost provided by the local government (currency)

0

Total cost provided by the majority funding source (currency)

175000000

Web link

<https://recovery.houstontx.gov/multifamily-program/>

Climate hazards

Flood and sea level rise > Flash / surface flood

Action

Nature based solutions for water

Action title

Houston Incentives for Green Development

Status of action

Implementation

Means of implementation

Awareness raising program or campaign

Infrastructure development

Policy and regulation

Financial mechanism

Co-benefit area

Disaster Risk Reduction

Enhanced resilience

Enhanced climate change adaptation

Social community and labour improvements

Greening the economy

Shift to more sustainable behaviours

Improved access to data for informed decision-making

Sectors/areas adaptation action applies to

Building and Infrastructure
Spatial Planning
Water
Public Health and Safety

Action description and implementation progress

Creating Houston's Green Development Incentives is the first step toward achieving a robust green infrastructure program, which includes municipal and private projects. Through funding from Houston Endowment, the City's Chief Recovery Office commissioned a one-year study to identify and recommend incentives to encourage the use of green stormwater infrastructure (GSI) in private land development, leading to economic, social, and environmental benefits as well as resilience. Green infrastructure strives to mimic how rain falls on undeveloped, green landscape. Typical design elements include green roofs, rain garden bio-retention systems, permeable pavements, rainwater harvesting, urban forests, constructed wetlands and other strategies to manage rainwater. It improves the performance of drainage systems and can make real estate projects safer and more attractive to buyers. After interviews with cities with GSI programs, external stakeholders, and city leadership, and analysis of costs and benefits, the following incentive programs are recommended: Integrated GSI Development Rules Property Tax Abatements Award and Recognition Program Increased Permitting Process Certainty and Speed

Finance status

Feasibility finalized, and finance partially secured

Majority funding source

Local

Total cost of the project (currency)

2000000

Total cost provided by the local government (currency)

Total cost provided by the majority funding source (currency)

Web link

<http://www.houstontx.gov/igd/>

Climate hazards

Extreme hot temperature > Extreme hot days

Action

Tree planting and/or creation of green space

Action title

Plant 4.6 million new native trees

Status of action

Pre-implementation

Means of implementation

Awareness raising program or campaign
Stakeholder engagement
Infrastructure development
Assessment and evaluation activities
Monitor activities
Development and implementation of action plan
Financial mechanism

Co-benefit area

Enhanced resilience
Enhanced climate change adaptation
Reduced GHG emissions
Social inclusion, social justice
Improved public health
Ecosystem preservation and biodiversity improvement
Improved access to data for informed decision-making

Sectors/areas adaptation action applies to

Building and Infrastructure
Industry
Spatial Planning
Agriculture and Forestry
Public Health and Safety

Action description and implementation progress

Houston's Resilient Houston and Climate Action Plan both include a new City tree planting target of 4.6 million new native trees by 2030. This target was established in 2020 to accelerate and increase tree planting in Houston to meet multiple resilience goals and actions. Public and private partners are working collaboratively to develop an action plan for being able to meet this 10-year goal. This work will include the evaluation of supply chain capacity for native trees, identification of potential locations for enhanced planting in coordination with climate/heat mapping.

Finance status

Pre-feasibility/impact assessment study status

Majority funding source

Other, please specify (Regular city operational budget)

Total cost of the project (currency)

Total cost provided by the local government (currency)

Total cost provided by the majority funding source (currency)

Web link

<https://www.houstontx.gov/mayor/Resilient-Houston-20200518-single-page.pdf> <http://greenhoustontx.gov/climateactionplan/CAP-April2020.pdf>

Climate hazards

Flood and sea level rise > Flash / surface flood

Action

Restrict development in at risk areas

Action title

Remove habitable structures from the floodway

Status of action

Implementation

Means of implementation

Development and implementation of action plan

Co-benefit area

Disaster Risk Reduction

Enhanced resilience

Poverty reduction / eradication

Improved public health

Improved access to data for informed decision-making

Sectors/areas adaptation action applies to

Building and Infrastructure

Spatial Planning

Public Health and Safety

Action description and implementation progress

Resilient Houston Action 25.1 Remove all habitable structures and prevent new development in the floodway. 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.

Finance status

Feasibility finalized, and finance partially secured

Majority funding source

(Sub)national

Total cost of the project (currency)**Total cost provided by the local government (currency)****Total cost provided by the majority funding source (currency)****Web link**

<https://www.houstontx.gov/mayor/Resilient-Houston-20200518-single-page.pdf>

Adaptation Planning

(3.2) Does your city council, or similar authority, have a published plan that addresses climate change adaptation and/or resilience?

Yes

(3.2a) Please provide more information on your plan that addresses climate change adaptation and/or resilience and attach the document. Please provide details on the boundary of your plan, and where this differs from your city's boundary, please provide an explanation.

Please note that some of the attachments exceeded the size limitations for attachments. Corresponding links have been provided.

Publication title and attach the document

Resilient Houston

Resilient-Houston-20200518-double-page.pdf

Web link

<https://www.houstontx.gov/mayor/Resilient-Houston-20200518-single-page.pdf>

Sectors/areas covered by plan that addresses climate change adaptation

Energy

Transport (Mobility)

Building and Infrastructure

Industry

Agriculture and Forestry

Water

Waste

Public Health and Safety

Business and Financial Service

Social Services

Climate hazards factored into plan that addresses climate change adaptation

Storm and wind > Cyclone (Hurricane / Typhoon)

Storm and wind > Storm surge

Extreme hot temperature > Extreme hot days

Water Scarcity > Drought

Flood and sea level rise > Flash / surface flood

Year of adoption of adaptation plan by local government

2020

Boundary of plan relative to city boundary (reported in 0.1)

Larger – covers the whole city and adjoining areas

If the city boundary is different from the plan boundary, please explain why

The plan included a regional approach beyond the city's immediate boundaries to emphasize the partnership opportunities for resilience-building in the region and to address that the resilience challenges do not stop at the city boundaries.

Stage of implementation

Plan in implementation

Type of plan

Integrated mitigation / adaptation

Has your local government assessed the synergies, trade-offs, and co-benefits, if any, of the main mitigation and adaptation actions you identified?

Yes

Describe the synergies, trade-offs, and co-benefits of this interaction

In 2020, City of Houston released Resilient Houston, which addresses Climate Adaptation as one of 5 core themes. The release of Resilient Houston included a corresponding Executive Order on Resilient as an implementation tool that directed City Departments and Divisions to implement Resilient Houston. Leading up to the release of Resilient Houston, the City also released a Living with Water Houston report that informed many of the goals, targets, actions and sub-actions in Resilient Houston. In May 2020, the City released a COVID-19 addendum to Resilient Houston to show the applicability of 42 of the 62 actions in Resilient Houston to also advancing response, recovery, adaptation, and institutionalization of COVID-19. Resilient Houston is a framework for collective action and links existing efforts with new ones that will work collectively to protect Houston against future disasters—from hurricanes and flooding to extreme heat waves—and chronic stresses such as aging infrastructure, poor air quality, and climate change. The strategy frames five key Visions for Houston's future along with 18 goals and 62 actions describing the path forward, timeframe, partners, implementation opportunities, and corresponding U.N. Sustainable Development Goals.

Primary author of plan

Dedicated city team

Description of the stakeholder engagement processes

Resilient Houston was forged during an 18-month process in collaboration with local stakeholders and regional, national and global partners. Resilient Houston will help to mitigate flooding risk and improve climate readiness. The stakeholder engagement consisted of two major "Living with Water" workshops held in November 2018 and May 2019 to develop recommendations at the regional, city, and neighborhood scale. During the May 2019 workshop, there was a community open house to review and provide feedback on the visions that were being sketched for three specific neighborhoods. The recommendations from this process primarily informed the Bayou chapter of Resilient Houston. An additional "agenda setting" workshop was held in November of 2018 with 250 stakeholders, the project team held interviews with public, private, academic, and non-profit stakeholders. In 2019 five working groups were established, with nearly 100 stakeholders, many of whom represented other coalitions, and groups. These multi-disciplinary working groups focused on 1) equity and inclusion, 2) housing and mobility, 3) living with water, 4) economy and infrastructure, and 5) health and safety. The working group members developed over 100 potential actions to be included in Resilient Houston. In addition to the working groups many other stakeholders were engaged through one-on-one interviews, and through presentations to organizations for additional feedback. A draft outline was also available for public comment.

Update/revision process in place for the Adaptation Plan

<Not Applicable>

Publication title and attach the document

Living With Water Houston

Web link

<https://www.houstontx.gov/mayor/Living-With-Water-Final-Report.pdf>

Sectors/areas covered by plan that addresses climate change adaptation

Industry

Water

Public Health and Safety

Climate hazards factored into plan that addresses climate change adaptation

Extreme Precipitation > Rain storm

Storm and wind > Cyclone (Hurricane / Typhoon)

Storm and wind > Storm surge

Water Scarcity > Drought

Flood and sea level rise > Flash / surface flood

Year of adoption of adaptation plan by local government

2020

Boundary of plan relative to city boundary (reported in 0.1)

Larger – covers the whole city and adjoining areas

If the city boundary is different from the plan boundary, please explain why

The plan included a regional approach beyond the city's immediate boundaries to emphasize the partnership opportunities for resilience-building in the region and to address that the resilience challenges do not stop at the city boundaries.

Stage of implementation

Plan in implementation

Type of plan

Integrated mitigation / adaptation

Has your local government assessed the synergies, trade-offs, and co-benefits, if any, of the main mitigation and adaptation actions you identified?

Yes

Describe the synergies, trade-offs, and co-benefits of this interaction

Living With Water Houston was undertaken as part of the Resilient Houston strategy development process. The Mayor's Office for Resilience teamed with The Water Institute of the Gulf, Waggoner & Ball, and the Kingdom of the Netherlands to hold two Living With Water workshops to develop place-specific strategies to reduce flood risk and equip Houstonians to prepare for the next storm. The outcomes of the Living With Water workshops are summarized in the following report and incorporated into

the Resilient Houston strategy. Living with Water is an exploration of the regional systems, natural and built, that define Houston and an analysis of regional flood risk in the context of climate projections and increasing urbanization. The key to Living With Water approach – and Resilient Houston strategy - is a recognition that actions to reduce risk and increase resilience can be taken at multiple interconnected scales—from the home, to the block, neighborhood, bayou, city, and region. The report goes on to highlight design proposals and recommendations developed for three focus areas – Kashmere Gardens, Independence Heights, and Greenspoint – as well as overall neighborhood-scale recommendations. The Living With Water workshops provided an opportunity for a deep dive into this critical component of Houston's resilience. Houston is the first city to integrate these two-well established frameworks for advancing city resilience, combining a comprehensive vision for a more resilient Houston with place-based strategies that reduce risk and deliver multiple community benefits. Living With Water Houston builds on the many local efforts underway to reduce flood risk and provides a framework and illustrative vision for aligning future actions. The strategies presented in this document should be embraced, localized, developed, and deployed to address the increasing riverine/bayou, urban drainage, and storm surge flooding that threatens Houston.
<http://www.greenhoustontx.gov/pressrelease20200130.html>

Primary author of plan

Dedicated city team

Description of the stakeholder engagement processes

Living With Water Houston was undertaken as part of the Resilient Houston strategy development process. 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. The stakeholder engagement consisted of two major "Living with Water" workshops held in November 2018 and May 2019 to develop recommendations at the regional, city, and neighborhood scale. During the May 2019 workshop, there was a community open house to review and provide feedback on the visions that were being sketched for three specific neighborhoods. The recommendations from this process primarily informed the Bayou chapter of Resilient Houston.

Update/revision process in place for the Adaptation Plan

<Not Applicable>

Publication title and attach the document

Houston Resilient Assessment

Resilient-Houston-Resilience-Assessment-2019may.pdf

Web link

<https://www.houstontx.gov/mayor/Resilient-Houston-Resilience-Assessment-2019may.pdf>

Sectors/areas covered by plan that addresses climate change adaptation

Energy

Transport (Mobility)

Building and Infrastructure

Industry

Spatial Planning

Agriculture and Forestry

Water

Business and Financial Service

Social Services

Climate hazards factored into plan that addresses climate change adaptation

Extreme Precipitation > Rain storm

Storm and wind > Severe wind

Storm and wind > Tornado

Storm and wind > Cyclone (Hurricane / Typhoon)

Storm and wind > Tropical storm

Storm and wind > Storm surge

Storm and wind > Lightning / thunderstorm

Extreme cold temperature > Cold wave

Extreme hot temperature > Heat wave

Extreme hot temperature > Extreme hot days

Year of adoption of adaptation plan by local government

2019

Boundary of plan relative to city boundary (reported in 0.1)

Larger – covers the whole city and adjoining areas

If the city boundary is different from the plan boundary, please explain why

The plan included a regional approach beyond the city's immediate boundaries to emphasize the partnership opportunities for resilience-building in the region and to address that the resilience challenges do not stop at the city boundaries.

Stage of implementation

Other, please specify (This report was a baseline analysis to inform Resilient Houston.)

Type of plan

Other, please specify (This report was a baseline analysis to inform Resilient Houston.)

Has your local government assessed the synergies, trade-offs, and co-benefits, if any, of the main mitigation and adaptation actions you identified?

Yes

Describe the synergies, trade-offs, and co-benefits of this interaction

The Resilient Assessment main focus was to establish a comprehensive list of shocks and stresses that Houston was susceptible to, based on quantitative and qualitative data. Through this assessment, the challenges and opportunities were grouped and ranked to establish priority areas and themes based on finding synergies, analyzing trade-offs and prioritizing opportunities for co-benefits.

Primary author of plan

Consultant

Description of the stakeholder engagement processes

The Resilience Assessment was developed after the Resilient Houston agenda-setting workshop with over 200 community members and additional interviews and review of existing programs and policies.

Adaptation Goals

(3.3) Please describe the main goals of your city's adaptation efforts and the metrics / KPIs for each goal.

Adaptation goal

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

Climate hazards that adaptation goal addresses

Storm and wind > Storm surge
Extreme hot temperature > Extreme hot days
Water Scarcity > Drought
Flood and sea level rise > Coastal flood
Biological hazards > Water-borne disease

Target year of goal

2025

Description of metric / indicator used to track goal

New companies

Does this goal align with a requirement from a higher level of government?

Do not know

Select the initiatives related to this adaptation goal that your city has committed to

Other, please specify (Global Resilient Cities Network)

Comment

Global Resilient Cities Network should be included as a related initiative.

Adaptation goal

Remove all habitable structures from the floodway by 2030

Climate hazards that adaptation goal addresses

Extreme Precipitation > Rain storm
Flood and sea level rise > Flash / surface flood
Flood and sea level rise > River flood

Target year of goal

2030

Description of metric / indicator used to track goal

Habitable units in the floodway 1) buy outs 2) narrowing of the floodway

Does this goal align with a requirement from a higher level of government?

No

Select the initiatives related to this adaptation goal that your city has committed to

Other, please specify (Global Resilient Cities Network)

Comment

Global Resilient Cities Network should be included as a related initiative.

Adaptation goal

Plant 4.6 million new native trees by 2030

Climate hazards that adaptation goal addresses

Extreme hot temperature > Extreme hot days
Chemical change > Atmospheric CO2 concentrations

Target year of goal

2030

Description of metric / indicator used to track goal

Trees planted

Does this goal align with a requirement from a higher level of government?

No

Select the initiatives related to this adaptation goal that your city has committed to

Other, please specify (Global Resilient Cities Network)

Comment

Global Resilient Cities Network should be included as a related initiative.

Adaptation goal

Carbon neutral by 2050 in accordance with the Paris Agreement

Climate hazards that adaptation goal addresses

Extreme Precipitation > Rain storm
Storm and wind > Cyclone (Hurricane / Typhoon)
Extreme hot temperature > Extreme hot days

Water Scarcity > Drought

Target year of goal

2040

Description of metric / indicator used to track goal

Reduction in carbon.

Does this goal align with a requirement from a higher level of government?

No

Select the initiatives related to this adaptation goal that your city has committed to

Mayors National Climate Action Agenda

Other, please specify (Global Resilient Cities Network)

Comment

Global Resilient Cities Network should be included as a related initiative.

Adaptation goal

100 new green stormwater infrastructure projects by 2025

Climate hazards that adaptation goal addresses

Extreme Precipitation > Rain storm

Extreme hot temperature > Extreme hot days

Flood and sea level rise > Flash / surface flood

Target year of goal

2025

Description of metric / indicator used to track goal

Public/private new green stormwater projects - associated co-benefits.

Does this goal align with a requirement from a higher level of government?

No

Select the initiatives related to this adaptation goal that your city has committed to

Other, please specify (Global Resilient Cities Network)

Comment

Global Resilient Cities Network should be included as a related initiative.

Adaptation goal

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

Climate hazards that adaptation goal addresses

Extreme hot temperature > Extreme hot days

Flood and sea level rise > Flash / surface flood

Target year of goal

2040

Description of metric / indicator used to track goal

Acres conserved

Does this goal align with a requirement from a higher level of government?

No

Select the initiatives related to this adaptation goal that your city has committed to

Other, please specify (Global Resilient Cities Network)

Comment

Global Resilient Cities Network should be included as a related initiative.

Adaptation goal

Invest \$50 billion in major recovery, mitigation, and modernization projects that increase resilience by 2040

Climate hazards that adaptation goal addresses

Extreme hot temperature > Extreme hot days

Flood and sea level rise > Flash / surface flood

Target year of goal

2040

Description of metric / indicator used to track goal

Dollars invested

Does this goal align with a requirement from a higher level of government?

No

Select the initiatives related to this adaptation goal that your city has committed to

Other, please specify (Global Resilient Cities Network)

Comment

Global Resilient Cities Network should be included as a related initiative.

(3.4) Does your local/regional government apply a Monitoring and Evaluation (M&E) system for monitoring the implementation of adaptation goals and targets as part of the climate adaptation plan (or integrated climate action plan)?

Monitoring & Evaluation (M&E) system

Response

Yes

Description of Monitoring and Evaluation (M&E) system applied

The City of Houston is in the process of developing Action-level KPIs to track all resilient measures, including climate adaptation actions in addition to the 18 overarching targets, including many related to climate adaptation. The monitoring and evaluation of Resilient Houston is led by the Chief Resilience Officer in coordination with Departmental Resilience Officers in every city department as well as additional internal and external implementation partners. Internal reporting is occurring at a minimum of quarterly with additional reporting planned for the annual anniversary of the February 2020 release of Resilient Houston. <https://www.houstontx.gov/mayor/Resilient-Houston-One-Year-Report.pdf> and <https://kinder.rice.edu/resilience-and-climate-progress-houston>

(3.5) Please explain how your city has addressed vulnerable groups through transformative action.

A holistic approach to resilience specifically focuses on our most vulnerable people, places and systems. The development of and implementation of resilient Houston is centered around 5 visions, a healthy place to live, and equitable, inclusive and affordable city, a leader in climate adaptation, a city that builds up, not out, and a transformative economy that builds forward. In this vision actions specifically addressing, engaging, and calling attention to the specific needs of vulnerable groups, from people with disabilities, to small businesses, young people, the elderly, the undocumented, immigrants and non-English speakers, Houstonians experiencing homelessness, Houstonians living in bayou floodways and historically under-invested communities through direct ties to Mayor Turner's Complete Community program.

4. City-wide Emissions

City-wide GHG Emissions Data

(4.0) Does your city have a city-wide emissions inventory to report?

Yes

(4.1) Please state the dates of the accounting year or 12-month period for which you are reporting your latest city-wide GHG emissions inventory.

	From	To
Accounting year dates	January 1 2019	December 31 2019

(4.2) Please indicate the category that best describes the boundary of your city-wide GHG emissions inventory.

	Boundary of inventory relative to city boundary (reported in 0.1)	Excluded sources / areas	Explanation of boundary choice where the inventory boundary differs from the city boundary (include inventory boundary, GDP and population)
Please explain	Same – covers entire city and nothing else		

(4.3) Please give the name of the primary protocol, standard, or methodology you have used to calculate your city's city-wide GHG emissions.

	Primary protocol	Comment
Emissions methodology	Global Protocol for Community Greenhouse Gas Emissions Inventories (GPC)	

(4.4) Which gases are included in your city-wide emissions inventory?

- CO2
- CH4
- N2O

(4.5) Please attach your city-wide inventory in Excel or other spreadsheet format and provide additional details on the inventory calculation methods in the table below.

Document title and attachment

2019 Houston GHG Emissions Inventory
COH 2019 GHG Emissions UEF 071421 Final Update.xlsx

Emissions inventory format

I have attached my inventory in the GPC format: City Inventory Reporting and Information System (CIRIS)

Web link

Attached Document

Emissions factors used

IPCC

Global Warming Potential (select relevant IPCC Assessment Report)

IPCC 4th AR (2007)

Please select which additional sectors are included in the inventory

No additional sectors included

Population in inventory year

2320268

Overall level of confidence

High

Comment on level of confidence

The City recently completed its 2019 GHG Emissions Inventory. A high level review was performed by a third party. The City is exploring options for a third party review and verification. The City followed a similar methodology as the 2014 GHG Emissions Inventory for which a high level of confidence was reported.

(4.6a) The Global Covenant of Mayors requires committed cities to report their inventories in the format of the new Common Reporting Framework, to encourage standard reporting of emissions data. Please provide a breakdown of your city-wide emissions by sector and sub-sector in the table below. Where emissions data is not available, please use the relevant notation keys to explain the reason why.

	Direct emissions (metric tonnes CO2e)	If you have no direct emissions to report, please select a notation key to explain why	Indirect emissions from the use of grid-supplied electricity, heat, steam and/or cooling (metric tonnes CO2e)	If you have no indirect emissions to report, please select a notation key to explain why	Emissions occurring outside the city boundary as a result of in-city activities (metric tonnes CO2e)	If you have no emissions occurring outside the city boundary to report as a result of in-city activities, please select a notation key to explain why	Please explain any excluded sources, identify any emissions covered under an ETS and provide any other comments
Stationary energy > Residential buildings	815970	Please select	4049204	Please select		NE	
Stationary energy > Commercial buildings & facilities	449325	Please select	8834817	Please select		NE	
Stationary energy > Institutional buildings & facilities		IE		IE		NE	Integrated Elsewhere – included in I.2.1 and I.2.2
Stationary energy > Industrial buildings & facilities	1183160	Please select		IE		NE	Integrated Elsewhere – included in I.2.2
Stationary energy > Agriculture		IE		IE		NE	Integrated Elsewhere – assumed to be included in I.2.1 and I.3.1 and in I.2.2 and I.3.2
Stationary energy > Fugitive emissions	35031	Please select		N/A		NE	
Total Stationary Energy	2483487	Please select	12884021	Please select		NE	
Transportation > On-road	16853981	Please select		IE		NE	Integrated Elsewhere – assumed to be included in Stationary Energy sector
Transportation > Rail	217846	Please select		IE		NE	Integrated Elsewhere – included in Stationary Energy I.2.2
Transportation > Waterborne navigation		NO		NO		NE	
Transportation > Aviation	586	Please select		NO		NE	
Transportation > Off-road		NO		NO		NE	
Total Transport	17072414	Please select		Combination of notation keys		NE	See above
Waste > Solid waste disposal	30089	Please select		N/A	566598	Please select	
Waste > Biological treatment		NO		N/A	20414	Please select	

	Direct emissions (metric tonnes CO2e)	If you have no direct emissions to report, please select a notation key to explain why	Indirect emissions from the use of grid-supplied electricity, heat, steam and/or cooling (metric tonnes CO2e)	If you have no indirect emissions to report, please select a notation key to explain why	Emissions occurring outside the city boundary as a result of in-city activities (metric tonnes CO2e)	If you have no emissions occurring outside the city boundary to report as a result of in-city activities, please select a notation key to explain why	Please explain any excluded sources, identify any emissions covered under an ETS and provide any other comments
Waste > Incineration and open burning		NO		N/A		NO	
Waste > Wastewater	225177	Please select		N/A		NO	
Total Waste	255266	Please select		N/A	587012	Please select	
IPPU > Industrial process		NE		N/A		NE	
IPPU > Product use		NE		N/A		NE	
Total IPPU		NE		N/A		NE	
AFOLU > Livestock		NE		N/A		NE	
AFOLU > Land use		NE		N/A		NE	
AFOLU > Other AFOLU		NE		N/A		NE	
Total AFOLU		NE		N/A		NE	
Generation of grid-supplied energy > Electricity-only generation	245852	Please select		N/A		NE	
Generation of grid-supplied energy > CHP generation	526508	Please select		N/A		NE	
Generation of grid-supplied energy > Heat/cold generation		IE		N/A		NE	Included in 1.4.4 CHP 1.A.1.a.ii
Generation of grid-supplied energy > Local renewable generation		NO		N/A		NE	
Total Generation of grid-supplied energy	772360	Please select		N/A		NE	
Total Emissions (excluding generation of grid-supplied energy)	19811166	Please select	12884021	Please select	587012	Please select	

(4.8) Please indicate if your city-wide emissions have increased, decreased, or stayed the same since your last emissions inventory, and describe why.

	Change in emissions	Primary reason for change	Please explain and quantify changes in emissions
Please explain	Decreased	Other, please specify (Decrease in stationary emissions)	Overall, the total emissions inventory (2019) decreased by 0.4% since the last reported inventory (2014). There was a nearly 7% decrease in stationary emissions and nearly 6% increase in transportation emissions. Waste Emissions increased by 2.91%. Although electricity demand increased in 2019 (observed by increased kWh usage and population growth), emissions from electricity decreased because of the improved composition of the electrical grid. The increase in transportation emissions in 2019 is largely driven by a 9% VMT per capita increase since 2014. VMT for Single Unit Trucks (short haul and long haul, refuse truck, and motor home) increased by 14%, similar to Passenger and Light Commercial Trucks. VMT for passenger cars rose by 13% while combination trucks (short and long haul) increased by 9%.

(4.9) Does your city have a consumption-based inventory to measure emissions from consumption of goods and services by your residents?

	Response	Provide an overview and attach your consumption-based inventory if relevant
Please complete	Intending to undertake in the next 2 years	

(4.11) Does your city have a strategy, or other policy document, in place for how to measure and reduce consumption-based GHG emissions in your city?

Food

Response

No

Please provide more details on and/or a link to the strategy or highlights of any specific actions the city is implementing

Construction

Response

No

Please provide more details on and/or a link to the strategy or highlights of any specific actions the city is implementing

Transportation

Response

No

Please provide more details on and/or a link to the strategy or highlights of any specific actions the city is implementing

Clothing and textiles

Response

No

Please provide more details on and/or a link to the strategy or highlights of any specific actions the city is implementing

Electronics

Response

No

Please provide more details on and/or a link to the strategy or highlights of any specific actions the city is implementing

Aviation

Response

No

Please provide more details on and/or a link to the strategy or highlights of any specific actions the city is implementing

City-wide external verification

(4.12) Has the city-wide GHG emissions data you are currently reporting been externally verified or audited in part or in whole?

Intending to undertake in the next 2 years

Historical emissions inventories

(4.13) Please provide details on any historical, base year or recalculated city-wide emissions inventories your city has, in order to allow assessment of targets in the table below.

Inventory date from

January 1 2014

Inventory date to

December 31 2014

Scopes / boundary covered

Total emissions

Previous emissions (metric tonnes CO2e)

33414017

Is this inventory a base year inventory or a recalculated version of a previously reported inventory?

Base year inventory

Methodology

Global Protocol for Community Greenhouse Gas Emissions Inventories (GPC)

File name and attach your inventory

2014 City of Houston Greenhouse Gas Emissions Inventory
Houston2014GPCCIRIS05.18.2018COHFINALforCDP.xlsx

Web link

Document attached

Comments

Inventory date from

January 1 2014

Inventory date to

December 31 2014

Scopes / boundary covered

Total emissions

Previous emissions (metric tonnes CO2e)

33414134

Is this inventory a base year inventory or a recalculated version of a previously reported inventory?

Recalculated version of a previously reported base year inventory

Methodology

Global Protocol for Community Greenhouse Gas Emissions Inventories (GPC)

File name and attach your inventory

2014 Houston GHG Emissions Inventory Updated
2014 Houston GHG Emissions Inventory CAP.xlsx

Web link

Document attached

Comments

The recalculation results from an update of the resident population used to determine the metric tonnes organic waste treated biologically to determine the emissions from the biological treatment of waste. Because of rounding issues the CIRIS spreadsheet and the total used as the baseline in the Houston Climate Action Plan differ slightly 33,414,135 verses 33,414,134 (CAP). The City, to be consistent with the CAP reports the 33,414,134 as the base.

Inventory date from

January 1 2019

Inventory date to

December 31 2019

Scopes / boundary covered

Total emissions

Previous emissions (metric tonnes CO2e)

33282189

Is this inventory a base year inventory or a recalculated version of a previously reported inventory?

Other, please specify (Previously submitted version since updated)

Methodology

Global Protocol for Community Greenhouse Gas Emissions Inventories (GPC)

File name and attach your inventory

2019 GHG Emissions Inventory
COH2019GHGEmissionsUEF012121Final.xlsx

Web link

Document attached.

Comments

The recalculation results from an update to aviation gasoline. The update results in a very slight change to overall emissions, 11 metric tonnes, from 33,282,189 to 33,282,200.

(4.14) State if the emissions factors and activity data used to calculate your cities emissions are accessible within the attached emissions inventory in question 4.5. If so, please describe where these are located within the attached inventory.

Emissions factors and Activity Data Reported

Emissions factors and activity data accessibility

Emissions factors and activity data are accessible within the attached inventory in question 4.5

State the location of emissions factors and activity data within the attached inventory in question 4.5

Emissions factors can be found on the 'Emission Factors' tab in the 2019 GHG Emission Inventory. Both the Emission Factors and Activity data can be found in each respective tab by sector and also corresponding calculator tabs.

5. Emissions Reduction

Mitigation Target setting

(5.0) Do you have a GHG emissions reduction target(s) in place at the city-wide level?

Base year emissions (absolute) target

(5.0a) Please provide details of your total city-wide base year emissions reduction (absolute) target(s). In addition, you may add rows to provide details of your sector-specific targets, by providing the base year emissions specific to that target.

Sector

All emissions sources included in city inventory

Where sources differ from the inventory, identify and explain these additions / exclusions

<http://greenhoustontx.gov/climateactionplan/index.html>

Boundary of target relative to city boundary (reported in 0.1)

Same (city-wide) – covers entire city and nothing else

Explanation of boundary choice where the inventory boundary differs from the city boundary (include inventory boundary, GDP and population)

Base year

2014

Year target was set

2020

Base year emissions (metric tonnes CO2e)

33414134

Percentage reduction target

40

Target year

2030

Target year absolute emissions (metric tonnes CO2e) [Auto-calculated]

20048480.4

The CAP plan targets account for certain growth factors, which result in an estimated target emissions reduction of 18 million metric tonnes CO2e. Percent target achieved to date is based on the Houston GHG 2019 Emissions Inventory.

Percentage of target achieved so far

0.99

Is this target considered to be your cities most ambitious target?

Other, please specify (Interim target)

Does this target align with the global 1.5 - 2 °C pathway set out in the Paris Agreement?

Yes - 1.5 °C

Select the initiatives that this target contributes towards

Global Covenant of Mayors for Climate & Energy

STAR Communities

Mayors National Climate Action Agenda

Does this target align to a requirement from a higher level of government?

No

Please describe your target. If your country has an NDC and your city's target is less ambitious than the NDC, please explain why.

The Houston Climate Action Plan, launched April 2020 and formally approved by Houston City Council October 2020, established a target to reduce GHG emissions by 100% by 2050 from a 2014 baseline. Interim targets include a 40% reduction by 2030 and 75% by 2040. This target applies to all the emission sources covered by the City's inventory and is outlined in the Houston Climate Action Plan: <http://greenhoustontx.gov/climateactionplan/index.html>. The US NDC established April 2021 is based on a 2005 baseline. The City's interim target of 75% by 2040 (26 years from the 2014 baseline) exceeds the US NDC of 50% over a 25 year period).

Sector

All emissions sources included in city inventory

Where sources differ from the inventory, identify and explain these additions / exclusions

<http://greenhoustontx.gov/climateactionplan/index.html>

Boundary of target relative to city boundary (reported in 0.1)

Same (city-wide) – covers entire city and nothing else

Explanation of boundary choice where the inventory boundary differs from the city boundary (include inventory boundary, GDP and population)

Base year

2014

Year target was set

2020

Base year emissions (metric tonnes CO2e)

33414134

Percentage reduction target

75

Target year

2040

Target year absolute emissions (metric tonnes CO2e) [Auto-calculated]

8353533.5

Percentage of target achieved so far

0.53

Is this target considered to be your cities most ambitious target?

Other, please specify (Interim goal)

Does this target align with the global 1.5 - 2 °C pathway set out in the Paris Agreement?

Yes - 1.5 °C

Select the initiatives that this target contributes towards

Global Covenant of Mayors for Climate & Energy

STAR Communities

Mayors National Climate Action Agenda

Does this target align to a requirement from a higher level of government?

No

Please describe your target. If your country has an NDC and your city's target is less ambitious than the NDC, please explain why.

NA

Sector

All emissions sources included in city inventory

Where sources differ from the inventory, identify and explain these additions / exclusions

<http://greenhoustontx.gov/climateactionplan/index.html>

Boundary of target relative to city boundary (reported in 0.1)

Same (city-wide) – covers entire city and nothing else

Explanation of boundary choice where the inventory boundary differs from the city boundary (include inventory boundary, GDP and population)

Base year

2014

Year target was set

2020

Base year emissions (metric tonnes CO2e)

33414134

Percentage reduction target

100

Target year

2050

Target year absolute emissions (metric tonnes CO2e) [Auto-calculated]

0

Percentage of target achieved so far

0.39

Is this target considered to be your cities most ambitious target?

Yes

Does this target align with the global 1.5 - 2 °C pathway set out in the Paris Agreement?

Yes - 1.5 °C

Select the initiatives that this target contributes towards

Global Covenant of Mayors for Climate & Energy

STAR Communities

Mayors National Climate Action Agenda

Does this target align to a requirement from a higher level of government?

No

Please describe your target. If your country has an NDC and your city's target is less ambitious than the NDC, please explain why.

NA

(5.1) Please describe how the target(s) reported above align with the global 1.5 - 2 °C pathway set out in the Paris agreement.

In April 2020, the City of Houston launched its Climate Action Plan. Houston City Council formally adopted the CAP October 2020. As outlined in the CAP, to comply with the Paris Agreement, the Houston plan will follow science-based criteria that will cap the temperature increase associated with climate change to 1.5 degrees Celsius. Scientists believe that preventing global temperatures from rising more than 1.5 degrees Celsius will avert the worst consequences of climate change. To comply with the Paris Climate Agreement and achieve a long-term goal of carbon neutrality by 2050, ambitious, interim targets were established. Using these targets as a roadmap, the CAP aims to reduce Houston's base year emissions (33,414,134 tonnes CO₂e in 2014; city-induced framework) by at least 40% by 2030 and at least 75% by 2040.) The plan promotes practical, cost-effective steps to develop global low-carbon energy, transportation, and waste solutions.

(5.2) Is your city-wide emissions reduction target(s) conditional on the success of an externality or component of policy outside of your control?

No

(5.3) Does your city-wide emissions reduction target(s) account for the use of transferable emissions units?

Yes

(5.3a) Please provide details on the use of transferable emissions.

Type of transferable emissions

Renewable energy credits

Emissions saved (metric tonnes CO₂e)

What percentage of the target does this unit represent?

Please identify which target this refers to and describe the transferable emissions unit in particular the source of the transferable units

Given deregulation of the Texas energy market, the City of Houston purchases electricity through a Retail Electricity Provider and does not own or operate a municipal utility. To meet its target of powering 100% of municipal operations with renewable energy, the City purchases renewable energy through its retail contract with NRG. NRG fulfills the 100% renewable requirement through a combination of Renewable Energy Certificates and purchasing power from a utility-scale solar farm in West Texas.

Mitigation Actions

(5.4) Describe the anticipated outcomes of the most impactful mitigation actions your city is currently undertaking; the total cost of the action and how much is being funded by the local government.

Mitigation action

Energy Supply > Low or zero carbon energy supply generation

Action title

Community Solar Projects on Municipal Land

Means of implementation

Education

Awareness raising program or campaign

Stakeholder engagement

Infrastructure development

Implementation status

Pre-implementation

Start year of action

2019

End year of action

2023

Estimated emissions reduction (metric tonnes CO₂e)

60000

Energy savings (MWh)

98880

Renewable energy production (MWh)

98880

Timescale of reduction / savings / energy production

Per year

Co-benefit area

Enhanced resilience

Reduced GHG emissions

Improved resource efficiency (e.g. food, water, energy)

Job creation

Improved resource quality (e.g. air, water)

Improved resource security (e.g. food, water, energy)

Action description and implementation progress

Through participation in the C40 Reinventing Cities program, the City is re-imagining how under-utilized public assets can be used in a sustainable way. Starting in Sunnyside, a neighborhood in the Complete Communities program, the City is working with Sunnyside Energy to convert the 240-acre former Holmes Road landfill into a 50 MW solar farm. The proposal by Sunnyside was selected through a competitive process and includes other potential benefits such as jobs and training, energy discounts for lower-income residents in the neighborhood, and reduced flooding.

Finance status

Pre-feasibility study status

Total cost of the project

70000000

Total cost provided by the local government

0

Majority funding source

Public-private partnership

Total cost provided by the majority funding source (currency)

70000000

Web link to action website

<http://greenhoustontx.gov/pressrelease20190829.html>

Name of the stakeholder group

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Buildings > Building performance rating and reporting

Action title

Building Performance Rating

Means of implementation

Policy and regulation

Implementation status

Implementation

Start year of action

2008

End year of action

2021

Estimated emissions reduction (metric tonnes CO2e)

10875.4

Energy savings (MWh)

27118.1

Renewable energy production (MWh)

Timescale of reduction / savings / energy production

Projected lifetime

Co-benefit area

Reduced GHG emissions

Improved resource efficiency (e.g. food, water, energy)

Shift to more sustainable behaviours

Action description and implementation progress

The City of Houston has voluntary benchmarking programs, like the Department of Energy's Better Buildings Challenge, where commercial buildings opt into disclosing their energy ratings to the City. Municipal buildings account for 7 million out of 30 million square feet of the city's commitment. Houston improved energy performance by 25% from a 2008 baseline. Progress related to the DOE Better Buildings Challenge can be found at <https://betterbuildingsolutioncenter.energy.gov/energy-data/Houston,%20TX>. Houston recently received confirmation from the DOE regarding its progress, which is not reflected in the corresponding link.

Finance status

Finance secured

Total cost of the project

Total cost provided by the local government

Majority funding source

Local

Total cost provided by the majority funding source (currency)

Web link to action website

<https://betterbuildingsolutioncenter.energy.gov/partners/houston-tx>

Name of the stakeholder group

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Buildings > Energy efficiency/ retrofit measures

Action title

Property Assessed Clean Energy Program/Energy

Means of implementation

Stakeholder engagement
Infrastructure development
Financial mechanism

Implementation status

Operation

Start year of action

2015

End year of action

Estimated emissions reduction (metric tonnes CO2e)

6900

Energy savings (MWh)

12770.23

Renewable energy production (MWh)

52.88

Timescale of reduction / savings / energy production

Per year

Co-benefit area

Enhanced resilience
Reduced GHG emissions
Improved resource efficiency (e.g. food, water, energy)
Job creation
Resource conservation (e.g. soil, water)

Action description and implementation progress

In 2015, Houston City Council adopted a resolution creating the state's first municipal Property Assessed Clean Energy Program (PACE) to provide an additional tool for Houston property owners to finance energy efficiency, renewable energy, and water conservation projects. In 2017, Houston's first PACE project was announced, which, at just over \$2 million, was the largest PACE project in Texas at that time. To date, 8 projects have been completed in Houston, resulting in more than \$33.4 million in investment and saving 6,900 metric tonnes of CO2 emissions each year, 28.4 million gallons water/year, 12.8 million kWh/year of electricity, and 4.8 million BTU/year of natural gas. PACE projects also created 441 clean energy jobs.

Finance status

Finance secured

Total cost of the project

33428043

Total cost provided by the local government

0

Majority funding source

Public-private partnership

Total cost provided by the majority funding source (currency)

33428043

Web link to action website

<https://www.texaspaceauthority.org/houston-pace/>

Name of the stakeholder group

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Buildings > Energy efficiency/ retrofit measures

Action title

City of Houston General Services Department (GSD) Energy Efficiency Project

Means of implementation

Assessment and evaluation activities

Implementation status

Implementation

Start year of action

2021

End year of action

Estimated emissions reduction (metric tonnes CO2e)

3686

Energy savings (MWh)

3618.76

Renewable energy production (MWh)

107.93

Timescale of reduction / savings / energy production

Per year

Co-benefit area

Reduced GHG emissions

Improved resource efficiency (e.g. food, water, energy)

Resource conservation (e.g. soil, water)

Shift to more sustainable behaviours

Action description and implementation progress

GSD applied to the State Energy Conservation Office (SECO) for energy efficiency funding under its LoanSTAR (Saving Taxes and Resources) Revolving Loan Program to fund the energy cost reduction measures identified by Texas Engineering Experiment Station (TEES) Energy Systems Laboratory. TEES conducted and developed a Preliminary Energy Assessment (PEA), followed by a detailed Utility Assessment Report (UAR) for identified strategies. The total estimated cost of the loan, including energy cost reduction measures and project management is \$2,326,526 with a payback of 8.7 years. GSD will implement the energy cost reduction measures at Bob Lanier Public Works Buildings, City Hall, City Hall Annex, and the Houston Permitting Center. The City will repay the low-interest SECO loan from energy cost savings achieved through retrofits of the facilities. On May 6, 2020 City Council approved Ordinance No. 2020-0395 an Interlocal Agreement for Energy Services between the City of Houston and Texas A&M Engineering Equipment Station.

Finance status

Feasibility finalized, and finance partially secured

Total cost of the project

2326526

Total cost provided by the local government

0

Majority funding source

Other, please specify (SECO LoanStar Revolving Loan Program)

Total cost provided by the majority funding source (currency)

2326526

Web link to action website

<https://houston.novusagenda.com/agendapublic/CoverSheet.aspx?ItemID=19643&MeetingID=429>; <https://comptroller.texas.gov/programs/seco/funding/loanstar/>

Name of the stakeholder group

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Buildings > On-site renewable energy generation

Action title

Solar United Neighbors (SUN) – City-Wide Solar Cooperative

Means of implementation

Education

Awareness raising program or campaign

Stakeholder engagement

Infrastructure development

Implementation status

Implementation

Start year of action

2021

End year of action**Estimated emissions reduction (metric tonnes CO2e)**

327

Energy savings (MWh)

672

Renewable energy production (MWh)

672

Timescale of reduction / savings / energy production

Per year

Co-benefit area

Enhanced resilience

Reduced GHG emissions

Improved resource efficiency (e.g. food, water, energy)

Shift to more sustainable behaviours

Action description and implementation progress

April 2021, Mayor Turner and Solar United Neighbors (SUN) announced the launch of Houston's citywide solar co-op. The Co-op will help Houston residents go solar. SUN's city-wide solar co-op is open to homeowners and business owners in and around Houston. Co-op members select a single solar company to complete the installations following SUN's facilitation of a competitive process to select an installer. Joining does not obligate members to purchase solar. Members have the option to individually purchase solar panels, batteries, and electric vehicle chargers based on the installer's group rate. SUN is a non-profit organization that works in Texas and nationwide to represent the needs and interests of solar owners and supporters. Solar co-ops are part of the organization's mission to create a new energy system with rooftop solar at the cornerstone. Solar United Neighbors holds events and education programs to help people become informed solar consumers, maximize the value of their solar investment, and advocate for fair solar policies. Assumptions used to calculate emissions reductions, energy savings and renewable energy production include: Assuming a 25% close rate from the 285 member co-op (70 contracts), and an average 8 kW size, the estimated installed capacity of 560 kW would provide an estimated emissions reduction (CO2e) of 327 metric tonnes per year, beginning mostly next year. The 560 kW of solar will save an estimated 672 MWh the first year, mostly beginning next year. Assuming the energy produced is used by the homes or sent into the grid to be used, then it is also the energy saved.

Finance status

Feasibility undertaken

Total cost of the project

1344000

Total cost provided by the local government

0

Majority funding source

Other, please specify (Local – individual home and business owners. Solar United Neighbors has provided their expertise and support free of charge)

Total cost provided by the majority funding source (currency)

1344000

Web link to action website<https://www.houstontx.gov/mayor/press/2021/solar-co-op.html>**Name of the stakeholder group**

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Private Transport > Improve fuel economy and reduce CO2 from motorized vehicles

Action title

EVOlve Houston Partnership and EVOlve Electric Vehicle Roadmap 30 by 30

Means of implementation

Awareness raising program or campaign

Policy and regulation

Sustainable public procurement

Implementation status

Operation

Start year of action

2019

End year of action

2030

Estimated emissions reduction (metric tonnes CO2e)

2100000

Energy savings (MWh)

0

Renewable energy production (MWh)

0

Timescale of reduction / savings / energy production

Per year

Co-benefit area

Reduced GHG emissions

Shift to more sustainable behaviours

Action description and implementation progress

EVOlve Houston is a public-private coalition founded by Mayor Turner, Shell, NRG Energy, CenterPoint Energy, the University of Houston, and LDR Advisory Partners dedicated to improving air quality and reducing GHG emissions by electrifying transportation in Houston. Launched in late 2019, EVOlve Houston set a "30 by 30" goal: for electric vehicles to reach a 30% share of annual new car sales in Houston by 2030. To achieve this goal, EVOlve Houston developed an Electric Vehicle Roadmap, which focuses on strategically increasing the awareness, availability, and affordability of electric vehicles. EVOlve Houston is already implementing these initiatives through pilot projects, demonstrations, and educational outreach to accelerate EV adoption. The estimated emissions reductions are based on reaching 30% EV sales in 2030 in the greater Houston area.

Finance status

Pre-feasibility study status

Total cost of the project**Total cost provided by the local government**

0

Majority funding source

Public-private partnership

Total cost provided by the majority funding source (currency)**Web link to action website**www.evolvehouston.org; <https://www.houstontx.gov/mayor/press/evolve-houston.html>**Name of the stakeholder group**

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Private Transport > Improve fuel economy and reduce CO2 from motorized vehicles

Action title

Convert 100% of the non-emergency, light-duty municipal fleet to EV technologies

Means of implementation

Education

Capacity building and training activities

Awareness raising program or campaign

Stakeholder engagement

Infrastructure development

Assessment and evaluation activities

Development and implementation of action plan

Policy and regulation

Sustainable public procurement

Implementation status

Implementation

Start year of action

2021

End year of action

2030

Estimated emissions reduction (metric tonnes CO2e)

39360

Energy savings (MWh)

888204

Renewable energy production (MWh)

0

Timescale of reduction / savings / energy production

Other, please specify (Estimated reductions will be per year (lifetime) after full project implementation)

Co-benefit area

Disaster Risk Reduction
Enhanced resilience
Disaster preparedness
Enhanced climate change adaptation
Reduced GHG emissions
Improved resource efficiency (e.g. food, water, energy)
Poverty reduction / eradication
Social inclusion, social justice
Social community and labour improvements
Greening the economy
Economic growth
Promote circular economy
Job creation
Improved resource quality (e.g. air, water)
Improved public health
Improved resource security (e.g. food, water, energy)
Security of tenure
Resource conservation (e.g. soil, water)
Ecosystem preservation and biodiversity improvement
Shift to more sustainable behaviours
Improved access to data for informed decision-making

Action description and implementation progress

The Houston CAP includes a target to convert 100% of its non-emergency, light-duty municipal fleet to EV technologies by 2030. The City plans to convert 8,000 vehicles. This project includes several activities which are in various stages of implementation and financial status and include: 1. Educate employees on benefits of battery electric vehicles. Mitigate fears of getting stuck on the road when the battery fails to provide for additional buy in. (Underway). Implementation status: scoping. Finance status: pre-feasibility study status. 2. Train auto technicians on maintenance of battery electric vehicles. Training scheduled to start later this year. Implementation status: pre-implementation. Finance status: finance secured. 3. Meet with staff of different departments to discuss opportunities for implementation of electric vehicles and available vehicle models. (Underway). Implementation status: implementation. Finance status: feasibility finalized, and finance partially secured. 4. Work with vehicle manufacturers and staff of the different departments to ensure electric vehicle implementations are optimized to ensure Climate Action goals are met without compromising City services. (Underway). Implementation status: implementation. Finance status: feasibility finalized, and finance partially secured. 5. Design and construct infrastructure improvements necessary to support the recharging of EVs. (Underway). Implementation status: implementation. Finance status: feasibility finalized, and finance partially secured. 6. Monitor, analyze and report EV usage and energy consumption to optimize emissions reductions, vehicle utilization, and cost savings. Cloud based services communicating with each charger will be used to source and report data. Currently being installed. Implementation status: scoping. Feasibility status: finance secured. 7. Develop and implement a strategic plan of infrastructure and vehicle deployments that is consistent with project goals and budget while ensuring critical City services are sustained. (Underway). Implementation status: implementation. Finance status: finance secured. 8. Develop and implement policies and standard operating procedures to coordinate efforts and facilitate project goals. (Underway). Implementation status: scoping. Finance status: finance secured. 9. Procure vehicles and charging infrastructure in accordance with policy and regulation. (Underway). Implementation status: implementation. Finance status: finance secured. The total \$344M cost includes cost of 8,000 vehicles, 6,000 chargers and utility retrofits.

Finance status

Feasibility finalized, and finance partially secured

Total cost of the project

344700000

Total cost provided by the local government

344700000

Majority funding source

Local

Total cost provided by the majority funding source (currency)

344700000

Web link to action website

<http://greenhoustontx.gov/climateactionplan/CAP-April2020.pdf>; <https://www.houstontx.gov/fleet/ev/>; <http://www.houstontx.gov/council/committees/fy22workshops/fleet.pdf>

Name of the stakeholder group

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Community-Scale Development > Transit oriented development

Action title

Houston Bike Share Program / Houston BCycle Expansion Project

Means of implementation

Infrastructure development
Monitor activities

Implementation status

Operation

Start year of action

2017

End year of action

2021

Estimated emissions reduction (metric tonnes CO2e)

970.6

Energy savings (MWh)

0

Renewable energy production (MWh)

0

Timescale of reduction / savings / energy production

Other, please specify (2020 estimated reduction)

Co-benefit area

Reduced GHG emissions

Improved public health

Shift to more sustainable behaviours

Action description and implementation progress

Houston BCycle is the city's bike share program and currently consists of over 130 stations and 1,000 bikes available to riders across Houston neighborhoods. The system is operated by Houston Bike Share, a local 501(c)(3) nonprofit whose mission is to provide equitable access to bike share that fosters recreation, mobility and personal wellness. In 2020, Houston BCycle ridership is the highest it's ever been with a 29% increase in bike share trips compared to last year. From 2017 to 2020 Houston BCycle has seen 117% growth in ridership. Expansion Project (expected completion in 2021). With oversight from the Houston Planning & Development Department and funding support from a federal grant and local partners, Houston Bike Share is leading a \$4.7 million project to expand the Houston BCycle network. The Planning & Development Department sponsored an application in the 2015 Transportation Improvement Program Call for Projects to expand the Houston BCycle program and was awarded a grant from the Federal Highway Administration. The expansion project will almost quadruple the size of bike share in Houston by adding 97 bike stations and 767 bicycles. Two transport vans will also be added to help distribute bikes across the Houston BCycle network. As new stations are added to the network, the bike share system becomes more useful by connecting more neighborhoods to job centers and recreational destinations. The grant will reimburse the City of Houston for 80% of the cost to expand the system, up to \$3.7 million. Houston Bike Share, the City's project partner and program operator, will provide the 20% local match requirement and oversee installation of the bike stations. City of Houston provides 100% of the funding upfront for the grant-funded expansion project. 80% of project expenses is reimbursable by TxDOT (Texas Department of Transportation), the project's grant administrator. Houston Bike Share provides the 20% local match funds for the project. The \$940,500 Local Government Participation is provided to the City by Houston Bike Share. The City works in partnership with Houston Bike Share. Houston Bike Share partners with local public and private stakeholders to obtain local match funding for the bike stations. The City does not provide funding for the operation of the Houston BCycle program. Bike station user fees provide 80% of operational needs for the program. Houston Bike Share obtains other grants and private donations to supplement operation needs. Since 2017, Houston BCycle rides produced the following: Total Rides - 842,855 (2017 - 140,151; 2018 - 162,770; 2019 - 236,192; and 2020 - 303,742) Total Distance (miles) - 5,200,106 (2017 - 972,420; 2018 - 974,582; 2019 - 1,203,825; 2020 - 2,049,279) Funding information below is for the expansion project.

Finance status

Finance secured

Total cost of the project

4702500

Total cost provided by the local government

940500

Majority funding source

Other, please specify (Transportation Alternatives Program Federal Grant (80% match))

Total cost provided by the majority funding source (currency)

3762000

Web link to action website<https://www.houstontx.gov/planning/transportation/BCycle.html>; <https://www.houstonbicycle.com/>**Name of the stakeholder group**

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Community-Scale Development > Transit oriented development

Action title

Bayou Greenways 2020

Means of implementation

Awareness raising program or campaign

Infrastructure development

Implementation status

Operation

Start year of action

2020

End year of action

2024

Estimated emissions reduction (metric tonnes CO2e)

0

Energy savings (MWh)

0

Renewable energy production (MWh)

0

Timescale of reduction / savings / energy production

Other, please specify (Indirect impact on emissions)

Co-benefit area

Enhanced resilience

Reduced GHG emissions

Job creation

Resource conservation (e.g. soil, water)

Ecosystem preservation and biodiversity improvement

Action description and implementation progress

In 2020, the Houston Parks Board completed the \$220 million Bayou Greenways initiative which created 150 miles of trails and bridges connecting Houston's major bayous across 3,000 acres of park space. It is anticipated that 1.5 million Houstonians will live within 1.5 miles of the Bayou Greenways. 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, and the Beyond the Bayous program will bring more parks and trails to the city so that everyone can enjoy equitable access to green spaces. Through these efforts, the City will enhance the environmental health of its communities and its economic landscape, creating new homes and job opportunities. Most of the Bayou Greenways is completed (85%), i.e. designed, constructed and in operation. The City contributed \$100 million in park bond funds toward the project. The remaining \$120 million is through private donations as well as state and federal grants.

Finance status

Finance secured

Total cost of the project

220000000

Total cost provided by the local government

100000000

Majority funding source

Public-private partnership

Total cost provided by the majority funding source (currency)

120000000

Web link to action website

<https://houstonparksboard.org/about/bayou-greenways-2020>

Name of the stakeholder group

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Buildings > Energy efficiency/ retrofit measures

Action title

Houston Airport System Energy Efficiency Project

Means of implementation

Assessment and evaluation activities

Implementation status

Implementation

Start year of action

2021

End year of action

Estimated emissions reduction (metric tonnes CO2e)

17255

Energy savings (MWh)

24404

Renewable energy production (MWh)

110.4

Timescale of reduction / savings / energy production

Per year

Co-benefit area

Reduced GHG emissions
Improved resource efficiency (e.g. food, water, energy)
Resource conservation (e.g. soil, water)
Shift to more sustainable behaviours

Action description and implementation progress

The Houston Airport System, through a design and construction management agreement with the Texas A&M Engineering Experiment Station (TEES), a member of the Texas A&M University System, will upgrade and renovate outdated infrastructure and equipment at the William P. Hobby and George Bush Intercontinental Airports. The projects include installing four new chillers, improving building operations, and installing a solar array on new shading canopies. The implemented projects will reduce annual energy consumption by more than 24 million kWh and utility costs by more than \$1.3 million. This will also help the Houston Airport System to reach its "net-zero" energy goal for George Bush Intercontinental Airport. TEES will manage project design and construction. The majority of funding will come from the LoanSTAR Program, administered by the State Energy Conservation Office.

Finance status

Finance secured

Total cost of the project

28370167

Total cost provided by the local government

12847025

Majority funding source

Other, please specify (Project management services related to the actual implementation of equipment upgrade and energy efficiency measures as funded by City and/or State agencies (i.e. State Energy Conservation Office (SECO))

Total cost provided by the majority funding source (currency)

15523142

Web link to action website

<https://www.fly2houston.com/newsroom/releases/texas-m-system-partners-city-houston-implement-capital-improvement-and-energy-efficiency-upgrades-ho/>

Name of the stakeholder group

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Community-Scale Development > Transit oriented development

Action title

Houston Bike Plan

Means of implementation

Education
Awareness raising program or campaign
Stakeholder engagement
Infrastructure development
Policy and regulation

Implementation status

Implementation

Start year of action

2018

End year of action

Estimated emissions reduction (metric tonnes CO2e)

0

Energy savings (MWh)

0

Renewable energy production (MWh)

0

Timescale of reduction / savings / energy production

Other, please specify (An indirect impact is anticipated on emissions and energy savings)

Co-benefit area

Reduced GHG emissions
Improved resource efficiency (e.g. food, water, energy)
Social inclusion, social justice

Improved public health
Improved access to and quality of mobility services and infrastructure
Shift to more sustainable behaviours

Action description and implementation progress

The Houston Bike Plan was adopted by City Council and Mayor Sylvester Turner in 2017, which includes a network of nearly 1,800 miles of high-comfort bicycle facilities. Starting in Fiscal Year 2018, the City of Houston allocated \$1.1 million each year for five years for bicycle infrastructure through its Capital Improvement Project. In 2020, 13 miles of high-comfort bike lanes were completed, which means over nearly 350 miles of the Bike Plan have been implemented, 50 more miles are in design or construction, and 1,400 more miles planned. Additional efforts include passing a Citywide “No Parking in Bike Lane” ordinance, community engagement and education, and pop-up bike lanes projects. The total costs to be provided by the City has not yet been determined, since partners and funding sources have not all been determined. Please note that this project is included in the City’s budget each year, but without guaranteed funding each successive year.

Finance status

Feasibility finalized, and finance partially secured

Total cost of the project

525000000

Total cost provided by the local government

Majority funding source

Other, please specify (The City is working to secure financing and not all the funding sources have been identified.)

Total cost provided by the majority funding source (currency)

Web link to action website

houstonbikeplan.org; <https://mycity.maps.arcgis.com/apps/webappviewer/index.html?id=c59bb1a39ba14202817e11ce7420ad31>

Name of the stakeholder group

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Waste > Recycling or composting collections and/or facilities

Action title

City of Houston Long Range Solid Waste Management Plan

Means of implementation

Education
Awareness raising program or campaign
Stakeholder engagement
Assessment and evaluation activities
Monitor activities
Development and implementation of action plan
Policy and regulation
Financial mechanism
Sustainable public procurement

Implementation status

Pre-implementation

Start year of action

2021

End year of action

2040

Estimated emissions reduction (metric tonnes CO2e)

Energy savings (MWh)

Renewable energy production (MWh)

Timescale of reduction / savings / energy production

Please select

Co-benefit area

Reduced GHG emissions
Promote circular economy
Shift to more sustainable behaviours

Action description and implementation progress

The City’s Solid Waste Department recently finalized a 20-year long range solid waste plan in February 21. The Plan was presented to City Council June 2020. The plan proposes to, among other things, right-size collection’s operations with necessary collections equipment and staffing, increase the number of inspectors needed to address illegal dumping enforcement in a more substantial way, and provide first class programs designed to reduce waste generation and improve quality of recycling programs. The cost of the plan was approximately \$485,000.

Finance status

Finance secured

Total cost of the project

485000

Total cost provided by the local government

485000

Majority funding source

Local

Total cost provided by the majority funding source (currency)

485000

Web link to action website

<https://www.houstontx.gov/council/committees/rna/20200601/swd-long-range-plan.pdf>;
https://www.houstontx.gov/solidwaste/longrange/plan/2020_DRAFT_Plan_FullDocument.pdf

Name of the stakeholder group

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Energy Supply > Low or zero carbon energy supply generation

Action title

Purchasing renewable energy to cover 100% of municipal operations

Means of implementation

Infrastructure development
Financial mechanism
Sustainable public procurement

Implementation status

Monitoring and reporting

Start year of action

2020

End year of action**Estimated emissions reduction (metric tonnes CO2e)**

500000

Energy savings (MWh)**Renewable energy production (MWh)**

1200000

Timescale of reduction / savings / energy production

Per year

Co-benefit area

Reduced GHG emissions
Improved access to and quality of mobility services and infrastructure
Shift to more sustainable behaviours

Action description and implementation progress

In the Climate Action Plan, launched April 2020, the City of Houston committed to purchasing 100% renewable energy, which it achieved through a new 7-year contract with NRG, its Retail Electric Provider, starting July 2020. The contract saves the City over \$9 million annually on its electric bill.

Finance status

Finance secured

Total cost of the project**Total cost provided by the local government****Majority funding source**

Local

Total cost provided by the majority funding source (currency)**Web link to action website**

<https://www.houstontx.gov/mayor/press/2020/100-percent-renewable-energy.html>

Name of the stakeholder group

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Private Transport > Infrastructure for non-motorized transport

Action title

Vision Zero Action Plan

Means of implementation

Education

Awareness raising program or campaign

Stakeholder engagement

Infrastructure development

Assessment and evaluation activities

Monitor activities

Development and implementation of action plan

Policy and regulation

Implementation status

Implementation

Start year of action

2020

End year of action

2030

Estimated emissions reduction (metric tonnes CO2e)

0

Energy savings (MWh)

0

Renewable energy production (MWh)

0

Timescale of reduction / savings / energy production

Other, please specify (An indirect impact on emissions and energy savings is anticipated)

Co-benefit area

Reduced GHG emissions

Improved resource efficiency (e.g. food, water, energy)

Social inclusion, social justice

Improved public health

Improved access to and quality of mobility services and infrastructure

Shift to more sustainable behaviours

Action description and implementation progress

In 2019, Mayor Turner signed an Executive Order for Vision-Zero Houston and appointed an Executive Committee and a Task Force to guide development of a Vision Zero Action Plan. Led by the Planning and Development Department, the purpose of the plan is to eliminate traffic-related fatalities and improve road safety by 2030. The Vision Zero Action Plan was released in December 2020; implementation started the next day. In the 6 months since the plan was released, 12 of the plan's 13 priority actions have been initiated. Please note that this project is included in the City's budget each year, but without guaranteed funding each successive year.

Finance status

Feasibility finalized, and finance partially secured

Total cost of the project**Total cost provided by the local government****Majority funding source**

Please select

Total cost provided by the majority funding source (currency)**Web link to action website**

<https://www.houstontx.gov/visionzero>; https://houstontx.gov/visionzero/pdf/VZAP_Final%20Report.pdf

Name of the stakeholder group

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Private Transport > Infrastructure for non-motorized transport

Action title

Walkable Places Program

Means of implementation

Awareness raising program or campaign
Stakeholder engagement
Infrastructure development
Policy and regulation

Implementation status

Implementation

Start year of action

2020

End year of action**Estimated emissions reduction (metric tonnes CO2e)****Energy savings (MWh)****Renewable energy production (MWh)****Timescale of reduction / savings / energy production**

Other, please specify (Estimated emissions reduction, energy savings & renewable energy production: negligible, due to short time program has been in place. More time is needed for developers to incorporate regulations into their project designs and complete construction)

Co-benefit area

Reduced GHG emissions
Improved resource efficiency (e.g. food, water, energy)
Improved public health
Improved access to and quality of mobility services and infrastructure
Shift to more sustainable behaviours

Action description and implementation progress

The Walkable Places and Transit-Oriented Development Programs became effective October 1, 2020. Both programs create rules to guide development on private properties. These rules are related to the pedestrian realm, building design and site design. The City of Houston Proposed Walkable Places Program and Plan establishes a public process to create context sensitive, pedestrian friendly development rules along designated street segments within the city. These public street corridors are in areas where the goal is to attract higher density commercial, office, and multifamily residential developments and improve the pedestrian experience. Note regarding estimated emissions reduction, energy savings and renewable energy production. The response is currently negligible due to the relatively short time this program has been in place. More time is needed for developers to incorporate the new regulations into their project designs and to complete construction. The total cost to local government is in-kind only, staff time to develop ordinance amendments.

Finance status

Finance secured

Total cost of the project**Total cost provided by the local government****Majority funding source**

Other, please specify (Local. In-kind only - staff time to develop ordinance amendments.)

Total cost provided by the majority funding source (currency)**Web link to action website**

https://www.houstontx.gov/planning/Commissions/committee_walkable-places.html;
https://houstontx.gov/planning/docs_pdfs/walkable_places/Walkable%20Places%20and%20Transit-Oriented%20Development%20Ordinance.pdf;
<https://houstontx.gov/planning/walkable-places-users-guide.html>

Name of the stakeholder group

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Private Transport > Infrastructure for non-motorized transport

Action title

Transit Oriented Development

Means of implementation

Awareness raising program or campaign

Stakeholder engagement
Infrastructure development
Policy and regulation

Implementation status

Implementation

Start year of action

2020

End year of action

Estimated emissions reduction (metric tonnes CO2e)

Energy savings (MWh)

Renewable energy production (MWh)

Timescale of reduction / savings / energy production

Other, please specify (Estimated emissions reduction, energy savings & renewable energy production: negligible, due to short time program has been in place. More time is needed for developers to incorporate new rules into their project designs and complete construction)

Co-benefit area

Reduced GHG emissions
Improved resource efficiency (e.g. food, water, energy)
Improved public health
Improved access to and quality of mobility services and infrastructure
Shift to more sustainable behaviours

Action description and implementation progress

The Walkable Places and Transit-Oriented Development Programs became effective October 1, 2020. Both programs create rules to guide development on private properties. These rules are related to the pedestrian realm, building design and site design. The City of Houston Transit-Oriented Development Amendment and Transit Corridor Ordinance are designed to encourage the use of different types of transportation, such as walking and cycling, that reduce car dependency. The program promotes pedestrian safety by creating wider, unobstructed sidewalks and landscaping, increasing the 'eyes on the street' and providing more separation between automobile and pedestrian areas. Note regarding estimated emissions reduction, energy savings and renewable energy production. The response is currently negligible due to the short time the program has been in place. More time is needed for developers to incorporate the new rules into their project designs and to complete construction. The total cost to local government is in-kind only, staff time to develop regulations.

Finance status

Finance secured

Total cost of the project

Total cost provided by the local government

Majority funding source

Other, please specify (Local - in-kind only - staff time to develop regulations)

Total cost provided by the majority funding source (currency)

Web link to action website

https://www.houstontx.gov/planning/Commissions/committee_walkable-places.html;
https://houstontx.gov/planning/docs_pdfs/walkable_places/Walkable%20Places%20and%20Transit-Oriented%20Development%20Ordinance.pdf;
<https://houstontx.gov/planning/walkable-places-users-guide.html>

Name of the stakeholder group

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Water > Water use efficiency projects

Action title

2019 Water Conservation Plan

Means of implementation

Development and implementation of action plan

Implementation status

Implementation

Start year of action

2019

End year of action

2024

Estimated emissions reduction (metric tonnes CO2e)

Energy savings (MWh)

Renewable energy production (MWh)**Timescale of reduction / savings / energy production**

Please select

Co-benefit area

Enhanced resilience
Reduced GHG emissions
Improved resource efficiency (e.g. food, water, energy)
Resource conservation (e.g. soil, water)
Shift to more sustainable behaviours

Action description and implementation progress

The City of Houston Water Conservation Plan (effective 2019-2024), highlights water conservation goals and continuous progress that will preserve long-term water supplies for the City of Houston and the greater Houston region. Water supply planning is important to the City of Houston in order to meet long term growth in demand and to comply with 30 TAC Chapter 288 that requires the City to prepare and implement a water conservation plan that meets certain requirements. This plan includes information to fulfil these requirements in addition to information specific to the City of Houston's water supply and treatment systems. The current plan includes measures to be taken internally at the City of Houston as well as programs for water customers. These include current programs such as an in-house public education program, continued enforcement of water-wise building and plumbing codes, and the Consumption Awareness Program, which communicates real-time meter data to household users, advanced metering infrastructure (AMI). This document also summarizes plans to develop an internal Water Loss Program, pilot a Mainline Leak Detection Program and expand the Consumption Awareness Program. Total costs provided relate to water conservation programs.

Finance status

Finance secured

Total cost of the project

100000

Total cost provided by the local government

100000

Majority funding source

Local

Total cost provided by the majority funding source (currency)

100000

Web link to action websitehttps://www.publicworks.houstontx.gov/sites/default/files/assets/2019_water_conservation_plan_01132020.pdf**Name of the stakeholder group**

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Finance and Economic Development > Instruments to fund low carbon projects

Action title

Benzene Surveillance and Control

Means of implementation

Assessment and evaluation activities

Implementation status

Operation

Start year of action**End year of action****Estimated emissions reduction (metric tonnes CO2e)**

0

Energy savings (MWh)

0

Renewable energy production (MWh)

0

Timescale of reduction / savings / energy production

Other, please specify (This project focuses on emissions monitoring)

Co-benefit area

Enhanced climate change adaptation
Reduced GHG emissions
Improved public health
Improved access to data for informed decision-making

Action description and implementation progress

Pilot. The carcinogen, benzene has been identified as a definite cancer risk in the city. This project was initiated to reduce benzene levels. First, the city created an email alert system, Rapid Alert Benzene Information: Time Sensitive (RABITS), to notify staff when elevated concentrations occur at fixed site monitors. These alerts provide action level recommendations for various concentrations based upon a novel toxicological assessment of the potential dangers of this chemical. This work informs overnight and weekend mobile benzene surveillance efforts to reduce the emission of this chemical in Houston. Night and weekend surveillance had not been conducted previously. The data collected from this surveillance can improve enforcement efforts by providing staff with more immediate benzene data from the field.

Finance status

Finance secured

Total cost of the project

250000

Total cost provided by the local government

0

Majority funding source

Other, please specify (Houston Endowment)

Total cost provided by the majority funding source (currency)

250000

Web link to action website

Name of the stakeholder group

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Finance and Economic Development > Instruments to fund low carbon projects

Action title

Improved Particulate Matter Monitoring through Low Cost Sensor Network

Means of implementation

Assessment and evaluation activities

Implementation status

Implementation

Start year of action

End year of action

Estimated emissions reduction (metric tonnes CO2e)

0

Energy savings (MWh)

0

Renewable energy production (MWh)

0

Timescale of reduction / savings / energy production

Other, please specify (This project focuses on emissions monitoring)

Co-benefit area

Enhanced climate change adaptation

Reduced GHG emissions

Improved public health

Improved access to data for informed decision-making

Action description and implementation progress

Pilot program. To augment the fixed site PM2.5 monitoring network, the City monitors PM2.5 both passively through a network of solar-powered Clarity monitors, as well as actively with PM sensors on fleet vehicles. The data collected from both of these sources improve spatial and temporal understanding of particulate matter concentrations across the city. Combining these assets with the data collected from the fixed site monitoring network extends the spatial coverage of particulate matter measurements through the use of low-cost sensors. Information from both of these sources can improve the identification and mitigation of PM hotspots throughout the city.

Finance status

Finance secured

Total cost of the project

100000

Total cost provided by the local government

0

Majority funding source

Other, please specify (Houston Endowment)

Total cost provided by the majority funding source (currency)

100000

Web link to action website

Name of the stakeholder group

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Finance and Economic Development > Instruments to fund low carbon projects

Action title

Formaldehyde Control through Precursor Monitoring and Source Identification

Means of implementation

Assessment and evaluation activities

Implementation status

Monitoring and reporting

Start year of action

End year of action

Estimated emissions reduction (metric tonnes CO2e)

0

Energy savings (MWh)

0

Renewable energy production (MWh)

0

Timescale of reduction / savings / energy production

Other, please specify (This project focuses on emissions monitoring)

Co-benefit area

Enhanced climate change adaptation
Reduced GHG emissions
Improved public health
Improved access to and quality of mobility services and infrastructure

Action description and implementation progress

One-time project. Formaldehyde is a chemical of concern in the National Air Toxics Assessment for potential cancer risk. The city has conducted surveillance and monitoring to identify secondary formation of this pollutant. The results have been used to provide legislative recommendations to city and state policy makers. Formaldehyde monitoring is ongoing.

Finance status

Finance secured

Total cost of the project

422159

Total cost provided by the local government

0

Majority funding source

Other, please specify (Environmental Protection Agency)

Total cost provided by the majority funding source (currency)

422159

Web link to action website

Name of the stakeholder group

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Action title

Environmental Youth Council Community Education and Engagement

Means of implementation

Education
Awareness raising program or campaign
Assessment and evaluation activities

Implementation status

Implementation

Start year of action

End year of action

Estimated emissions reduction (metric tonnes CO2e)

0

Energy savings (MWh)

0

Renewable energy production (MWh)

0

Timescale of reduction / savings / energy production

Other, please specify (This project focuses on education and monitoring)

Co-benefit area

Enhanced climate change adaptation
Reduced GHG emissions
Improved public health
Improved access to data for informed decision-making

Action description and implementation progress

In order to continue providing environmental education and leadership development for Houston's youngest leaders, the Houston Health Department partnered with the Environmental Defense Fund and local high schools to run the Environmental Youth Council program. Participating high school groups learn about the environmental threats facing their communities while providing the tools to take a stand to cause local change.

Finance status

Finance secured

Total cost of the project

Total cost provided by the local government

0

Majority funding source

Other, please specify (Self-funded)

Total cost provided by the majority funding source (currency)

Web link to action website

Name of the stakeholder group

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Buildings > Building codes and standards

Action title

LEED Designed Buildings and Sustainable Building Practices

Means of implementation

Policy and regulation

Implementation status

Operation

Start year of action

2004

End year of action

Estimated emissions reduction (metric tonnes CO2e)

15555

Energy savings (MWh)

22000

Renewable energy production (MWh)

182

Timescale of reduction / savings / energy production

Per year

Co-benefit area

Enhanced resilience
Reduced GHG emissions
Improved resource efficiency (e.g. food, water, energy)
Resource conservation (e.g. soil, water)
Shift to more sustainable behaviours

Action description and implementation progress

Since 2004, the City of Houston has required all new municipal buildings larger than 10,000 square feet to be LEED Certified. The City now has 35 LEED municipal buildings either certified or under review and is investing in energy efficiency upgrades to 6 million square feet of city facilities through energy performance contracting. This effort has reduced energy use by 30%, saving more than 22 million kWh of electricity every year. A retro-commissioning audit of the Houston Permitting Center in 2019 identified \$9,000 of energy-efficiency updates that will result in more than 1.3 million kWh saved per year. Sustainable building costs are more and more absorbed by each project as standard response to model building codes. In pursuit of higher levels of LEED certification, some projects have implemented strategies including green roofs, geothermal energy, and BAS responsive daylighting.

Finance status

Finance secured

Total cost of the project

Total cost provided by the local government

Majority funding source

Local

Total cost provided by the majority funding source (currency)

Web link to action website

<http://www.greenhoustontx.gov/pdf/ordinance-greenbuilding.pdf>; <http://www.greenhoustontx.gov/energy.html>; <http://greenhoustontx.gov/climateactionplan/CAP-April2020.pdf> (pg 25)

Name of the stakeholder group

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Finance and Economic Development > Low-carbon industrial zones

Action title

Greentown Houston

Means of implementation

Capacity building and training activities
Stakeholder engagement

Implementation status

Implementation

Start year of action

2020

End year of action

Estimated emissions reduction (metric tonnes CO2e)

Energy savings (MWh)

Renewable energy production (MWh)

Timescale of reduction / savings / energy production

Per year

Co-benefit area

Enhanced resilience
Reduced GHG emissions
Greening the economy
Economic growth
Job creation

Action description and implementation progress

Greentown labs opened its Houston incubator, Greentown Houston, on Earth Day 2021. Greentown Houston currently supports 30 inaugural startup members. Greentown

Houston is a 40,000, square-foot incubator offering a prototyping lab, office and community space for up to about 50 startup companies. totaling 200-300 employees.

Finance status

Feasibility finalized, and finance partially secured

Total cost of the project

Total cost provided by the local government

0

Majority funding source

Public-private partnership

Total cost provided by the majority funding source (currency)

Web link to action website

<https://greentownlabs.com/houston/>; <http://greenhoustontx.gov/climateactionplan/CAP-April2020.pdf>; <https://www.houstontx.gov/mayor/press/2021/climatetech-incubator-second-location.html>

Name of the stakeholder group

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation action

Buildings > Energy efficiency/ retrofit measures

Action title

City of Houston General Services Department (GSD) & Finance Department Enrollment in Reliant's Voluntary Load Management Program

Means of implementation

Development and implementation of action plan

Implementation status

Implementation

Start year of action

2021

End year of action

2021

Estimated emissions reduction (metric tonnes CO2e)

34

Energy savings (MWh)

48

Renewable energy production (MWh)

0

Timescale of reduction / savings / energy production

Other, please specify (Per summer, summer season program)

Co-benefit area

Reduced GHG emissions

Shift to more sustainable behaviours

Action description and implementation progress

GSD and Finance drafted an Amendment to the City's Electricity Supply Agreement with Reliant Energy. The Amendment outlines the terms of Enrollment in a summer program called Voluntary Load Management (alternately, Reliant Economic Dispatch, or "RED"). City Council approved the Amendment on June 30th. The City enrolled for the period from July 1 – September 30th. Enrollment includes an agreement to voluntarily reduce energy use and demand during peak, critical times during the summer at 12 facilities chosen by the City for participation. Event days will be forecast 24 hours in advance and events will run from 2.00-6.00pm CST. The City intends to make minor adjustments to HVAC and/or chiller setpoints (2-3F) in order to conserve energy during critical times. No more than 12 events may be called for the program.

Finance status

Finance secured

Total cost of the project

0

Total cost provided by the local government

0

Majority funding source

Other, please specify (Not Applicable)

Total cost provided by the majority funding source (currency)

0

Web link to action website

<https://houston.novusagenda.com/agendapublic/CoverSheet.aspx?ItemID=23248&MeetingID=489>; [https://www.nrg.com/business/all-products-and-services/reliant-economic-dispatch.html#:~:text=Reliant%20Economic%20Dispatch%20\(RED\)%20is,Texas%20during%20the%20summer%20months](https://www.nrg.com/business/all-products-and-services/reliant-economic-dispatch.html#:~:text=Reliant%20Economic%20Dispatch%20(RED)%20is,Texas%20during%20the%20summer%20months)

Name of the stakeholder group

<Not Applicable>

Role in the GCC program

<Not Applicable>

Name of the engagement activities

<Not Applicable>

Aim of the engagement activities

<Not Applicable>

Attach reference document

<Not Applicable>

Mitigation Planning

(5.5) Does your city have a climate change mitigation or energy access plan for reducing city-wide GHG emissions?

Yes

The City launched its Climate Action Plan April 2020. Houston City Council formally approved the Houston CAP October 2020. Separately, the City launched its Resilient Houston Strategy February 2020. <http://greenhoustontx.gov/climateactionplan/index.html> houstontx.gov/mayor/chief-resilience-officer.html

(5.5a) Please attach your city's climate change mitigation plan below. If your city has both mitigation and energy access plans, please make sure to attach all relevant documents below.

Publication title and attach document

Houston Climate Action Plan
CAP-April2020.pdf

Web link

<http://greenhoustontx.gov/climateactionplan/>

Focus area of plan

Climate change mitigation plan

Year of adoption of plan by local government

2020

Areas covered by action plan

Energy
Transport (Mobility)
Building and Infrastructure
Waste

Boundary of plan relative to city boundary (reported in 0.1)

Same – covers entire city and nothing else

If the city boundary is different from the plan boundary, please explain why and any areas/other cities excluded or included

N/A - The boundaries are not different.

Stage of implementation

Plan in implementation

Has your local government assessed the synergies, trade-offs, and co-benefits, if any, of the main mitigation and adaptation actions you identified?

Yes

Describe the synergies, trade-offs, and co-benefits of this interaction

There are numerous synergies and co-benefits with other goals and actions, including those identified in the Resilience Plan, the Houston Public Works Water Conservation Plan, Houston Airport System Sustainable Management Plan, Houston Bike Plan, Bayou Greenways 2020 Project, and many other plans and initiatives. There are several co-benefits tied to each goal and target including, but not limited to, economic growth, cost-savings, improved environmental quality, better health and well-being, affordability, enhanced resilience, improved resource efficiency and resource conservation, improved community equity, job creation, ecosystem preservation, and reduce GHG emissions.

Description of stakeholder engagement process

Development of the plan included a very extensive stakeholder process which is outlined in the plan. Stakeholder engagement included public participation, comment and input on the draft plan. Working groups, public meetings, a "host-a-meeting" toolbox to facilitate and share dialogue. Starting in January 2019, the City of Houston convened a multi-sector working group consisting of approximately 160 subject-matter experts and stakeholders to help draft the CAP. After this initial convening, smaller working groups dedicated to the four focus areas—transportation, building optimization, energy transition, and materials management—were formed. During this same time period, the City of Houston also hosted a series of public community meetings at neighborhood multi-service centers across the City to introduce community members to the CAP development process and obtain feedback on proposed strategies and actions. The Office of Sustainability also participated in City of Houston Capital Improvement Plan (CIP) public meetings to encourage residents to learn more about the CAP and how to get involved. City participation in community events and workshops throughout the year provided additional opportunities to engage students, residents, and businesses. The City also held numerous individual discussions and interviews with private sector stakeholders and subject matter experts that helped to socialize the CAP and garner additional feedback and input. During the implementation process the City will continue to utilize a robust stakeholder process. During 2020, the City formed and kicked-off the CAP implementation working groups. Other initiatives involve Houston's Complete Communities and the creation of the Youth Climate Ambassador Program. Launched June 2021, the Youth Climate Ambassador Program was created to train young Houstonians to be climate leaders in their communities - raising awareness about the impacts of climate change and gathering feedback from historically underserved communities on climate challenges and environmental justice issues. Houston's Complete Communities is also involved. Complete Communities.
<http://greenhoustontx.gov/pressrelease20210714.html> https://www.houstoncc.org/about_the_initiative/index.php <http://www.greenhoustontx.gov/climateactionplan/cap-implementation.html>

Does your plan include policy goals that explicitly reflect one of the following principles?

<Not Applicable>

Primary author of plan

Consultant

Comment

The City of Houston launched the Houston Climate Action Plan in April 2020. Houston City Council formally adopted the CAP October 2020.

6. Opportunities

Opportunities

(6.0) Please indicate the opportunities your city has identified as a result of addressing climate change and describe how the city is positioning itself to take advantage of these opportunities.

Opportunity	Describe how the city is maximizing this opportunity
-------------	--

Opportunity	Describe how the city is maximizing this opportunity
Development of clean technology businesses	Houston is often referred to as the energy capital of the world. With the implementation of the Houston CAP, Houston is pursuing another title, leader in carbon capture technology and energy innovation. To achieve this goal, the Houston CAP sets a target to attract or incubate 50 Energy 2.0 companies in Greater Houston by 2025. Greentown Labs opened its Houston incubator, Greentown Houston, on Earth Day 2021. Greentown Houston currently supports 30 inaugural startup members. Greentown Houston is a 40,000, square-foot incubator offering a prototyping lab, office and community space for up to 50 startup companies totaling 200-300 employees. The 16-acre South Main Innovation District is a joint initiative between Rice University and the City of Houston. The innovation district is anchored by the Ion, a \$100 million, 270,000 square foot collaboration hub. The Ion is expected to open the fall of 2021. The innovation district will connect the city's other districts through an innovation corridor connected by light rail, bike lanes and sidewalks. The district is expected to attract technology startups, including those in clean tech. Greentown Labs is one such tenant. https://www.ionhouston.com/the-district/
Improved efficiency of municipal operations	During the FY 2022 budget process, departments identified 'high priority' resilience and climate action initiatives, and included these initiatives in the budget presentations presented to the Budget and Fiscal Affairs Council Committee. Initiatives included several opportunities to improve efficiency of municipal operations. For example, Houston Airport Systems projects include central utility plant improvements - combined heat and power generation (CIP) and Hobby Airport domestic water resiliency improvements (CIP). Additional projects include purchase of electric vehicle charging stations for City vehicles, implementation of electric refuse truck pilot program, Houston Public Work's strategic asset management program, and Fire Department's initiative to retrofit station generators to natural gas. The incorporation of resilience and climate action initiatives into the budget process reinforces the City's commitment to integrate resilience and implementation actions into city-wide planning and city operations. https://www.houstontx.gov/council/committees/fy2022budgetworkshops.html
Development of resource conservation and management	As more people notice extreme weather events occurring in Houston, there is more attention placed on how the community needs to be more resilient. For instance, after the major drought in 2011, residents were increasingly inquiring about installing rainwater harvesting and the City's annual half-price rain barrel sale. Houston updated its water conservation plan in 2019, which is effective until 2024. The water conservation plan includes evaluation of the water and wastewater system and customer use characteristics. It also identifies opportunities for water conservation. Houston's 2014 Water Conservation Plan stated a total GPCD baseline of 144, with the goal of reducing this number by 1.6% every five years, thereby establishing a total GPCD five-year target of 141.7 by 2019, and a ten-year target of 139.4 by 2024. As of 2019, Houston's total GPCD (and new baseline) is 129, based on the five-year historical average. Houston will continue, expand, and implement the following programs to achieve a 1.6% reduction in total GPCD and residential GPCD over the next five years. This includes a water main replacement program, water loss reduction program, consumption awareness program, leak detection program, new building standards, and PACE program. Houston is working to initiate the efforts to develop a One Water plan, which will look at water resources holistically to improve their integrated management (storm, water, and potable water). https://www.publicworks.houstontx.gov/sites/default/files/assets/2019_water_conservation_plan_01132020.pdf The city is also working on natural preserves for conservation of wildlife and natural habitat. The Parks and Recreation department is creating an ordinance that if approved by Council (TBD) would preserve 24% of undeveloped land in Houston.
Increased opportunities for investment in infrastructure projects	Natural disasters like Hurricane Harvey highlighted the need to invest in the City's infrastructure. In the aftermath of Harvey, over 663 million dollars have been committed to projects to increase storm water detention and channel conveyance. As the city continues to rebuild, it is committed to looking towards smart, resilient solutions. Additionally funding has been made available through FEMA Hazard Mitigation Grant Program (APPROXIMATELY \$300,000,000) and potential CDBG DR funding through HUD (\$61,200,000) for infrastructure investments.
Development of sustainable transport sector	July 2020, the City issued a request for information to gather input on business models and potential partnership opportunities for owning, operating, and managing publicly and privately accessible Electric Vehicle Support Equipment on City owned property. May 2021, City Council approved purchasing, installing and employing electric vehicle stations in various City facilities through a partnership with Greenlots. Council also approved an ordinance allocating \$195,000 for the charging stations. The City plans to convert an estimated 8,000 City of Houston non-emergency, light-duty municipal fleet vehicles to EVs by 2030. In addition to the Greenlots partnership, the City is working in partnership with EVolve Houston and other entities to expand electric vehicle infrastructure in the community, in addition to municipal operations.
Other, please specify (Community Outreach and Education)	September 2020, Houston launched Houston Climate Week, a week-long event to kick-off the implementation of the Houston CAP. The purpose of the event was to engage and educate the community regarding the climate impact on Houston, the CAP and how to get involved in the CAP. The event was a success, and the City plans to make this an annual event. http://greenhoustonx.gov/#:~:text=Houston%20Climate%20Week%20%2D%20SEP.&text=A%20week%2Dlong%20virtual%20event,was%20...%20...
Development of energy efficiency measures and technologies	April 2021, Mayor Turner and Solar United Neighbors (SUN) announced the launch of Houston's citywide solar co-op. The Co-op will help Houston residents go solar. SUN's city-wide solar co-op is open to homeowners and business owners in and around Houston. Co-op members select a single solar company to complete the installations following SUN's facilitation of a competitive process to select an installer. The Houston CAP sets a target of 5 million MWh local solar per year by 2050. The City is exploring additional initiatives and partnerships to make it easier for homeowners to go solar.
Improved efficiency of municipal operations	Per the Houston CAP, municipal operations accounted for 3% of the total community GHG inventory. With a land area of 671 square miles, Houston covers a lot of territory. The building inventory is approximately 33,000,000 million square feet. Houston is implementing and exploring several options to increase efficiency in municipal operations to reduce emissions, reduce costs and to increase resilience and energy security. The City of Houston General Services Department (GSD) applied to the State Energy Conservation Office (SECO) for energy efficiency funding under its LoanStar (Saving Taxes and Resources) Revolving Loan Program to fund the energy cost reduction measures identified by the Texas A&M Engineering Experiment Station (TEES) Energy System Laboratory. The Houston Airport System is also partnering with SECO and TEES to implement capital improvement and energy efficiency upgrades at Hobby and Bush Airports. The City is also participating in the Department of Energy Better Buildings Challenge, and since 2004, the City has required all new municipal buildings larger than 10,000 square feet to be LEED certified (Green Building Ordinance).
Development of sustainable transport sector	The City's Walkable Places and Transit-Oriented Development Programs became effective October 1, 2020. The programs create rules to guide development on private properties. These rules are related to the pedestrian realm, building design and site design. The Proposed Walkable Places Program and Plan establishes a public process to create context sensitive, pedestrian friendly developments and improve the pedestrian experience. The Transit-Oriented Development Amendment and Transit Corridor Ordinance are designed to encourage the use of different types of transportation, such as walking and cycling, that reduce car dependency. The program promotes pedestrian safety by creating wider, unobstructed sidewalks and landscaping, increasing the 'eyes on the street' and providing more separation between automobile and pedestrian areas. The Houston CAP includes a goal to reduce vehicle miles traveled per capita and a target to build and retrofit complete transit-oriented neighborhoods. The Resilient Houston Plan includes an action to invest in transit-oriented and trail-oriented development.
Additional funding opportunities	Following the launch of the Climate Action Plan in April 2020, the City entered into an agreement with BP, which included a \$2 million grant to support implementation of the CAP and to increase community awareness and participation in the plan. Under the agreement, BP will serve as the City's strategic planning and technical partner on the CAP for four years. June 2021, the US Environmental Agency (EPA) awarded Houston a \$200,000 grant as part of the State Environmental Justice Cooperative Agreement (SEJCA) to use for Environmental Justice Initiatives. The City will invest the grant in Houston Inspires/Houston Inspira, a citywide public health education campaign using innovative messaging, including cartoons, billboards, postcards, and door-hangers regarding the risks communities face from elevated levels of environmental pollutants. Houston is exploring additional grants and partnership opportunities.
Increased energy security	Winter Storm Uri left millions without power throughout Texas and in Houston. The City is exploring several opportunities for increasing energy security for municipal operations and also in the community. Additionally, several bills were passed during the current legislative session. The City will work with utility companies, state commissions, city groups and other partners in subsequent rulemakings and related initiatives. The City will also review any related bills, and if needed will take action, filed during subsequent special 'called' legislative sessions.
Increased food security	When the Biden Administration in February made the FEMA COVID-19 Mass Feeding program 100% reimbursable, the City of Houston applied to the program to receive support to sustain the Houston Eats Restaurant Support (H.E.R.S.) Program that addresses the food insecurity of populations disproportionately affected by COVID-19 using FEMA's strict criteria. Over \$4,000,000 have been approved for this program through the months of April - July. This model can be further utilized to address food security climate related challenges. The City is working within the Mayor's Office of Complete Communities to provide guidance and support for local Urban Farms, Community Gardens and Farmers Markets to integrate them into the Healthy Food Landscape. Additionally, the City is working with the Mayor's Office of Public Safety and Homeland Security to imbed Healthy Food Access and Food-related Business Resilience into Disaster Preparedness and Neighborhood Resilience Hubs, which are climate resilient community serving facilities augmented to support residents and coordinate resource distribution services before, during, or after a natural hazard event.
Improved flood risk mitigation	The City has also pursued several infrastructure grant programs to complement the local spending on drainage and storm water projects. Under the FEMA Hazard Mitigation Grant Program, the city secured approximately \$300 million total for large-scale infrastructure and transformative project implementation. Under the HUD's CDBG Mitigation program, the City received \$62 million directly, and \$8 million from the state for infrastructure. Houston is expected to receive even more funding through this program as a result of hurricane Harvey. Additionally, the City has worked with the State legislature to create a Flood Infrastructure Fund, which has provided grants and funding for different storm water improvement projects. Finally, the City is working to take advantage of FEMA's Building Resilient Infrastructure in Communities program and was selected to move forward with two projects in 2021. The program provides annual funding for which the City is looking to take advantage. Additionally, the City is working with local partners to leverage other projects implemented by other agencies to ensure that they also meet the needs of the City. For more information on CDBG, HMGP, and FIF see https://www.houstontx.gov/mayor/chief-recovery-officer.html
Development of climate change resiliency projects	Since Winter Storm Uri, the Offices of Recovery, Resilience, Sustainability, HCDD, HPW, Complete Communities, as well as external partners have worked together to look comprehensively at weatherization of single-family housing in Houston culminating in recommendations to the administration that focus on building codes, education and outreach, weatherization programs, funding, and incentives. In addition, HCDD, Resilience and Recovery, are working together to develop a single-family resilience matrix to encourage and measure additional resilience in single family homes being publicly funded. The resilience matrix is predicated on work initially developed for multi-family developments and has been scaled for additional applications including our own city facilities. These resilience guides will provide background that will inform a robust review of the City of Houston's Construction Code amendment and adoption process that will commence later this year and will include resilient building standards. In addition to more robust construction codes and standards, enforcement is a priority. We are currently training 25 code enforcement employees to enforce the residential energy code. The energy code, which includes provisions that address most weatherization requirements has received the least attention behind IRC and the MEP codes, and the flood ordinances. Enforcement is the most effective activity we can do to forward weatherization specifically, and resilience in general. We are working with partners to identify and prioritize areas with largest energy burden and greatest need. CEER has recently conducted a survey of 600 households in Houston. With more information on need and priority areas, we can then work with partners organizations like BakerRipley, Connective, Rebuilding Together, Habitat for Humanity and other home repair organizations to align programs and match home owners with resources that can assist with deferred maintenance, weatherization, energy independence, tax relief, and continued maintenance.

(6.1) Has your city measured the wider social and economic impacts of delivering climate actions/projects/policies? If so, please provide more details on which benefits are being measured and/or a link to more information.

Response

Which of the impacts has your cities measured

Other impacts from climate actions (The Houston Climate Action Plan and Resilient Houston Plan address the social and economic impacts of climate actions. In conjunction with the CAP working groups, the City is defining more specific measures.)

Has your city measured the distribution of these impacts across the city's population (e.g. through the listed actions)

Other, please specify (The Houston Climate Action Plan and Resilient Houston Plan address the social and economic impacts of climate actions. In conjunction with the CAP working groups, the City is defining more specific measures.)

Further information

<http://greenhoustontx.gov/climateactionplan/CAP-April2020.pdf> <https://www.houstontx.gov/mayor/Resilient-Houston-20200518-single-page.pdf>
<https://www.houstontx.gov/mayor/Climate-Impact-Assessment-2020-August.pdf>

Collaboration

(6.2) Does your city collaborate in partnership with businesses and/or industries in your city on sustainability projects?

Yes

(6.2a) Please provide some key examples of how your city collaborates with business and/or industries in the table below.

Collaboration area	Type of collaboration	Description of collaboration
Industry	Project delivery - Public Private Partnership	Following the launch of the Climate Action Plan in April 2020, the City entered into an agreement with BP, which included a \$2 million grant to support implementation of the CAP and to increase community awareness and participation in the plan. Under the agreement, BP will serve as the City's strategic planning and technical partner on the CAP for four years.
Building and Infrastructure	Project delivery - Public Private Partnership	The City is working in partnership with several entities, including CenterPoint, its electric utility, the Texas Commission on Environment Quality (TCEQ), Sunnyside Community Energy Group (with representation from local businesses), Complete Communities, Houston Renewable Energy Group (HREG), Solar United Neighbors (SUN), and Wolfe Energy on the Sunnyside Solar Farm Project. Through the C40s Reinventing Cities program, Houston is in the process of redeveloping a former landfill in Sunnyside, a neighborhood in the Complete Communities program. The City is working with Sunnyside Energy to convert the 240-acre Holmes Road landfill into a 50 MW solar farm. http://greenhoustontx.gov/pressrelease20190829.html
Energy	Financing (investment)	In 2015, Houston City Council adopted a resolution creating the state's first municipal Property Assessed Clean Energy Program (PACE) to provide an additional tool for Houston property owners to finance energy efficiency, renewable energy, and water conservation projects. The City engaged the Texas PACE Authority to administer the program.
Energy	Knowledge or data sharing	The City collaborates with several entities including local utilities, universities (e.g. the Texas A&M Transportation Institute), EVolve Houston, Houston Galveston Area Council, and state agencies and commissions to gather information needed for emissions and sustainability reporting. In addition to energy, this also includes transportation and other sectors. The City also partnered with Rice University Kinder Institute to report Houston CAP and Resilience progress.
Energy	Climate action target setting consultation	May 2021, the City entered into an agreement with the Rocky Mountain Institute to assist with implementation of the Houston CAP.
Transport (Mobility)	Collaborative initiative	Houston, as a member of EVolve Houston, partners with several entities, to promote EVs in Houston. EVolve Houston is a public-private coalition founded by Mayor Turner, Shell, NRG Energy, CenterPoint Energy, the University of Houston, and LDR Advisory Partners dedicated to improving air quality and reducing GHG emissions by electrifying transportation in Houston. May 2021, Houston City Council approved purchasing, installing and deploying electric vehicle charging stations in various City facilities through a partnership with Greenlots. July 2020 the City issued a request for information to gather input on business models and potential partnership opportunities for owning, operating, and managing publicly and privately accessible Electric Vehicle Support Equipment on City owned property. The City, in conjunction with EVolve, initiated a follow-up workshop and discussions with interested parties.
Energy	Project implementation and management	The City of Houston General Services Department (GSD) applied to the State Energy Conservation Office (SECO) for energy efficiency funding under its LoanStar (Saving Taxes and Resources) Revolving Loan Program to fund the energy cost reduction measures identified by the Texas A&M Engineering Experiment Station (TEES) Energy System Laboratory. TEES conducted and developed a Preliminary Energy Assessment. The Houston Airport System is also partnering with SECO and TEES to implement capital improvement and energy efficiency upgrades at Hobby and Bush Airports.
Energy	Collaborative initiative	The City does not operate a municipal electric or natural gas utility. Therefore, the City often partners with its local utility companies, including CenterPoint, on several initiatives, as well as other city groups, and state agencies. CenterPoint is also the sponsor of the Houston Climate Action Plan. Houston, in partnership with CenterPoint began converting its utility owned streetlights (approximately 178,000) to LED technology in 2014. This project increases public safety, reduces GHG emissions, and energy costs. As of December 2020, Houston and CenterPoint have converted 175,438 streetlights to LEDs, accounting for approximately 98% of the city's streetlights. The State established energy efficiency goals and requirements for electric utilities. CenterPoint Energy annually files with the PUC its Energy Efficiency Plan (EEP), which details CenterPoint Energy's efforts towards promoting energy efficiency throughout its service area. The City actively participates in related state agency energy efficiency rulemakings and proceedings including CenterPoint Energy's Energy Efficiency Cost Recovery Factor (EECRF) proceeding. The City also participates in CenterPoint's energy efficiency programs.
Water	Project delivery - Build Operate Transfer	June 2020, City Council approved a contract with Enchanted Rock Solutions to provide a standby/ emergency generation system for the City's water treatment facilities. The agreement also allows for non-emergency use of the system. https://houston.novusagenda.com/agendapublic/CoverSheet.aspx?ItemID=19866&MeetingID=434 (Link to Ordinance No. 2020-541 provided at bottom of RCA).
Waste	Collaborative initiative	In 2018 Houston began its newest project in waste management: a new 36-million-dollar contract with FCC Environmental Services for curbside recycling. This new contract makes it just as cost effective to recycle as using older more primitive waste disposal techniques.
Building and Infrastructure	Funding (grants)	FEMA Hazard Mitigation Grant Program (4 projects), TWDB Flood Infrastructure Fund (2 projects), CDBG MIT 2016, CDBG MIT 2015 direct allocation, CDBG DR 17 single family housing, multifamily development, and buyouts, FEMA BRIC
Natural environment	Project delivery - Public Private Partnership	Working to meet the goal of 100 Green storm water infrastructure projects by 2025, through private grants, incentives, and other partnerships with organizations. Examples include: Urban Prairie Project funded by NFWF and Wells Fargo, Mayor's 50/50 Parks Initiative, and launch of the incentives for green development.
Public Health and Safety	Project implementation and management	Air Alliance Houston is working to expand existing community air monitoring work to improve the air quality in historically underserved communities. As a result of their 2019 study, Air Alliance Houston is working in partnership with residents in Kashmere Gardens, Near Northside, and Gulfton Complete Communities to establish air monitoring networks and build residents capacity to use monitoring data to accelerate action on air quality issues thanks to a grant they secured.

Finance and Economic Opportunities

(6.5) List any mitigation, adaptation, water related or resilience projects you have planned within your city for which you hope to attract financing and provide details on the estimated costs and status of the project. If your city does not have any relevant projects, please select 'No relevant projects' under 'Project Area'.

Project area

Other, please specify (Resiliency - Flood Management)

Project title

Ruffino Project

Stage of project development

Project structuring

Status of financing

Project not funded and seeking full funding

Financing model identified

No

Identified financing model description

No financing model has been identified.

Project description and attach project proposal

This concept aims to transform an abandoned landfill into a stormwater detention facility that will provide flood risk reduction along the watershed and communities downstream.

Total cost of project

200000000

Total investment cost needed

200000000

Project area

Other, please specify (Urban Forestry)

Project title

Legacy Tree Program

Stage of project development

Transaction preparation

Status of financing

Project partially funded and seeking additional funding

Financing model identified

Yes

Identified financing model description

Tree Fund - special fund dedicated for tree planting (https://library.municode.com/tx/houston/codes/code_of_ordinances?nodeId=COOR_CH33PLDE_ARTVTRSHSCFE_DIV2BUSI_S33-123TRPLEQCR) The City recently submitted a grant to start the program with funding for three years.

Project description and attach project proposal

The Houston Parks and Recreation Department (HPARD) is planning a Legacy Tree Program to propagate native seedlings for installation into restoration sites and other tree plantings around the city and is developing a tree nursery to hold 10,000 trees annually. Launched in 2020, the Linear Forests Initiative will tie into the current adoption program to create a plan to reforest esplanades across the city. These programs will prioritize tree planting in underserved communities and increase the city's overall tree canopy. The total cost to be provided by the City has not yet been determined, since partners and funding sources have not all been determined. <http://greenhoustontx.gov/climateactionplan/CAP-April2020.pdf> (page 25) <https://www.houstontx.gov/parks/pdfs/LinearForestProgramFN.pdf>

Total cost of project

4700000

Total investment cost needed

4700000

Project area

Water management

Project title

Water Conservation Plan

Stage of project development

Implementation

Status of financing

Project partially funded and seeking additional funding

Financing model identified

No

Identified financing model description

NA

Project description and attach project proposal

The City of Houston Water Conservation Plan (effective 2019-2024), highlights water conservation goals and continuous progress that will preserve long-term water supplies for the City of Houston and the greater Houston region. Water supply planning is important to the City of Houston in order to meet long term growth in demand and to comply with 30 TAC Chapter 288 that requires the City to prepare and implement a water conservation plan that meets certain requirements. This plan includes information to fulfill these requirements in addition to information specific to the City of Houston's water supply and treatment systems. The current plan includes measures to be taken internally at the City of Houston as well as programs for water customers. These include current programs such as an in-house public education program, continued enforcement of water-wise building and plumbing codes, and the Consumption Awareness Program, which communicates real-time meter data to household users, advanced metering infrastructure (AMI). This document also summarizes plans to develop an internal Water Loss Program, pilot a Mainline Leak Detection Program and expand the Consumption Awareness Program. Total costs provided relate to water conservation programs. https://www.publicworks.houstontx.gov/sites/default/files/assets/2019_water_conservation_plan_01132020.pdf

Total cost of project

1047000000

Total investment cost needed

1047000000

Project area

Other, please specify (Resilience)

Project title

Lilypads

Stage of project development

Project structuring

Status of financing

Project not funded and seeking full funding

Financing model identified

No

Identified financing model description

NA

Project description and attach project proposal

The City is moving forward with developing a Lilypads/Neighborhood Resilience Hubs plan which will look at specific functions, programming, and conceptual design elements for these sites. These sites should serve as spaces for the community to support residents and coordinate resource distribution and services before, during, and/or after a natural hazard event. Once this plan is completed, the City aims to attract funds to select, design, implement/construct the Lilypads across the City

Total cost of project**Total investment cost needed**

Project area

Other, please specify (Resilience)

Project title

Pocket Prairie and GSI Program

Stage of project development

Project structuring

Status of financing

Project not funded and seeking full funding

Financing model identified

Yes

Identified financing model description

Project is seeking \$200,000 in grant funds, to be matched by \$200,000 for developing the pocket prairie and gsi program.

Project description and attach project proposal

This unfunded program aims to develop a strategy and conceptual designs that can be replicated across abandoned land and green spaces to serve as ecological amenities for communities and resident, while providing benefits of stormwater capture, flood mitigation, increased biodiversity, and reduced heat in urban settings.

Total cost of project

400000

Total investment cost needed

400000

Project area

Other, please specify (Resilience)

Project title

Buy In/ Buy Out Program

Stage of project development

Project structuring

Status of financing

Project not funded and seeking full funding

Financing model identified

No

Identified financing model description

NA

Project description and attach project proposal

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 is working with 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. 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 should be used to support flood risk reduction and serve as public amenities. Once the plan is developed, the City aims to attract funding to implement the buy out/ buy in strategy.

Total cost of project

Total investment cost needed**Project area**

Other, please specify (Air Quality Monitoring)

Project title

Municipal Fleet Air Quality Monitoring Project

Stage of project development

Project structuring

Status of financing

Project not funded and seeking partial funding

Financing model identified

Yes

Identified financing model description

Seeking full funding (cost sharing provided by HHD).

Project description and attach project proposal

In 2019, in partnership with the Houston Health Department (HHD), the Environmental Defense Fund (EDF) implemented a "smart fleet" pilot to test a cost-effective, scalable model for mapping air pollution using municipal vehicles. Prior to this pilot, air pollution mapping using vehicle-mounted sensors required expensive equipment, special-purpose vehicles, time-consuming hands-on instrument management, and special-purpose routes. In contrast, the Houston Smart Fleet pilot used rugged, low-cost instruments mounted on municipal vehicles. HHD vehicles collected and transmitted data in real time, demonstrating a new model for cities to actively monitor air quality using existing assets. Based on the success of the project, HHD ordered 10 additional vehicle monitors to expand air monitoring capacity on municipal vehicles. <https://houstontx.gov/smartcity/>

Total cost of project

120000

Total investment cost needed

120000

Project area

Renewable energy

Project title

Sunnyside Solar Farm

Stage of project development

Project structuring

Status of financing

Project partially funded and seeking additional funding

Financing model identified

No

Identified financing model description

NA

Project description and attach project proposal

Through participation in the C40 Reinventing Cities program, the City is re-imagining how under-utilized public assets can be used in a sustainable way. Starting in Sunnyside, a neighborhood in the Complete Communities program, the City is working with Sunnyside Energy to convert the 240-acre former Holmes Road landfill into a 50 MW solar farm. The proposal by Sunnyside was selected through a competitive process and includes other potential benefits such as jobs and training, energy discounts for lower-income residents in the neighborhood, and reduced flooding. <http://www.greenhoustontx.gov/pressrelease20190829.html>
Sunnyside Solar Project FAQ 060120.pdf

Total cost of project

70000000

Total investment cost needed

70000000

Project area

Transport

Project title

Public Facing Electric Vehicle Charging Infrastructure

Stage of project development

Pre-feasibility/impact assessment

Status of financing

Other, please specify (Pre-feasibility study status)

Financing model identified

No

Identified financing model description

NA

Project description and attach project proposal

The City's Climate Action Plan, identifies accelerating the transition to cleaner and more efficient vehicle technologies as a priority action to reduce greenhouse gas emissions (T1.1 increase commercial and private sector infrastructure and incentives). To further enable EV ownership and ensure its viability for all residents, sufficient infrastructure needs to be put in place. Currently, the City operates 63 publicly available Level 2 charging stations. The City is working with EVolve Houston to expand public and private charging options across the City. On July 10, 2020 the City issued a Request for Information to gather information about business models and potential

partnership opportunities with third-party electric vehicle support equipment (EVSE) providers for owning, operating, and managing publicly accessible EVSE on City-owned property, in addition to privately accessible EVSE on City-owned property. The City, in conjunction with EVolve, initiated a follow-up workshop and discussions with interested parties. <https://purchasing.houstontx.gov/bids/103320/103320%20-%20RFI%20for%20Publicly%20Accessible%20EV%20Charging%20Stations.pdf>; <http://greenhoustontx.gov/climateactionplan/CAP-April2020.pdf>
103320 - RFI for Publicly Accessible EV Charging Stations.pdf

Total cost of project

Total investment cost needed

Project area

Water management

Project title

Wastewater Operations

Stage of project development

Project structuring

Status of financing

Project partially funded and seeking additional funding

Financing model identified

No

Identified financing model description

NA

Project description and attach project proposal

Houston Public Works plans to consolidate 39 wastewater treatment facilities into 30 and to include energy efficiency upgrades and resource recovery at all remaining sites. Consolidation of the wastewater treatment plants will allow for a more efficient water treatment and collection system, upgrade facilities to reduce energy use, and strengthen resilience of the wastewater treatment facilities that are at risk of flood and other climate events. This effort will also reduce the combined sewer overflow that impact Houston's surface water quality.

Total cost of project

Total investment cost needed

Project area

Transport

Project title

Houston Bike Plan

Stage of project development

Implementation

Status of financing

Project partially funded and seeking additional funding

Financing model identified

No

Identified financing model description

NA

Project description and attach project proposal

The Houston Bike Plan was adopted by City Council and Mayor Sylvester Turner in 2017, which includes a network of nearly 1,800 miles of high-comfort bicycle facilities. Starting in Fiscal Year 2018, the City of Houston allocated \$1.1 million each year for five years for bicycle infrastructure through its Capital Improvement Project. In 2020, 13 miles of high-comfort bike lanes were completed, which means over nearly 350 miles of the Bike Plan has been implemented, 50 more miles are in design or construction, and 1,400 more miles planned. The total costs to be provided by the City has not yet been determined, since partners and funding sources have not all been determined. Please note that this project is included in the City's budget each year, but without guaranteed funding each successive year. houstonbikeplan.org; <https://mycity.maps.arcgis.com/apps/webappviewer/index.html?id=c59bb1a39ba14202817e11ce7420ad31> https://houstonbikeplan.org/wp-content/uploads/2017/07/HoustonBikePlan_Full.pdf
HBP-Chapter-0-Executive-Summary_Feb17.pdf

Total cost of project

525000000

Total investment cost needed

525000000

Project area

Renewable energy

Project title

Fast Track Solar Permitting

Stage of project development

Implementation

Status of financing

Other, please specify (Project does not require funding)

Financing model identified

No

Identified financing model description

NA

Project description and attach project proposal

The Houston Permitting Center offers expedited solar panel permitting for residential properties. This incentive has helped encourage the increased adoption of solar panel installations over the past four years. The City is also working with the National Renewable Energy Laboratory to pilot using its streamlined SolarAPP for permitting residential home solar projects. The pilot will coincide in part with the solar co-op currently underway.

Total cost of project

Total investment cost needed

Project area

Renewable energy

Project title

Solar United Neighbors Solar Co-OP - Low/Moderate Income Outreach

Stage of project development

Project structuring

Status of financing

Project partially funded and seeking additional funding

Financing model identified

No

Identified financing model description

NA

Project description and attach project proposal

In April 2021, Mayor Turner announced the launch of a Houston city-wide solar co-op, being managed by the non-profit Solar United Neighbors (SUN). The solar co-op is open to homeowners and business owners in and around Houston. Over 150 homes have subscribed so far, and the selected installer is currently developing contracts with subscribed homeowners. Homeowners gain access to educational materials from SUN and a lower rate for installation than what is available in the broader market. The co-op does not currently have access to grant capital to increase accessibility to low- and moderate- income communities for which the cost is still out of reach. Total cost is to be determined and will depend on number of subscribed LMI households needing financial support. <https://www.houstontx.gov/mayor/press/2021/solar-co-op.html>

Total cost of project

Total investment cost needed

Project area

Energy efficiency / retrofit

Project title

Municipal Buildings, Energy Efficiency/Retrofit, Water Management Program

Stage of project development

Scoping

Status of financing

Other, please specify (Scoping)

Financing model identified

No

Identified financing model description

NA

Project description and attach project proposal

The City of Houston is working with the non-profit RMI to identify opportunities to increase energy efficiency across its building portfolio, which it could address through an energy performance contract in 2022. True energy performance contracts may not require upfront capital, but the work may also identify necessary capital improvement projects. The City has a revolving fund that may be able to partially fund these projects, but outside funding would facilitate an increased scope. Total project cost is to be determined.

Total cost of project

Total investment cost needed

Project area

Other, please specify (Air Quality)

Project title

Mobile Air Quality Programs

Stage of project development

Implementation

Status of financing

Project partially funded and seeking additional funding

Financing model identified

No

Identified financing model description

N/A

Project description and attach project proposal

The City's Health Department (HHD) educates Houstonians about the public health impacts of transportation emissions and promotes outreach efforts with the non-profit organization Air Alliance Houston. This includes placing bumper stickers on school buses to remind drivers of Houston's five-minute idling limit¹² and the health impacts of

air pollution. HHD developed and uses the Rapid Alert Benzene Information: Time Sensitive, or RABITS, system to inform where and when elevated benzene concentrations are detected so HHD can respond more quickly with more specific monitoring or enforcement. The City also supports legislation to limit placement of concrete batch plants and is conducting research on the source of hot spots of formaldehyde toxic air pollution in Houston.

Total cost of project

Total investment cost needed

(6.7) Has your city received/secured funding for any climate projects (e.g. energy efficiency, renewable energy, low emission vehicles, waste management, flood defence etc.) from an International Financial Institution (e.g. World Bank, Asian Development Bank, etc.)?

	Funding received/secured for low carbon projects or climate adaptation	Comment
Funding received/secured	No	

(6.11) Does your city have its own credit rating?

	Does your city have a credit rating?	Rating agency	Rating	If you do not have a credit rating, please provide more details on why and what steps you are taking to get one
International	No			The City of Houston does not have an international credit rating because the City does not conduct business in the international market. Consequently, the City is not taking steps to obtain an international credit rating because there is no need for one.
Domestic	Yes	Moody's, Fitch, Standard and Poor's	Moody's Aa3; S&P's rating AA; Fitch's rating AA (Source: http://www.houston.tx.gov/controller/treasury/about.html)	<Not Applicable>

Climate Action Planning

(6.13) How many people within your city are employed in green jobs/industries?

	Number of people in your city employed in green jobs and/or industries	If you measure green jobs in your city, please also indicate if you analyze demographic variables	If you analyse demographic variables, please indicate which variables from the list below	Comment
Green jobs/industries	60113	No	Working status	Source: Clean Jobs America 2021. Statistics provided for Houston-Sugar Land-Baytown, TX metropolitan area (2017-2020). https://e2.org/wp-content/uploads/2021/04/E2-2021-Clean-Jobs-America-Report-04-19-2021.pdf

8. Energy

(8.0) Does your city have a renewable energy target?

Yes

In April 2020, the City of Houston launched its Climate Action Plan, which has a goal of 100% renewable energy by 2025 for municipal operations. Houston City Council adopted the Houston CAP October 2020.

(8.0a) Please provide details of your renewable energy target(s) and how the city plans to meet those targets.

Scale

Local government operations

Energy sector

Electricity

Target type

Other, please specify (Purchased)

Base year

2020

Total renewable energy covered by target in base year (based on target type specified in column 3)

1248958

Percentage renewable energy of total energy in base year

100

Target year

2025

Total renewable energy covered by target in target year (based on target type specified in column 3)

1248958

Percentage renewable energy of total energy in target year

100

Percentage of target achieved

100

Comment

The City entered into a five-year contract (with two one-year renewal options) with NRG, the City's retail electric provider. As of July 1, 2020, Houston began purchasing 100% renewable energy through this contract with NRG. June 30, 2021 marked one full year of 100% renewable energy purchases under the contract. A small portion of Houston's municipal operations are located in Entergy's service territory. Because Entergy is not in the Electric Reliability Council of Texas (ERCOT), retail competition does not apply. Entergy is a fully integrated utility, and the City is required to purchase its electricity from Entergy. The Entergy portion of the City's electricity usage amounts to approximately 0.30% of the City's total usage. The City is currently exploring options to ensure Entergy consumption is also 100% renewable. The City reported 1,073,382 MWh usage for FY 21 (July 1, 2020 through June 30, 2021) through its NRG Contract and 123,623 MWh through ENGIE, its solar power purchase agreement. The numbers will fluctuate each year based on usage.

Scale

City-wide

Energy sector

Electricity

Target type

All electricity generated (in MWh)

Base year

2014

Total renewable energy covered by target in base year (based on target type specified in column 3)

7550

Percentage renewable energy of total energy in base year

0.03

Target year

2050

Total renewable energy covered by target in target year (based on target type specified in column 3)

5000000

Percentage renewable energy of total energy in target year

14

Percentage of target achieved

0.64

Comment

The City launched its Climate Action Plan April 2020. The CAP was formally approved by Houston City Council October 2020. The Houston CAP includes a target of 5 million MWh local solar per year by 2050. Goals include growing Houston's investment in renewable and resilient energy with strategies to support and promote the use and development of renewable energy; support and promote retail renewable energy opportunities; and advocate for renewable energy policies at the local, state and federal levels. Source data for solar capacity in prior years was obtained through the Environment America's Shining Cities Report . A report was not provided for 2021. 2020 data was provided by the City's electric utility for Houston only.

(8.1) Please indicate the source mix of electricity consumed in your city.

Electricity source

Coal
18.6

Gas
51.1

Oil
0

Nuclear
9.9

Hydro
0.3

Bioenergy (Biomass and Biofuels)
0.2

Wind
18.3

Geothermal
0

Solar (Photovoltaic and Thermal)
1

Waste to energy (excluding biomass component)
0

Other sources
0.6

Total - please ensure this equals 100%
100

Total electricity consumption (MWh)
30345237

Year data applies to
2019

What scale is the electricity mix data
Regional/State mix reported

Comment

Source is EPA eGrid Summary Tables 2019, subregion resource mix. Please note that because the City does not operate a municipal electric utility, consumption data is provided by the utility. The City is pending receipt of the 2020 usage data from the utility.
[egrid2019_summary_tables.pdf](#)

(8.1a) Please indicate the source mix of thermal energy (heating and cooling) consumed in your city.

Thermal energy consumption

Coal

Gas

Oil

Bioenergy (Biomass and Biofuel)

Geothermal

Solar (Thermal)

Waste to energy (excluding biomass component)

Other sources

Total (auto-calculated)

Total consumption (MWh)

Year data applies to

What scale is the thermal energy mix data

Comment

Data not available at this time. The City does not operate a municipal utility. Because Texas is deregulated the majority of Houston customers purchase their electricity through retail electric providers.

(8.2) For each type of renewable energy within the city boundary, please report the installed capacity (MW) and annual generation (MWh).

	Installed capacity (MW)	Annual generation (MWh)	Year data applies to	Comment
Solar PV	17.57	32080	2020	Source 2020 update: CenterPoint Energy Houston Electric. Environment America did not issue a Shining Cities report in 2021. Prior year numbers (2019 and 2018) were based on the Shining Cities report. The City is currently fine tuning data collection methods. Annual generation obtained through EPA Avert.
Solar thermal	0		2020	Source 2020 update: CenterPoint Energy Houston Electric.
Hydro power	0		2020	Source 2020 update: CenterPoint Energy Houston Electric.
Wind	0		2020	Source 2020 update: CenterPoint Energy Houston Electric.
Bioenergy (Biomass and Biofuels)	0		2020	Source 2020 update: CenterPoint Energy Houston Electric.
Geothermal	0		2020	Source 2020 update: CenterPoint Energy Houston Electric.
Other, please specify	0		2020	Source 2020 update: CenterPoint Energy Houston Electric.

(8.3) Does your city have a target to increase energy efficiency?

Yes

April 2020, the City launched its Climate Action Plan which has an overall goal to achieve carbon neutrality by 2050. Houston City Council adopted the Houston CAP October 2020. Increasing energy efficiency is part of this broader carbon reduction goal.

(8.3a) Please provide details on your city's energy efficiency targets.

Scale

City-wide

Energy efficiency type covered by target

Reduce total energy consumption (in MWh)

Base year

2014

Total energy consumed/produced covered by target in base year (in unit specified in column 2)

26095683

Target year

2030

Total energy consumed/produced covered by target in target year (in unit specified in column 2)

29636384

Percentage of energy efficiency improvement in target year compared to base year levels

6

Percentage of target achieved

89

Plans to meet target (include details on types of energy in thermal /electricity)

Please note that Houston's target is based on a cap on the electric consumption increase, factoring in growth factors. Therefore, the recommended calculation for percentage target achieved does not apply. The City's Climate Action Plan, launched April 2020, has an overall goal to achieve carbon neutrality by 2050. Houston City Council adopted the Houston CAP October 2020. Interim goals include 40% by 2030 and 75% by 2040. Increasing energy efficiency is part of this broader carbon reduction goal. Targets include: adopt the 2021 International Code Council (ICC) model codes by 2025 with a minimum 5-year update, double the current number of PACE projects by 2025, 70% of non-residential buildings operated by trained building operators by 2030. Building optimization goal 1 is to reduce building energy use and maximize savings. To achieve this goal, the CAP includes the following strategies and actions: update energy code and increase compliance • increase capacity and training for plan review and code inspection staff by 2025 • evaluate, improve and update municipal code enforcement procedures by 2025 • accelerate energy code adoption by 2025; develop programs that improve building energy efficiency • adopt a municipal benchmarking and disclosure policy for municipal buildings by 2021 • develop benchmarking and audit programs for commercial, industrial and residential buildings by 2025; and reduce water and wastewater energy consumption by 10% through optimization of facility operations and water conservation. Additional goals include expanding investment in energy efficiency and investing in skilled local jobs to optimize building operations. Corresponding strategies include promoting clean energy financing programs; expanding utility energy financing and incentive programs; and providing training in the operation, management and maintenance of relevant building systems. Related actions can be found on page 84 of the Houston CAP.

Please indicate to which energy sector(s) the target applies (Multiple choice)

Commercial buildings
Residential buildings
Public facility

Scale

Local government operations

Energy efficiency type covered by target

Reduce total energy consumption (in MWh)

Base year

2019

Total energy consumed/produced covered by target in base year (in unit specified in column 2)

1145508

Target year

2026

Total energy consumed/produced covered by target in target year (in unit specified in column 2)

799951

Percentage of energy efficiency improvement in target year compared to base year levels

30

Percentage of target achieved

23

Plans to meet target (include details on types of energy in thermal /electricity)

Per state law (Texas Health and Safety Code §388.005(c)), certain political subdivisions, including the City of Houston, are required to establish a goal to reduce electric consumption by at least five percent each year. In 2019, the 86th Legislature passed Senate Bill 241, extending the timeline for this requirement seven years beginning September 1, 2019. The City of Houston actively strives to meet this 5% target each year. In 2021, the City reported a 7% reduction in its electric consumption for municipal operations. Please visit <https://comptroller.texas.gov/programs/seco/reporting/local-gov.php>. There are several initiatives underway to achieve this annual target as outlined in the response to Q 5.4. CAP actions include adopting a municipal benchmarking and disclosure policy for municipal buildings by 2021. Note: because of changes to State Energy Conservation Office reporting requirements for cities, the base year data is based on the state fiscal year (September 1 through August 31, 2021), while data for subsequent reports is based on a calendar year.

Please indicate to which energy sector(s) the target applies (Multiple choice)

Public facility

(8.4) Please report the following energy access related information for your city.

Energy access

Electrification ratio of the city

100

Average electricity consumption per commercial establishment (MWh/annum)

118.391

Average electricity consumption per residential household (MWh/annum)

13.577

Average unit price of electricity (Currency unit as specified in 0.4/MWh)

119.7

Percentage of electricity distributed, but not billed

Percentage of city population with access to clean cooking

100

Comment

Sources: Electrification Ratio: CIA the World Factbook (nation) Access to Clean Cooking: World Bank (national) Average unit price of electricity (Provided for residential customers). The Texas electricity market was deregulated in 2002. The majority of Houston electric customers purchase electricity in the competitive electric market. Therefore, electricity rates vary and are provided at the state level. Sources include: U.S Energy Information Administration Electric Power Monthly - https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_5_6_a . Also attached is the Public Utility Commission Retail Electric Service Rate Comparisons - <https://www.puc.texas.gov/industry/electric/rates/RESRate/rate21/Mar21Rates.pdf> Average electricity consumption provided by CenterPoint Energy Houston Electric. Notes: Percentage of electricity distributed, but not bill. CenterPoint Energy provides services to the majority of Houston customers. Because of the deregulated market structure, customers are billed through the Retail Electricity Provider. A large number of REPs serve customers in Houston. The City does not operate a municipal electric utility. PUC Mar21Rates.pdf Electric Power Monthly - U.S. Energy Information Administration (EIA).pdf

(8.5) How many households within the municipal boundary face energy poverty? Please select the threshold used for energy poverty in your city.

Energy Poverty

Number of households within the city boundary that face energy poverty

311261

Threshold used for energy poverty

Up to 10% of income spent on energy services

Comment

9. Buildings

(9.0) Is your city implementing any retrofit programs addressing existing commercial, residential and/or municipal buildings?

Response	Buildings that the program applies to	Please provide more detail and/or link to more information about the programs
Yes	Residential Commercial Municipal	Houston Property Assessed Clean Energy (PACE) Program. The City of Houston's commercial Property Assessed Clean Energy (PACE) program provides an additional tool for Houston property owners to finance energy efficiency, renewable energy retrofits, and water conservation projects. https://www.texaspaceauthority.org/houston-pace/ http://www.greenhoustontx.gov/pace/ City of Houston General Services Department (GSD) Energy Efficiency Project. GSD applied to the State Energy Conservation Office (SECO) for energy efficiency funding under its LoanStar (Saving Taxes and Resources) Revolving Loan Program to fund energy cost reduction measures identified by the Texas Engineering Experiment Station (TEES) Energy System Laboratory. On May 6, 2020 City Council approved Ordinance No. 2020-0395 an Interlocal Agreement for Energy Services between the City of Houston and Texas A&M Engineering Equipment Station. https://houstons.novusagenda.com/agendapublic/CoverSheet.aspx?ItemID=19643&MeetingID=429 https://comptroller.texas.gov/programs/seco/funding/loanstar/ Houston Airport System (HAS) Energy Efficiency Project. HAS is also partnering with SECO and TEES to implement capital improvements and energy efficiency upgrades at Hobby and Bush Airports. https://www.fly2houston.com/newsroom/releases/texas-m-system-partners-city-houston-implement-capital-improvement-and-energy-efficiency-upgrades-ho/ The City of Houston began a LEED Tax abatement program in 2012 that was not utilized (Sec. 44-131 Ordinance No 2020-424). In 2020, the incentives were increased by City Council to nearly double. The City also offers a LEED incentive program, which allows buildings registered for LEED certification to take part in the Quick Start program. The Quick Start program provides a means for expediting the plan review of certain large commercial design projects. https://library.municode.com/tx/houston/ordinances/code_of_ordinances?nodeId=1026461file:///C:/Users/e127398/AppData/Local/Microsoft/Windows/INetCache/Content.Outlook/G65YWNAT/Quick%20Start.pdf https://www.houstonpermittingcenter.org/resources?keys=CE-1071 The City's electric utility offers retro-fit programs through its Energy Efficiency Plan which apply to municipal, commercial, and residential buildings. The City does not operate a municipal electric utility. The City works with its electric utility regarding the energy efficiency plans, participates in the programs to benefit city buildings, and reviews the cost recovery for program implementation. http://interchange.puc.texas.gov/search/filings/?ControlNumber=52194&UtilityType=A&ItemMatch=Equal&DocumentType=ALL https://www.centerpointenergy.com/en-us/SaveEnergyandMoney/Pages/centerpoint-efficiency.aspx?sa=ho&au=bus http://interchange.puc.texas.gov/search/filings/?UtilityType=A&ControlNumber=51672&ItemMatch=Equal&DocumentType=ALL&SortOrder=Ascending LEED Certification and Building Retrofit Program. Since 2004, the City has required all new municipal buildings to be LEED certified. The City currently has 35 LEED buildings certified or under review with plans to add more through 2021. http://www.greenhoustontx.gov/pdf/ordinance-greenbuilding.pdf

(9.1) Does your city have emissions reduction targets (government operations, city wide targets) or energy efficiency targets for the following building types?

Emissions reduction target	Please provide more details and/or link to more information about the emission reduction target.	Energy efficiency target	Please provide more details and/or link to more information about the energy efficiency target.
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	Emissions reduction target	Please provide more details and/or link to more information about the emission reduction target.	Energy efficiency target	Please provide more details and/or link to more information about the energy efficiency target.
Commercial	Yes	<p>Houston CAP targets. Building emissions reduction targets are part of the overall Houston CAP carbon neutrality goal. A full list of related goals, targets, strategies and actions can be found on pages 21, 23 and 84. Targets include: • Adopt the 2021 International Code Council (ICC) model codes by 2025 with a minimum 5-year update; and establish a plan to achieve 85% energy code compliance by 2030 (page 60). • Double the current number of PACE projects by 2025. • 70% of non-residential buildings operated by trained building operators by 2030. Strategies and actions include: • By 2025 increase capacity training for plan review and code inspection staff; evaluate, improve, and update municipal code enforcement procedures; and accelerate energy code adoption. • Develop benchmarking and audit programs for commercial, industrial and residential buildings by 2030. • Reduce water and wastewater energy consumption by 10% through optimization of facility operations and water conservation; • Provide training and education resources on building optimization and available finance mechanisms, such as PACE, green leases, on-bill financing, etc.; and promote tools that identify financial incentives and assistance with efficiency programs by 2025. • Promote existing building owner/operator trainings and certification and identify programs that need to be developed; educate, engage and connect the community about career pathway opportunities; provide training and education resources for single and multi-family residences; educate owners/operators on the Federal Rules governing refrigerant management by 2025.</p> <p>http://www.greenhoustontx.gov/climateactionplan/CAP-April2020.pdf http://greenhoustontx.gov/climateactionplan/index.html Houston adopted the 2015 IECC for commercial buildings with amendments, effective December 2016. The City also adopted ASHRAE 90.1-2013 with amendments, effective December 2016. https://www.houstonpermittingcenter.org/help/codes</p>	Yes	<p>Houston CAP targets. Building energy efficiency targets are part of the overall Houston carbon neutrality goal. A full list of related goals, targets, strategies and actions can be found on pages 21, 23 and 84. Targets include: • Adopt the 2021 International Code Council (ICC) model codes by 2025 with a minimum 5-year update; and establish a plan to achieve 85% energy code compliance by 2030 (page 60). • Double the current number of PACE projects by 2025. • 70% of non-residential buildings operated by trained building operators by 2030. Strategies and actions include: • By 2025 increase capacity training for plan review and code inspection staff; evaluate, improve, and update municipal code enforcement procedures; and accelerate energy code adoption. • Develop benchmarking and audit programs for commercial, industrial and residential buildings by 2030. • Reduce water and wastewater energy consumption by 10% through optimization of facility operations and water conservation. • Provide training and education resources on building optimization and available finance mechanisms, such as PACE, green leases, on-bill financing, etc.; and promote tools that identify financial incentives and assistance with efficiency programs by 2025. • Promote existing building owner/operator trainings and certification and identify programs that need to be developed; educate, engage and connect the community about career pathway opportunities; provide training and education resources for single and multi-family residences; educate owners/operators on the Federal Rules governing refrigerant management by 2025.</p> <p>http://www.greenhoustontx.gov/climateactionplan/CAP-April2020.pdf http://greenhoustontx.gov/climateactionplan/index.html Houston adopted the 2015 IECC for commercial buildings with amendments, effective December 2016. The City also adopted ASHRAE 90.1-2013 with amendments, effective December 2016. https://www.houstonpermittingcenter.org/help/codes</p>
Municipal	Yes	<p>Houston CAP targets. Building emissions reduction targets are part of the overall Houston CAP carbon neutrality goal. Targets include: • Adopt the 2021 International Code Council (ICC) model codes by 2025 with a minimum 5-year update; and establish a plan to achieve 85% energy code compliance by 2030 (page 60). Strategies and actions include: • Adopt a municipal benchmarking and disclosure policy for municipal buildings by 2021 • Reduce water and wastewater energy consumption by 10% through optimization of facility operations and water conservation. • Support and participate in CenterPoint's portfolio of energy efficiency programs (target timeframe 2025).</p> <p>http://www.greenhoustontx.gov/climateactionplan/CAP-April2020.pdf http://greenhoustontx.gov/climateactionplan/index.html Houston adopted the 2015 IECC for commercial buildings with amendments, effective December 2016. The city also adopted ASHRAE 90.1-2013 with amendments, effective December 2016. https://www.houstonpermittingcenter.org/help/codes</p>	Yes	<p>Department of Energy's Better Buildings Challenge. The City committed 7 million square feet from municipal buildings, to achieve a 20% reduction in energy by 2021 from a 2008 baseline.</p> <p>https://betterbuildingssolutioncenter.energy.gov/partners/houston-tx Reduce municipal electricity consumption by 5% each state fiscal year. Per state law (Texas Health and Safety Code §388.005(c)), the City is required to establish a goal to reduce electric consumption by at least five percent each state fiscal year for seven years.</p> <p>https://comptroller.texas.gov/programs/seco/reporting/local-gov.php Houston CAP Targets. Building energy efficiency targets are part of the overall Houston CAP carbon neutrality goal. Targets include: • Adopt the 2021 International Code Council (ICC) model codes by 2025 with a minimum 5-year update; and establish a plan to achieve 85% energy code compliance by 2030 (page 60). Strategies and actions include: • Adopt a municipal benchmarking and disclosure policy for municipal buildings by 2021 • Reduce water and wastewater energy consumption by 10% through optimization of facility operations and water conservation. • Support and participate in CenterPoint's portfolio of energy efficiency programs (target timeframe 2025).</p> <p>http://www.greenhoustontx.gov/climateactionplan/CAP-April2020.pdf http://greenhoustontx.gov/climateactionplan/index.html Houston adopted the 2015 IECC for commercial buildings with amendments, effective December 2016. The city also adopted ASHRAE 90.1-2013 with amendments, effective December 2016. https://www.houstonpermittingcenter.org/help/codes The City of Houston's Green Building Resolution, adopted by City Council on June 23, 2004, sets a target of LEED Silver certification for new construction, replacement facilities, and major renovations of city-owned or -funded buildings and facilities with more than 10,000 square feet of occupied space. http://greenhoustontx.gov/pdf/ordinance-greenbuilding.pdf Administrative Procedure 7-1 City Energy Efficiency Policy (Section 7.2.7 Equipment Purchasing) specifies that all purchases of equipment, appliances, and computers should be ENERGY STAR–rated when feasible. http://www.houstontx.gov/adminpolicies/7-1.pdf https://www.houstontx.gov/policies/administrative_policies.html</p>
Residential	Yes	<p>Houston CAP targets. Building emissions reduction targets are part of this overall Houston CAP carbon neutrality goal. A full list of related goals, targets, strategies and actions can be found on pages 21, 23 and 84. Targets include: • Adopt the 2021 International Code Council (ICC) model codes by 2025 with a minimum 5-year update; and establish a plan to achieve 85% energy code compliance by 2030 (page 60). Strategies and actions include: • Increase capacity training for plan review and code inspection staff; evaluate, improve, and update municipal code enforcement procedures; and accelerate energy code adoption by 2025. • Develop benchmarking and audit programs for commercial, industrial and residential buildings by 2030. • Reduce water and wastewater energy consumption by 10% through optimization of facility operations and water conservation. • Promote weatherization programs to reduce residential energy consumption and focus on reducing energy burden of low-income populations (timeframe 2025). • Support and participate in CenterPoint's portfolio of energy efficiency programs (timeframe 2025).</p> <p>http://www.greenhoustontx.gov/climateactionplan/CAP-April2020.pdf http://greenhoustontx.gov/climateactionplan/index.html Houston adopted the 2015 IECC for residential buildings with amendments, effective October 2016. https://www.houstonpermittingcenter.org/help/codes</p>	Yes	<p>Houston CAP targets. Building energy efficiency targets are part of the overall Houston carbon neutrality goal. A full list of related goals, targets, strategies and actions can be found on pages 21, 23 and 84. Targets include: • Adopt the 2021 International Code Council (ICC) model codes by 2025 with a minimum 5-year update; and establish a plan to achieve 85% energy code compliance by 2030 (page 60). Strategies and actions include: • Increase capacity training for plan review and code inspection staff; evaluate, improve, and update municipal code enforcement procedures; and accelerate energy code adoption by 2025. • Develop benchmarking and audit programs for commercial, industrial and residential buildings by 2030. • Reduce water and wastewater energy consumption by 10% through optimization of facility operations and water conservation. • Promote weatherization programs to reduce residential energy consumption and focus on reducing energy burden of low-income populations (timeframe 2025). • Support and participate in CenterPoint's portfolio of energy efficiency programs (timeframe 2025).</p> <p>http://www.greenhoustontx.gov/climateactionplan/CAP-April2020.pdf http://greenhoustontx.gov/climateactionplan/index.html Houston adopted the 2015 IECC for residential buildings with amendments, effective October 2016. https://www.houstonpermittingcenter.org/help/codes</p>
New buildings	Yes	<p>Houston CAP targets. Building emissions reduction targets are part of the overall Houston CAP carbon neutrality goal. A full list of related goals, targets, strategies and actions can be found on pages 21, 23 and 84.</p>	Yes	<p>Houston CAP targets. Building energy efficiency targets are part of the overall Houston carbon neutrality goal. A full list of related goals, targets, strategies and actions can be found on pages 21, 23 and 84.</p>
All building types	Yes	<p>Houston CAP targets. Building emissions reduction targets are part of the overall Houston CAP carbon neutrality goal. A full list of related goals, targets, strategies and actions can be found on pages 21, 23 and 84. Targets include: • Adopt the 2021 International Code Council (ICC) model codes by 2025 with a minimum 5-year update; and establish a plan to achieve 85% energy code compliance by 2030 (page 60). Strategies and actions include: • Increase capacity training for plan review and code inspection staff; evaluate, improve, and update municipal code enforcement procedures; and accelerate energy code adoption by 2025. • Reduce water and wastewater energy consumption by 10% through optimization of facility operations and water conservation; and develop benchmarking and audit programs for commercial, industrial and residential buildings by 2030. • Support and participate in CenterPoint's portfolio of energy efficiency programs (timeframe 2025).</p> <p>http://www.greenhoustontx.gov/climateactionplan/CAP-April2020.pdf http://greenhoustontx.gov/climateactionplan/index.html Houston adopted the 2015 IECC for residential and commercial buildings with amendments, effective October 2016. https://www.houstonpermittingcenter.org/help/codes</p>	Yes	<p>Houston CAP targets. Building energy efficiency targets are part of the overall Houston carbon neutrality goal. A full list of related goals, targets, strategies and actions can be found on pages 21, 23 and 84. Targets include: • Adopt the 2021 International Code Council (ICC) model codes by 2025 with a minimum 5-year update; and establish a plan to achieve 85% energy code compliance by 2030 (page 60). Strategies and actions include: • Increase capacity training for plan review and code inspection staff; evaluate, improve, and update municipal code enforcement procedures; and accelerate energy code adoption by 2025. • Reduce water and wastewater energy consumption by 10% through optimization of facility operations and water conservation; and develop benchmarking and audit programs for commercial, industrial and residential buildings by 2030. • Support and participate in CenterPoint's portfolio of energy efficiency programs (timeframe 2025).</p> <p>http://www.greenhoustontx.gov/climateactionplan/CAP-April2020.pdf http://greenhoustontx.gov/climateactionplan/index.html Houston adopted the 2015 IECC for residential and commercial buildings with amendments, effective October 2016. https://www.houstonpermittingcenter.org/help/codes</p>

	Emissions reduction target	Please provide more details and/or link to more information about the emission reduction target.	Energy efficiency target	Please provide more details and/or link to more information about the energy efficiency target.
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The City launched its Climate Action Plan April 2020 which has an overall goal to achieve carbon neutrality by 2050. Houston City Council formally adopted the CAP October 2020. Building emissions reductions and energy efficiency targets are part of this overall carbon neutral goal.

10. Transport

(10.0) Do you have mode share information available to report for the following transport types?

Passenger transport

(10.1) What is the mode share of each transport mode in your city for passenger transport?

Information from the US Census American Community Survey: 2019 ACS 1-Year Estimates data Profiles (2019 is the most recent year available). The survey categories include car, truck, or van - drove alone and carpool, public transportation (excluding taxi), walked, other means and worked from home. Included public transport in bus category, and combined worked from home and carpool with other. https://data.census.gov/cedsci/table?g=0400000US48_1600000US4835000&d=ACS%201-Year%20Estimates%20Selected%20Population%20Profiles&tid=ACSSPP1Y2019.S0201&hidePreview=false

Please complete

Private motorized transport

78.1

Rail/Metro/Tram

Buses (including BRT)

3.8

Ferries/ River boats

Walking

1.9

Cycling

Taxis or shared vehicles (i.e. for hire vehicles)

Micro-Mobility

Other

16.1

Comment

Information from the US Census American Community Survey: 2019 ACS 1-Year Estimates data Profiles (2019 is the most recent year available). The survey categories include car, truck, or van - drove alone and carpool, public transportation (excluding taxi), walked, other means and worked from home. Included public transport in bus category, and combined worked from home and carpool with other. https://data.census.gov/cedsci/table?g=0400000US48_1600000US4835000&d=ACS%201-Year%20Estimates%20Selected%20Population%20Profiles&tid=ACSSPP1Y2019.S0201&hidePreview=false

(10.3) Please provide the total fleet size and number of vehicle types for the following modes of transport.

	Number of private cars	Number of buses	Number of municipal fleet (excluding buses)	Number of freight vehicles	Number of taxis	Transport Network Companies (e.g. Uber, Lyft) fleet size	Customer-drive carshares (e.g. Car2Go, Drivenow) fleet size	Comment
Total fleet size	1413505	1236	9978		1115	5308		Number or private cars includes renter and owner occupied. Does not provide a break down of type of vehicle
Electric	2728		44					
Hybrid	15321		525					
Plug in hybrid	1333		0					
Hydrogen			0					

Reporting for the number of private vehicles and fuel type is an estimate based on the number of sales of vehicles by fuel type from 2011 (Jan) - 2020 (Dec) (<https://www.autosinnovate.org/resources/electric-vehicle-sales-dashboard>). This number was divided by the aggregate number of vehicles state wide for each fuel category. The resultant % was multiplied by the reported aggregate number of vehicles for Houston. Reporting for 'Number of Buses' obtained from the Metropolitan Transit Authority Website <https://www.ridemetro.org/pages/aboutmetro.aspx> Number of Taxis: current number of permits issues as of June 3, 2021 TNC: Includes number of Lyft driver's only. Data source: Houston Airport System. Reporting for 'Number of Private Cars': https://censusreporter.org/data/table/?table=B25046&geo_ids=04000US48,16000US4835000,01000US&primary_geo_id=04000US48

(10.5) Does your city have a low or zero-emission zone or restrictions on high polluting vehicles that cover a significant part of the city? (i.e. that disincentivises fossil fuel vehicles through a charge, a ban or access restriction)

No

(10.7) How many public access EV charging points do you have in your city and/or metropolitan area for the following types.

	Number of charging points	Number of charging points in your metropolitan area	Comment
Rapid 43 kw and above	74	126	Data Source: Department of Energy Alternative Fuels Data Center https://afdc.energy.gov/fuels/electricity_locations.html#/analyze?fuel=ELEC Metropolitan Area: Harris County, Fort Bend County, Montgomery County. Number of Charging Points: EV charging points in COH city limits
Fast 7-22kw	632	813	Data Source: Department of Energy Alternative Fuels Data Center. https://afdc.energy.gov/fuels/electricity_locations.html#/analyze?fuel=ELEC Metropolitan Area: Harris County, Fort Bend County, Montgomery County. Number of Charging Points: EV charging points in COH city limits
Slow 3kw or below	9	9	Data Source: Department of Energy Alternative Fuels Data Center. https://afdc.energy.gov/fuels/electricity_locations.html#/analyze?fuel=ELEC Metropolitan Area: Harris County, Fort Bend County, Montgomery County. Number of Charging Points: EV charging points in COH city limits
All types	706	948	Data Source: Department of Energy Alternative Fuels Data Center. https://afdc.energy.gov/fuels/electricity_locations.html#/analyze?fuel=ELEC Metropolitan Area: Harris County, Fort Bend County, Montgomery County. Number of Charging Points: EV charging points in COH city limits

Source: https://afdc.energy.gov/fuels/electricity_locations.html#/analyze?fuel=ELEC

(10.8) Does your city collect air quality data?

Yes

(10.11) Please provide city-wide average air pollution metrics from the monitoring sites within your city for the most recent three years.

PM2.5 (1 year (annual) mean)

Most recent years available (select year)

2020

Average concentration for most recent year available (ug/m3)

9.66

Average concentration for second most recent year available (ug/m3)

9.83

Average concentration for third most recent year available (ug/m3)

9.91

Number of monitoring stations

3

Frequency of measurements (e.g. hourly, daily)

Varies by site and pollutant: hourly in most cases. Not all pollutants are monitored at each station and some report hourly automatically, some are daily and need to be lab processed

Where can the data be accessed?

<https://www17.tceq.texas.gov/tamis/index.cfm>

Who owns the data?

Texas Commission on Environmental Quality

Publicly available?

Yes

Completeness of data (%)

94.7

PM2.5 (Maximum 24-hour average)

Most recent years available (select year)

2020

Average concentration for most recent year available (ug/m3)

67.66

Average concentration for second most recent year available (ug/m3)

84.84

Average concentration for third most recent year available (ug/m3)

33.93

Number of monitoring stations

3

Frequency of measurements (e.g. hourly, daily)

Varies by site and pollutant: hourly in most cases. Not all pollutants are monitored at each station and some report hourly automatically, some are daily and need to be lab processed

Where can the data be accessed?

<https://www17.tceq.texas.gov/tamis/index.cfm>

Who owns the data?

Texas Commission on Environmental Quality

Publicly available?

Yes

Completeness of data (%)

100

PM10 (1 year (annual) mean)

Most recent years available (select year)

2020

Average concentration for most recent year available (ug/m3)

20.29

Average concentration for second most recent year available (ug/m3)

21.1

Average concentration for third most recent year available (ug/m3)

18.5

Number of monitoring stations

1

Frequency of measurements (e.g. hourly, daily)

Varies by site and pollutant: hourly in most cases. Not all pollutants are monitored at each station and some report hourly automatically, some are daily and need to be lab processed

Where can the data be accessed?

<https://www17.tceq.texas.gov/tamis/index.cfm>

Who owns the data?

Texas Commission on Environmental Quality

Publicly available?

Yes

Completeness of data (%)

92.4

PM10 (Maximum 24-hour average)

Most recent years available (select year)

2020

Average concentration for most recent year available (ug/m3)

126.36

Average concentration for second most recent year available (ug/m3)

64.3

Average concentration for third most recent year available (ug/m3)

105.8

Number of monitoring stations

1

Frequency of measurements (e.g. hourly, daily)

Hourly

Where can the data be accessed?

<https://www17.tceq.texas.gov/tamis/index.cfm>

Who owns the data?

Texas Commission on Environmental Quality

Publicly available?

Yes

Completeness of data (%)

95

NO2 (1 year (annual) mean)

Most recent years available (select year)

2020

Average concentration for most recent year available (ug/m3)

16.15

Average concentration for second most recent year available (ug/m3)

20.4

Average concentration for third most recent year available (ug/m3)

19.3

Number of monitoring stations

12

Frequency of measurements (e.g. hourly, daily)

Most data downloaded from TCEQ is in hourly increments. Some pollutants have 5-minute data; however, that data requires a public records request for access.

Where can the data be accessed?

<https://www17.tceq.texas.gov/tamis/index.cfm?fuseaction=report.main>

Who owns the data?

The data displayed on the Texas Commission on Environmental Quality website may not all be measured directly by the TCEQ. Other entities may supply TCEQ with data including Houston Regional Monitoring

Publicly available?

Yes

Completeness of data (%)

95.5

O3 (Daily maximum 8 hour mean)

Most recent years available (select year)

2020

Average concentration for most recent year available (ug/m3)

73

Average concentration for second most recent year available (ug/m3)

81

Average concentration for third most recent year available (ug/m3)

88

Number of monitoring stations

20

Frequency of measurements (e.g. hourly, daily)

Varies by site and pollutant: hourly in most cases. Not all pollutants are monitored at each station and some report hourly automatically, some are daily and need to be lab processed

Where can the data be accessed?

https://www.tceq.texas.gov/cgi-bin/compliance/monops/8hr_attainment.pl

Who owns the data?

The data displayed on the TCEQ website may not all be measured directly by the TCEQ. Other entities may supply TCEQ with data including Houston Regional Monitoring, Harris County Pollution Control Services, and University of Houston

Publicly available?

Yes

Completeness of data (%)

96.2

SO2 (Maximum 24-hour average)

Most recent years available (select year)

2020

Average concentration for most recent year available (ug/m3)

4.29

Average concentration for second most recent year available (ug/m3)

7.87

Average concentration for third most recent year available (ug/m3)

7.54

Number of monitoring stations

4

Frequency of measurements (e.g. hourly, daily)

Most data downloaded from TCEQ is in hourly increments. Some pollutants have 5-minute data; however, that data requires a public records request for access.

Where can the data be accessed?

<https://www17.tceq.texas.gov/tamis/index.cfm?fuseaction=report.main>

Who owns the data?

Texas Commission on Environmental Quality

Publicly available?

Yes

Completeness of data (%)

100

11. Urban Planning

(11.0) What is the size of your city's park space in square km?

163.6

Total park space includes: Public Park Acreage: 25,082.55 Non-Public Park Acreage: 282.93 Lake Houston Reservoir: 12,240.00 Esplanades: 2,200.00 Cemeteries: 622.70 Data provided by Houston Parks Department.

(11.1) Report the total population living within 500m of a mass transit station, with mass transit defined as any Bus Rapid Transit (BRT), light rail, other rail-based transit modes or frequent bus services (average of five times an hour from 7 a.m. to 9 p.m. on a weekday).

Total population living within 500m of a mass transit station

Population

941563

Comment

This number is based on the 500 m buffer. The City previously reported based on a half mile or 800 meter buffer). Data was provided by the Houston Planning Department.

12. Food

(12.0) Report the total number of meals that are annually served and/or sold through programs managed by your city (this includes schools, hospitals, shelters, public canteens, etc.).

Total meals served or sold through programs managed by your city

Number of meals

45.4

Cities facilities

Schools

Other, please specify (Meals on Wheels, Congregate Meals (Community Centers))

Comment

44 million from Houston Independent School District 1.5 million from Houston Health Department Total: 45.5 million meals annually

<https://www.houstonisd.org/Page/125847> https://www.houstontx.gov/health/Aging/nutrition_services.html#:~:text=Nutrition%20Programs,-Our%20nutrition%20programs&text=Through%20a%20network%20of%20community,throughout%20Houston%20and%20Harris%20County

(12.0a) Report the tonnes per food group that are served and/or sold through the above mentioned programs.

Vegetables

Tonnes served and/or sold

Comment

Not available

Fruit

Tonnes served and/or sold

Comment

Not available

Dairy foods

Tonnes served and/or sold

Comment

Not available

Whole grains

Tonnes served and/or sold

Comment

Not available

Tubers or starchy

Tonnes served and/or sold

Comment

Not available

Total protein sources

Tonnes served and/or sold

Comment

Not available

Meat (Beef, Pork, Chicken) protein sources

Tonnes served and/or sold

Comment

Not available

Egg protein sources

Tonnes served and/or sold

Comment

Not available

Fish protein sources

Tonnes served and/or sold

Comment

Not available

Plant-based (pulses, nut) protein sources

Tonnes served and/or sold

Comment

Not available

Added fats

Tonnes served and/or sold

Comment

Not available

Foods with added sugar

Tonnes served and/or sold

Comment

Not available

(12.1) What is the per capita meat and dairy consumption (kg/yr) in your city?

Meat consumption per capita (kg/year)

Kg/Year/Capita
93.9

Year data applies to
2019

Is your city calculating emissions associated with this consumption?
No

Comment

According to the USDA, the average American consumed 207 lbs. of meat products In 2019 <https://www.ers.usda.gov/data-products/food-availability-per-capita-data-system/>

Dairy consumption per capita (kg/year)

Kg/Year/Capita
296.1

Year data applies to
2019

Is your city calculating emissions associated with this consumption?
No

Comment

Dairy consumption: 652.6 lbs./yr (296.1 kg/yr) - 2019 According to the USDA, the average American consumed 652.6 lbs. of dairy products In 2019 <https://www.ers.usda.gov/data-products/food-availability-per-capita-data-system/>

(12.3) Does your city have any policies relating to food consumption within your city? If so, please describe the expected outcome of the policy.

	Response	Please describe the expected outcome of the policy
Please complete	No	

(12.4) How does your city increase access to sustainable foods?

Do you subsidise fresh fruits and vegetables?

Action implemented
No

Please provide details and/or links to more information about the actions your city is taking to increase access to sustainable foods

Do you tax/ban higher carbon foods (meat, dairy, ultra-processed)?

Action implemented
No

Please provide details and/or links to more information about the actions your city is taking to increase access to sustainable foods

Do you use regulatory mechanisms that limit advertising of higher carbon foods (meat, dairy, ultra-processed)?

Action implemented
No

Please provide details and/or links to more information about the actions your city is taking to increase access to sustainable foods

Do you use regulatory mechanisms that limit the sale of higher carbon foods (meat, dairy, ultra-processed)?

Action implemented
No

Please provide details and/or links to more information about the actions your city is taking to increase access to sustainable foods

Do you incentivise fresh fruit/vegetables vendor locations?

Action implemented
No

Please provide details and/or links to more information about the actions your city is taking to increase access to sustainable foods

Do you have programs/policies/regulations on food surplus - either food surplus recovery and redistribution, or food waste avoidance programs (i.e. Love Food/Hate Waste)?

Action implemented
No

Please provide details and/or links to more information about the actions your city is taking to increase access to sustainable foods

(12.5) Please report the total annual volume of food waste (subset of organic waste) in tonnes.

Total annual volume of food waste

Total annual volume of food waste (subset of organic waste) in tonnes

Comment

(12.6) What percentage of your population is food insecure?

Population that is food insecure

Percentage of population that is food insecure

16.3

Comment

Dec. 2019 report by the Houston Health Department on food insecurity provided a rate of 16.3 <https://www.houstontx.gov/health/chs/documents/201912-houston-health-highlights.pdf>

13. Waste

(13.0) What is the annual solid waste generation in your city?

	Amount of solid waste generated (tonnes/year)	Year data applies to	Please describe the methodology used to calculate the annual solid waste generation in your city
Please complete	843217.61	2020	Total Solid Waste Generation: tonnes (landfill, recycle, compost and reuse.) Only represents material collected by the City of Houston.

(13.1) How much of the solid waste generated in your city is disposed to landfill or incineration (tonnes/year)?

720573.36

(13.2) What percentage of the solid waste generated in your city is diverted away from landfill or incineration?

14.54

(13.3) What is the amount of your city's total solid waste collected for each of the following sectors (tonnes/year)?

	Amount of solid waste generated (tonnes/year)
Total	843217.61
Residential	843217.61
Commercial	
Industrial	
Construction and demolition waste	
Other	

(13.4) What is the amount of solid waste being treated (tonnes/year) through the methods listed.

	Tonnes/year
Re-use	537
Recycling	67220.71
Composting	54886.54
Anaerobic digestion	
Incineration or other form of thermal treatment	
Open burning	
Sanitary landfill	720573.36
Non-sanitary landfill	
Other	

(13.5) Please provide a waste composition analysis

Please see attached City of Houston Waste Characterization Study 2014 Final Report FINAL_HoustonWasteCharacterizationStudyv2.docx

14. Water Security

Water Supply

(14.0) What are the sources of your city's water supply?

- Surface water, from sources located fully or partially within city boundary
- Surface water, from sources outside the city boundary (by water transfer schemes)
- Ground water
- Other source (Recycled/reclaimed water)

(14.1) What percentage of your city's population has access to potable water supply service?

100

(14.2) Are you aware of any substantive current or future risks to your city's water security?

Yes

(14.2a) Please identify the risks to your city's water security as well as the timescale and level of risk.

Water security risk drivers	Anticipated timescale	Estimated magnitude of potential impact	Estimated probability of impact	Risk description
Increased water stress	Medium-term (by 2050)	Extremely serious	High	HB 2846 (86th Legislative Session) Mandating Houston's Sale of Allens Creek Reservoir water rights to Brazos River Authority. https://capitol.texas.gov/tlodocs/86R/billtext/pdf/HB02846F.pdf#navpanes=0

Water Supply Management

(14.3) Please select the actions you are taking to reduce the risks to your city's water security.

Risks

Increased water stress

Adaptation action

Other, please specify (Increasing our water portfolio by implementing other water supply strategies, including reuse and conservation, as well as beginning the development of a One Water Master Plan that integrates drinking, wastewater and stormwater operations.)

Status of action

Pre-feasibility study/impact assessment

Action description and implementation progress

Houston is in litigation to retain its Allens Creek Reservoir water rights. The Travis County District Court ruled that HB 2846 is unconstitutional and Houston's water rights are currently intact. Brazos River Authority (BRA) has appealed the District Court's ruling, but Houston anticipates the Austin Court of Appeals will affirm the District Court's ruling. Houston has no knowledge whether BRA will appeal to the Texas Supreme Court. Houston continues to implement conservation awareness and education and is studying conservation incentives and water use restrictions. Houston is also developing its recycled/reclaimed water to expand the use of this resource.

(14.4) Does your city have a publicly available Water Resource Management strategy?

Yes

(14.4a) Please provide more information on your city's public Water Resource Management strategy.

Publication title and attach document

2019 City of Houston Water Conservation Plan
2019_water_conservation_plan_01132020.pdf

Year of adoption from local government

2019

Web link

https://www.publicworks.houstontx.gov/sites/default/files/assets/2019_water_conservation_plan_01132020.pdf

Does this strategy include sanitation services?

No

Stage of implementation

Measurement in progress

Publication title and attach document

2019 City of Houston Drought Contingency Plan (Appendix A in the 2019 City of Houston Water Conservation Plan)

Year of adoption from local government

2019

Web link

https://www.publicworks.houstontx.gov/sites/default/files/assets/2019_water_conservation_plan_01132020.pdf

Does this strategy include sanitation services?

No

Stage of implementation

Measurement in progress

Publication title and attach document

Exploring the Potential and Feasibility of WaterUse Conservation for Houston Water, Houston, Texas
FinalReport_HoustonWater_062821.pdf

Year of adoption from local government

2021

Web link

https://www.publicworks.houstontx.gov/sites/default/files/assets/2019_water_conservation_plan_01132020.pdf

Does this strategy include sanitation services?

No

Stage of implementation

Strategy in implementation

Submit your response

What language are you submitting your response in?

English

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Please confirm how your response should be handled by CDP.

	Public or non-public submission
I am submitting my response	Publicly (recommended)