

Implementation of Houston's Climate Action Plan in the Private Sector

**Prepared for Houston City Council District C
Councilmember Abbie Kamin**

June 22nd, 2020

Prepared by:

Clea Hendricks

Frances Malley

Amanda Scheichet

Mason Ward



Table of Contents

I.	EXECUTIVE SUMMARY	2
II.	STATEMENT OF THE PROBLEM	2
III.	BACKGROUND	3
IV.	CASE STUDIES	3
	a. Austin, Texas	3
	b. Miami, Florida	4
	c. Atlanta, Georgia	6
	d. Chicago, Illinois	7
V.	POLICY OPTIONS	8
	a. Transportation	8
	b. Energy Transition	9
	c. Building Optimization	11
	d. Materials Management	12
VI.	LIMITATIONS	15
VII.	CONCLUSIONS	15
VIII.	WORKS CITED	16



I. Executive Summary

The City of Houston recently developed an ambitious climate plan to reduce local greenhouse gas emissions and become carbon neutral by 2050 in keeping with the goals of the Paris Climate Agreement. The plan will improve climate resilience and preserve the city's place as a global leader. The private sector is an essential partner for meeting these goals. Local businesses are the source of substantial emissions and control major local investment decisions. This plan explores how Houston can more fully involve the private sector in the four focus areas that organize the goals of the Climate Action Plan. These include Transportation, Energy Transition, Building Optimization, and Materials Management. Through this analysis, we identify several concrete solutions including implementing a cohesive charging network for electric vehicles, enforcing pre-existing energy regulations, implementing a building standard beyond the LEED model that focuses on both construction and building management, and introducing a composting program to divert solid waste from local landfills and instead produce biogas to generate a new sustainable energy source.

II. Statement of the Problem

We have been tasked with researching how to implement the city of Houston's proposed Climate Action Plan. This includes a strong focus on incentives for private sector compliance. The city council needs solutions that they can advocate and push for in the city of Houston in the short term, specifically within the next five years. With a lack of funds available to implement the climate action plan, low-budget solutions and general programs to bring public awareness to the plan would benefit Houston.

Houston is a large center of developing infrastructure, meaning that it is important to research new building standards that go beyond LEED. Our goal is to incentivize private sector compliance on four key components of the city that the plan highlights: Transportation, Energy Transition, Building Optimization, and Materials Management. Houston is consistently growing and developing with a high demand for energy. Given the monetary constraints of this policy, private sector investment in the implementation of the climate action plan is crucial to reach the goals. Producing these emission- reduction driven goals will connect different stakeholders and industries to a more sustainable future in Houston.



III. Background

The effects of global climate change are not Houston specific problems, but Houston will undoubtedly be a major part of the global solutions. Houston’s position as the “Energy Capital of the World” places it in a unique position to lead a new generation in a green future.

However, Houston faces its own unique challenges from a changing climate. Increasing Gulf storms pose a significant threat to flood prone areas and infrastructure, drier winters and warmer summers threaten to drive natural flora and fauna northwards, and increasing illegal pollution from industrial producers threaten local communities and ecosystems.^{1,2} The devastating Hurricane Harvey highlighted some of the biggest threats to the bustling city of Houston exacerbated by climate change impacts, including flooding. Reducing flood risk is a top priority of Houston as the increase of impermeable surfaces blocks natural flood control. In light of the threats to Houston’s infrastructure and development, the Climate Action Plan addresses the need for a reduction in greenhouse gas emissions in all sectors of the city.

On the state level, Texas both produces and consumes the most energy per year in the US. Texas is also the nation’s leader in wind energy production, and has a rapidly expanding solar market.³

IV. Case Studies

a. Austin, Texas

Austin is a leader when it comes to climate change advocacy and implementation. Austin owns its own power utility, so it has more control and a direct influence on renewable energy standards. However, Austin still heavily relies on private sector compliance to ensure positive relationships between the city and businesses, and to achieve its goal of carbon neutrality by 2050. Austin has had a plan in place since 2015 and has spent the past few months reviewing and

¹ Fountain, “Scientists Link Hurricane Harvey’s Record Rainfall to Climate Change” New York, December, 2017
<https://www.nytimes.com/2017/12/13/climate/hurricane-harvey-climate-change.html>

² “Climate Change: Ecosystem Change and Carbon Storage” Houston Advanced Research Center, 2008
https://adapt2climate.org/ecosystem_change.html

³ “Energy” Office of the Governor, Economic Development and Tourism Division, 2016
<https://businessintexas.com/sites/default/files/08/08/16/energy-2016.pdf>



adjusting their climate plan based on the results they have seen.⁴ Their target focus areas are electricity and natural gas, transportation and land use, and materials and waste management.⁵

One of Austin’s tactics has been to involve stakeholders in the creation of its new plan, which has been crucial in its citywide implementation and ability to involve all parties. Its original climate plan from 2015 references collaboration with the private sector, writing “The City of Austin must provide leadership by creating effective partnership with private businesses and nonprofit leaders to educate and inform individual choices in support of this plan” (4).⁶ Rather than imposing plans and regulations on the private sector, Austin strives to collaborate with them and involve them in their planning.

Zach Baumer, Climate Program Manager for the city of Austin, shared some of his approaches for engaging the private sector.⁷ Ultimately, Austin’s goal is to combine regulatory control and collaborative conversation in order to best involve all parties in the climate action plan. For the monetary approach, the city will use approaches such as buying power from the private sector to reward those companies that are pushing for a green future. However, the majority of its advocacy comes from a fiscally conservative approach. Baumer describes the ways in which Austin recognizes successful green initiatives by hosting breakfast with the mayor for those businesses, advertising green businesses, and creating a sense of competition between businesses when it comes to innovation concerning climate change. This has been described as a self-motivation tactic by Baumer, and he credits much of the city's success to these methods.

b. Miami, Florida

Miami, Florida is often viewed as “ground zero” for the impacts of climate change in the continental United States. With South Florida lying just above sea level, the city’s existence is extremely threatened by climate-induced sea level rise. Additionally, the city has always been vulnerable to hurricanes, storm surge, and flooding, all of which are intensifying with climate change. Because of this, Miami released their first Climate Action Plan, MiPlan, early on in 2008. This plan was focused on five main areas of sustainability: buildings, energy sources, transportation, land use, and adaptation.⁸ Miami has since updated their Climate Action Plan,

⁴ *Austin Community Climate Plan* [PDF, 4]. (2015). Austin, Texas: Office of Sustainability.

⁵ *Austin Community Climate Plan* [PDF, 4]. (2015). Austin, Texas: Office of Sustainability.

⁶ *Austin Community Climate Plan* [PDF, 4]. (2015). Austin, Texas: Office of Sustainability.

⁷ Phone Interview - May 15th, 2020, conducted by Frances Malley

⁸ “MiPlan: City of Miami Climate Action Plan.” (June 2008).
<http://egov.ci.miami.fl.us/Legistarweb/Attachments/87211.pdf>



releasing the Southeast Florida Regional Climate Change Compact in 2010 to coordinate mitigation and adaptation activities across the entire region of Southeast Florida. The design of the Compact allows local governments to set the agenda for adaptation, and jointly advocate for state and federal policies and funding. The Compact is widely recognized as one of the nation's leading examples of regional-scale climate action.⁹

The Southeast Florida Regional Climate Change Compact's updated Regional Climate Action Plan, RCAP 2.0, focuses on a wide range of categories, including Agriculture, Compact Coordination, Energy and Fuel, Natural Systems, Public Health, Public Outreach and Engagement, Public Policy Advocacy, Regional Economic Resilience, Risk Reduction and Emergency Management, Social Equity, Sustainable Communities and Transportation, and Water. RCAP 2.0 is a collaborative effort between departments with a plan to reduce greenhouse gas emissions and adapt to the effects of climate change. Many of their priorities align with Houston's Climate Action Plan areas of focus, with RCAP 2.0 paying extra attention to Energy and Fuel, Sustainable Communities, and Transportation.¹⁰ Because 90% of the Gross Domestic Product of Miami comes from the private sector¹¹, the city has strategies to include the private sector in the implementation of their Climate Action Plan, taking a holistic approach to building resiliency, mitigation and adaptation. A Climate Change Advisory Task Force was established in 2006 to advise the Miami-Dade Board of County Commissioners on policies, including substantial private sector participation, along with utility and university partners, government agencies, and other stakeholders. A major focus of the private sector efforts has been waste management and recycling programs, as well as working on upgrading the city's privately owned building stock for energy efficiency and environmental performance.¹² Other areas of private sector engagement have included flood mapping and inundation planning, regional greenhouse gas inventories, new policy development and local leadership summits. They have created effective, low-cost strategies to engage the private sector in the work of their plan, with a special focus on private sector incentives like low-cost financing for energy efficiency and renewable energy, some of which even generate revenue for the city.

⁹ "What is the Compact?" Southeast Florida Regional Compact Climate Change. <https://southeastfloridaclimatecompact.org/about-us/what-is-the-compact/>

¹⁰ "Climate Action Plan." Miami Beach Rising Above.

<http://www.mbrisingabove.com/your-city-at-work/resilience-strategy/climate-action-plan/>

¹¹ "MiPlan: City of Miami Climate Action Plan." (June 2008).

<http://egov.ci.miami.fl.us/Legistarweb/Attachments/87211.pdf>

¹² *Miami Dade Climate Action Plan*. https://www.miamidade.gov/greenprint/pdf/climate_action_plan.pdf



c. Atlanta, Georgia

Atlanta, Georgia has had a Climate Action Plan since 2015. They have always had ambitious goals and initiatives to encourage a sustainable future. They recently committed to 100% green energy by 2035. The city focused on ten impact sections of their community that contributed most to greenhouse gas emissions (GHG). Their focus areas for these reductions included Commercial & Industrial Buildings, Residential Buildings, Energy Production, Materials Management and Recycling, Water and Wastewater Management, Transportation, and Green Spaces/Food Security. Its significant goal to include the private sector in the implementation in the plan was very focused on transit-oriented development since one of the major problems for the city is traffic congestion due to commuters. Similar to Houston, they have expansive public transportation systems but needed to connect pedestrian and vehicular transport.

Atlanta has created programs that address their parking needs by taxing private-parking operators. They have created a parking cash out policy that “requires employers who provide subsidized parking to also offer their employees the option of receiving taxable income instead of parking”¹³. Since Atlanta has such a large spanning transportation system, it has increased incentives and programs for people to take advantage of. Atlanta takes advantage of partnering with the public, private, and non-profit sector that proves essential to the success of sustainability. The Mayor’s Office of Resilience and the Department of Corrections have partnered with Common Courtesy, Inc. for an EV Rideshare Program¹⁴. Common Courtesy is a non-profit that provides transportation services to individuals with low-mobility access using zero-emission vehicles to help previously incarcerated individuals.

The City of Atlanta partnered with the Department of Energy and adopted the Better Buildings Challenge¹⁵. The challenge began with no-cost building assessments that were offered as an incentive to get people involved. Private, public, and non-profit businesses all participated and were offered recognition for their progress. Media coverage was an important incentive for businesses to get community recognition and participate. Hosting education events and award ceremonies for the companies motivate the private sector to become involved. Atlanta utilizes public recognition for private sector involvement.

¹³ Garcia, Dr. Jairo H. "Atlanta Climate Action Plan." Atlanta Climate Action Plan. June 28, 2018.
<https://atlantaclimateactionplan.wordpress.com/>.

¹⁴ "Atlanta, GA." Resilience Initiatives | Atlanta, GA.

<https://www.atlantaga.gov/government/mayor-s-office/executive-offices/office-of-resilience/sustainability-initiatives>

¹⁵ Atlanta Better Buildings Challenge RSS. <http://atlantabbc.wpengine.com/initiatives/implementation-model/>.



d. Chicago, Illinois

Chicago initiated its climate action plan in 2008. The plan was a collaboration of scientists, NGO's, community groups, and private partners and set a goal of 25% reduction in GHG by 2020. Chicago's climate plan calls for a five-step approach¹⁶: Energy efficient buildings, Clean/Renewable energy, Improved transportation, Reduced waste and industrial pollution, and a Culture of adaptation.

Chicago is a city of 2.7 million people, making it slightly larger than Houston. Both cities are looking for public and private partnerships to complete their climate goals. An important part of Chicago's climate plan is that they are using a "moving climate" strategy¹⁷. This takes into account the difficulties of measuring every quantitative aspect of climate and gives the researcher a way to look at potential situations the city might move to. This also allows for private and public entities to move past planning stages and into implementation with the understanding that circumstances may be evolving.

Another important aspect of Chicago's CAP is its benchmarking and rating systems. The benchmark system allows for business owners to track their energy and climate footprint and report reductions over time. This is good for incentive based programs as well as for better understanding unique locational challenges.

Unlike Houston, Chicago gets most of its energy from coal and nuclear plants (44% and 40%)¹⁸. Any transition to renewable energy sources will likely begin in state legislation. Houston's deregulated energy market is proving to be a more effective strategy for change. However, Chicago is making strides in grass-root and community programs that may be beneficial examples for Houston. Programs exist for almost every facet of a cleaner future, including: urban

¹⁶ "Chicago Climate Action Plan: Proposed mitigation and adaptation strategies" City of Chicago Mayor's Office, 2020 https://www.chicago.gov/content/dam/city/progs/env/CCAP/CCAP_5_SUMMARIES_English.pdf

¹⁷ "Climate Change and Chicago: Projections and Potential Impacts" Hayhoe et al, 2008 https://www.chicago.gov/content/dam/city/progs/env/CCAP/Chicago_climate_impacts_report_Chapter_7_Conclusions.pdf

¹⁸ Diferdinando, "Sources of Our Power" Chicago Loopster, 2011 <https://chicagoloopster.medill.northwestern.edu/2012/01/27/sources-of-our-power/index.html#:~:text=So%20where%20exactly%20does%20the,from%20coal%20and%20nuclear%20energy.&text=30%2C%202011%3A%2044%20percent%20came,wind%2C%20biomass%20and%20hydro%20power.>



gardening and compost, waste reduction, water, transportation, green space development, and economic growth¹⁹

V. Policy Options

a. Transportation

Creating sustainable transportation options is crucial for the city of Houston. Transportation is the second largest contributor to greenhouse gas (GHG) emissions globally, primarily driven by personal vehicles.²⁰ The Climate Action Plan outlined the need for more electric and low-emission vehicles, reducing overall travel by integrating transit-oriented neighborhoods, and to provide equitable and safe mobility choices.

In order to make the shift to electric and low-emission vehicles, a cohesive charging network is needed for those looking to purchase more affordable electric vehicles with less range and require frequent charging. The EVolve Houston public-private Coalition has already implemented some of their initiatives²¹. They suggest partnering with dealerships to create online tools to increase education on EV while shopping for conventional vehicles. A helpful incentive would be to include public recognition for dealers who excel at selling EVs in the Greater Houston area. Partnering with dealers will also put in place incentives such as rebates and discounts on equipment and installations as well as make financing options like lease programs available. Another option that would tie into the building optimization goal of the climate action plan is to encourage new building codes for all new construction to mandate EV charging stations to be installed. This would increase the demand for Electric vehicles, allowing an extensive network of charging to be installed while also encouraging new development in Houston. An extremely low-budget option is to develop friendly competition programs that reward the winners with public recognition to increase participation. The private sector is many times motivated by public recognition; for example, Atlanta's Better Buildings Challenge allows private, public, and nonprofit businesses to get involved and motivates with recognition.

To get the private sector involved in investing in sustainable transport infrastructure around the city, it may be useful to consider public-private partnerships. This is an alternative to traditional

¹⁹ "Focus Areas" Sustain Chicago, 2020 <https://sustainchicago.cityofchicago.org/focus-areas/food-compost>

²⁰ Ang, G. and V. Marchal (2013), "Mobilising Private Investment in Sustainable Transport: The Case of Land-Based Passenger Transport Infrastructure", OECD Environment Working Papers, No. 56, OECD Publishing. <http://doi.org/10.1787/5k46hjm8jpmv-en>

²¹ "Home." EVolve Houston. <https://www.evolvehouston.org/>.



public sector involvement. “A PPP is a contractual arrangement between a public sector agency and a private sector party, involving private sector participation in the development, financing, construction, operation, maintenance and/or transfer/deconstruction/designation of a public infrastructure project”²² In other words, the public sector owns the infrastructure, but the private sector operates the service and receives revenue from it. However, PPP projects and initiatives can prove hard to set up if there is a lower benefit-cost ratio and they may face challenges such as “regulatory barriers, low bankability and risk misallocation”.²³ Transportation is a large part of Houston’s infrastructure, making private sector investment crucial.

b. Energy Transition

Houston is a global leader in energy production and technology. Texas both produces and consumes the most energy per year in the US, and Houston alone is home to over 4,600 energy companies²⁴. Texas has a deregulated energy market, meaning energy suppliers compete for customers. Growing demand for affordable access to renewable energy services and technologies puts Houston in a unique position to lead the charge for a green future.

Electric Reliability Council of Texas (ERCOT)

- Manages availability and power from each source depending on market demands statewide

CenterPoint Energy (Greater Houston area)

- Maintains/operates power lines and energy grid distribution
- Provides residential natural gas

Retail Energy Providers

- Sell power from the grid to individual customers
- Offer varying levels of renewable energy up to 100%
- Powers homes, small businesses, and the downtown area

²² Ang, G. and V. Marchal (2013), “Mobilising Private Investment in Sustainable Transport: The Case of Land-Based Passenger Transport Infrastructure”, OECD Environment Working Papers, No. 56, OECD Publishing. <http://doi.org/10.1787/5k46hjm8jpmv-en>

²³ Ang, G. and V. Marchal (2013), “Mobilising Private Investment in Sustainable Transport: The Case of Land-Based Passenger Transport Infrastructure”, OECD Environment Working Papers, No. 56, OECD Publishing. <http://doi.org/10.1787/5k46hjm8jpmv-en>

²⁴ “Why Houston?” Greater Houston Partnership, 2020 <https://www.houston.org/why-houston/industries/energy>



An important aspect of Houston’s energy transition is the availability of solar and wind. Community solar programs are a specific goal pointed out in their 2020 CAP. Community solar companies, like MP2 Energy, allow consumers to buy into renewable energy sources in a way that benefits their community as a whole. Houston is also primed for an expansion in its wind energy production. The state already produces the most wind energy in the country, and the costs of turbines and equipment is still driving down^{25 26}. However, critical legislation at the federal level has recently been retracted, taking away almost all federal incentives for investment and development²⁷.

Innovation in carbon-capture technology is also a priority put forth by the 2020 CAP. Houston’s position as a global industry hub makes it an attractive setting for tech and energy companies, and the target goal is to add an additional fifty energy 2.0 companies by 2025. Houston’s energy transition is highly dependent on its ability to train and hire a specialized workforce to create solutions in technologically advanced industries. Youth programs aimed at preparing a new generation with skills to succeed, like Hire Youth or Outdoor Solar Classroom, should be encouraged and expanded.

Because Houston is already positioned to be a global leader in energy, suggested policy options mostly include enforcement of pre-existing regulations and “standing by” the proposed goals set by Houston’s Climate Action Plan. Recent data from the Texas Commission on Environmental Quality shows Texas doubled its amount of illegal air pollution in 2018. Houston area facilities such as the Enterprise Products’ Mont Belvieu complex, Chevron Phillips Chemical’s Cedar Bayou Plant in Baytown, Valero Refining’s Texas City facility, and ExxonMobil’s Baytown refinery were cited as “significant contributors to the state’s illegal air pollution totals”²⁸. The first step Houston should take in enacting any climate policy is to enforce the laws already in place. Intensive efforts should be made to invest in and support REPs, and Houston should also

²⁵ Druzin, “Texas wind generation keeps growing...” Houston Chronicle. August, 2018
<https://www.houstonchronicle.com/business/energy/article/Texas-wind-generation-keeps-growing-state-13178629.php>

²⁶ “Report Confirms Wind Technology Advancements...” Berkeley Lab. August 2019
<https://newscenter.lbl.gov/2019/08/26/report-confirms-wind-technology-advancements-continue-to-drive-down-the-cost-of-wind-energy/>

²⁷ Osborne, “Wind, Solar Face Future Without Subsidies” Houston Chronicle. December, 2019
<https://www.houstonchronicle.com/business/energy/article/Wind-solar-face-future-without-subsidies-14930292.php>

²⁸ Hagerty, “Illegal Air Pollution in Texas Doubled in 2018” HOuston Public Media, December, 2019
<https://www.houstonpublicmedia.org/articles/shows/houston-matters/2019/12/19/354804/illegal-air-pollution-in-texas-doubled-in-2018/#:~:text=Illegal%20Air%20Pollution%20In%20Texas%20Doubled%20In%202018,in%20oil%20and%20chemical%20production.&text=The%20report%20says%20267%20companies,4%2C500%20separate%20events%20in%202018.>



take steps to publicly commit to their climate action goals by continuing and increasing their engagement in outreach and community involvement in the energy transition.

c. Building Optimization

Building optimization will be key in eliminating carbon waste. Buildings in the U.S. account for nearly 40% of all carbon dioxide emissions²⁹. This means that in order for Houston to achieve its goal of zero carbon emissions by 2050, reducing energy waste in buildings will be a huge step for the city. Houston is classified as a subtropical climate, making it so that the most effective use of building strategy would be a “moderately insulated building envelope with limited fenestration area having log SHGG (solar heat gain coefficient) and effective shading devices. [...] Sophisticated ventilation and AC systems [are] essential to provide healthy and comfortable indoor air conditions without wasting energy.”³⁰ Taking advantage of the climate and using it as a means of crafting a building standard beyond the LEED model will be important as Houston aims to eliminate carbon waste. Many organizations have devised means of using subtropical climate to construct zero-carbon buildings, and this can be done in Houston as well.

Encouraging construction businesses to be at the forefront of this process will be key in engaging the private sector. Rather than setting a standard set of requirements, the city can give different incentives to the private sector to create an air of competition between organizations. Taking note from Chicago, a benchmark system could incentivise companies and keep them accountable. Also offered could be recognition from the office of the mayor, ability to engage with policy makers on policies that directly impact their business or expanding the article four tax abatement to reward those contributing to the city’s development in an eco-friendly manner. The Houston Article 4, Section 44 tax abatement describes the city as having “an abundance of buildable sites” and highlights the many ways in which Houston rewards organizations from bringing jobs and prosperity to different parts of the city. Expanding this abatement to reward eco-friendly buildings could be a large propeller in the green building industry.

C40 cities, an initiative which Houston is a part of, offers a Clean Construction Forum, which “supports cities in the transition to resource-efficient, zero-emission construction, which will also deliver healthier buildings and better air quality to millions of residents in cities around the

²⁹ Environmental and Energy Study Institute (EESI). (n.d.). Buildings & Built Infrastructure. Retrieved June 19, 2020, from <https://www.eesi.org/topics/built-infrastructure/description>

³⁰ Mitterer, C., Künzle, H. M., Herkel, S., & Holm, A. (2012). Optimizing energy efficiency and occupant comfort with climate specific design of the building. *Frontiers of Architectural Research*, 1(3), 229-235. doi:10.1016/j.foar.2012.06.002



world.”³¹ Their research highlights the global impact of construction onto carbon levels in the atmosphere, and they aim to change the way we think about construction. Their research provides great insight into the ways that the city can support organizations that are contributing to green building. This includes buying the city clean energy to support organizations that are doing this work and adapting the city-owned machinery to follow these standards and set an example.³²

For established buildings, the Climate Action Plan highlights building optimization going beyond the building process and into business management. For buildings with tenants or occupants beyond a single family, well-trained business managers will be instrumental in energy conservation. Building managers can choose greener energy plans and be more aware of energy use in their buildings. The city can encourage these changes with educational opportunities available for business managers and compensation or reward for those building managers who best involve themselves into this process, similarly to what is being done in Austin. There are many federal tax credits for buildings operating with renewable resources that building managers can be introduced to, such as Energy Investment Credit and Renewable Energy Production Tax Credit.³³ The city can encourage building owners and managers to follow these guidelines through education, recognition, and eventually city tax abatement. Including business managers in the planning process, or an advisory task force similar to what we see in Miami, could be beneficial in devising guidelines that everyone feels comfortable abiding by. Awareness and incentives will be the most important first step in encouraging owners and managers to better control the energy use in their building and give their tenants environmentally conscious energy options.

d. Materials Management

Materials management is a huge part of Houston’s effort to create a more sustainable city. The commercial sector generates more than half of the waste stream in Greater Houston, and multi-family and single-family residences generate 22% and 25%, respectively.³⁴ Therefore, it is crucial that the city incorporate the private sector into their materials management solutions. The

³¹ Clean Construction Forum. Retrieved June 19, 2020, from <https://www.c40.org/networks/clean-construction-forum>

³² Mayors of Copenhagen, Oslo and Stockholm Commit to Clean Construction. (n.d.). Retrieved June 19, 2020, from https://www.c40.org/press_releases/mayors-of-copenhagen-oslo-and-stockholm-commit-to-clean-construction

³³ Renewable Energy Investment Incentives. (n.d.). Retrieved June 19, 2020, from <https://rsmus.com/what-we-do/services/tax/credits-and-incentives/renewable-energy-investment-incentives.html>

³⁴ Houston Climate Action Plan. (April, 2020) <http://greenhoustontx.gov/climateactionplan/CAP-April2020.pdf>



materials management section of Houston’s Climate Action Plan is organized around three goals: 1) reduce waste and transform the circular economy, 2) optimize waste operations and create power from waste, and 3) ensure safe and cost-effective long-term disposal capacity. One way to meet all of these goals using the private sector, and even generate new revenue in the process is through the use of biogas, a naturally produced type of biofuel made from the decomposition of organic waste.³⁵ Creating a system to produce biogas in the city of Houston would work to reduce waste and contribute to the circular economy, create power from waste, and reduce the amount of waste ending up in landfills.

One of Houston’s goals stated in the Climate Action Plan is to increase waste diversion and reduction through reusing, recycling, refusing, repairing, and composting. The City’s target is to reduce residential waste 50% by 2040. The current plans and strategies to reduce waste are effective, but much more can be done to significantly reduce waste. Currently, the city recycles metal and cans, plastics #1-5 and #7, cardboard and cartons, paper and newspaper, and glass. Additionally, there is currently a company in Houston, Avangard Innovative, that recovers commercial plastic waste, mainly plastic film used to wrap goods, into pellets that have an aftermarket use. Avangard also helps companies “track how much recyclable material ends up in the trash and works to identify solutions to improve recycling and circularity.”³⁶ This is a great start, however introducing composting to the city to create biogas will help to dramatically reduce waste. According to the EPA, commercial food wholesalers, retailers, manufacturers, and processors produce close to 75% of the estimated 309,941 tons of excess food in Houston each year.³⁷ Getting this food waste out of the landfills would not only expand the life of the landfill, but it can be used to create natural gas and methane that can then be used as an energy source.

The process of creating biogas begins with the addition of a curbside composting program with a commercial component, working with the restaurant and hospitality industry as well. The addition of a per garbage bag fee on trash, but making recycling free, would be a revenue neutral way to create an incentive for businesses and households to recycle more. Food waste from homes and restaurants is the second largest source of municipal solid waste nationally, constituting 18% of the waste stream.³⁸ By diverting this waste to an anaerobic digester located at the sewage treatment plant, this food waste can be combined with sewage solids and the

³⁵ “What is Biogas? A Beginner’s Guide.” Homebiogas.

https://www.homebiogas.com/Blog/142/What_is_Biogas%7Cfq%7C_A_Beginners_Guide

³⁶ Houston Climate Action Plan. (April, 2020) <http://greenhoustontx.gov/climateactionplan/CAP-April2020.pdf>

³⁷ Houston Climate Action Plan. (April, 2020) <http://greenhoustontx.gov/climateactionplan/CAP-April2020.pdf>

³⁸ “The Benefits of Anaerobic Digestion of Food Waste At Wastewater Treatment Facilities” EPA Archive. <https://archive.epa.gov/region9/waterinfrastructure/web/pdf/why-anaerobic-digestion.pdf>



combined material can be decomposed to produce methane (or natural gas). The natural gas produced can then be used to generate power, rather than releasing methane into the atmosphere.³⁹ Additionally, the collection of waste oils from restaurants can be used to generate an additional energy source by creating biodiesel, which can then be used to power the City’s vehicle fleet.⁴⁰

This process would all occur at a wastewater treatment plant, where a contract can be issued for a company in the private sector to build an anaerobic digester at the public facility, along with a small powerplant to turn this sustainable fuel source into electricity. The power plant would receive a low cost and reliable fuel source in the form of the natural gas generated from food and storage waste. At below market rates, the cheap energy and purchase of the gas can also generate a new revenue stream back to the city government. The low price of the fuel and the stable, long-term contract will create an incentive for a private company to build a power plant, because they will have a cheap and steady fuel supply and a customer for the power they produce.

This structure of using waste to create biogas has been implemented in Miami,⁴¹ Washington, DC,⁴² New York City,⁴³ and many other places around the United States. This strategy would be perfect for the City of Houston, because it meets all of the materials management goals in the Climate Action Plan, involves the private sector, and generates revenue to the city at no cost. It offers an excellent element in a closed-loop energy plan, contributing to the circular economy while reducing waste. Additionally, it contributes to Houston’s target of converting the municipal solid waste fleet to low emission vehicles by 2030 through the use of biodiesel that comes from restaurants’ waste oil. Lastly, it helps to meet Houston’s target of adopting a long-range solid waste plan in 2020, as well as working to advance multi-family and commercial recycling. Overall, the implementation of this plan to convert waste into biogas would contribute to Houston’s circular economy, offer a cheap and efficient way of producing energy, and reduce the City’s waste while lowering greenhouse gas emissions.

³⁹ Stolark, Jessie. (October 3, 2017). “Fact Sheet- Biogas: Converting Waste to Energy” Environmental and Energy Study Institute. <https://www.eesi.org/papers/view/fact-sheet-biogasconverting-waste-to-energy>

⁴⁰ Salma Khan, Mahnoor Raza, Asia Nosheen, Rabia Naz, Syed Muhammad Usman Shah & Muhammad Nadeem Hassan (2020) “Quality comparison of biodiesel produced from waste cooking oil of restaurant and domestic kitchen.” International Journal of Green Energy. <https://www.tandfonline.com/doi/abs/10.1080/15435075.2019.1700123#:~:text=Restaurant%20waste%20oil%20biodiesel%20showed,friendly%20source%20for%20biodiesel%20production.>

⁴¹ “Stepping on the (bio)gas in Miami Dade.” (October 21, 2019). Kemira. <https://www.kemira.com/insights/stepping-on-the-biogas-miami-dade/>

⁴² “Bailey Bioenergy Facility.” DC Water is Life. <https://www.dewater.com/bailey-bioenergy-facility>

⁴³ Snaders, Matt. (July 2, 2013). “Biogas: the city’s new compost power.” New York City Atlas. <http://newyork.thecityatlas.org/lifestyle/biogas-emerging-in-nyc-2/>



VI. Limitations

We were able to be successful in our search for cities to look for implementation models. However, the Climate Action Plan is only being newly implemented in many places, which made it more difficult to get long term data about the effects of implementation. Also, the implementation is only just beginning in the public sector, proving it hard to acquire information regarding the private sector.

We had some difficulty acquiring qualitative data from interviews from other city officials due to busy schedules and a limited time frame to produce research. More time for additional research would allow for a more in depth analysis of policy options.

Since Houston is the fourth largest city in the United States, many implementation models will not be able to be put forth to the scale that Houston requires. Without a budget, the incentives for the private sector are limited. Sustainability usually requires a large monetary investment, especially in highly developed areas like Houston.

VII. Conclusions

As Houston moves forward with its plans to achieve carbon neutrality by 2050, collaboration with the private sector is imperative. Within each of the components of the Climate Action Plan, there are opportunities to advocate for the involvement of the private sector. Looking at other cities, we have learned that some of the tactics that Houston can utilise as they encourage their private-sector organizations to be at the forefront of these changes. Whether this looks like a direct involvement of stakeholders, tax abatements, partnerships with local organizations, recognition of private-sector organizations, or one of the other methods introduced in this brief, there is great opportunity for Houston to involve their private sector into the goals outlined in the Climate Action Plan. While some of the long term goals may require greater financial backing, many of these options include immediate first steps Houston can take in order to involve the private sector from the get-go and affirm their collaboration. In breaking down the four goals mentioned in the Climate Action Plan, (Transportation, Energy Transition, Building Optimization, and Materials Management) the city council can devise different means of arriving at the same goal of a greener Houston and carbon neutrality in the next 40 years.



VIII. Works Cited

Ang, G. and V. Marchal (2013), "Mobilising Private Investment in Sustainable Transport: The Case of Land-Based Passenger Transport Infrastructure", OECD Environment Working Papers, No. 56, OECD Publishing.
<http://doi.org/10.1787/5k46hjm8jpmv-en>

Atlanta Better Buildings Challenge RSS. <http://atlantabbc.wpengine.com/initiatives/implementation-model/>.

Atlanta, City Of. "Atlanta's Transportation Plan." Atlanta's Transportation Plan.
<https://transportationplan.atlantaga.gov/>.

"Atlanta, GA." Resilience Initiatives | Atlanta, GA.
<https://www.atlantaga.gov/government/mayor-s-office/executive-offices/office-of-resilience/sustainability-initiatives>

Austin Community Climate Plan [PDF, 4]. (2015). Austin, Texas: Office of Sustainability.

Clean Construction Forum. Retrieved June 19, 2020, from <https://www.c40.org/networks/clean-construction-forum>

Environmental and Energy Study Institute (EESI). (n.d.). Buildings & Built Infrastructure. Retrieved June 19, 2020, from <https://www.eesi.org/topics/built-infrastructure/descriptio>

Garcia, Dr. Jairo H. "Atlanta Climate Action Plan." Atlanta Climate Action Plan. June 28, 2018.
<https://atlantaclimateactionplan.wordpress.com/>.
"Home." EVolve Houston. <https://www.evolvehouston.org/>.

Mayors of Copenhagen, Oslo and Stockholm Commit to Clean Construction. (n.d.). Retrieved June 19, 2020, from https://www.c40.org/press_releases/mayors-of-copenhagen-oslo-and-stockholm-commit-to-clean-construction

Mitterer, C., Künzel, H. M., Herkel, S., & Holm, A. (2012). Optimizing energy efficiency and occupant comfort with climate specific design of the building. *Frontiers of Architectural Research*, 1(3), 229-235.
doi:10.1016/j.foar.2012.06.002

Renewable Energy Investment Incentives. (n.d.). Retrieved June 19, 2020, from <https://rsmus.com/what-we-do/services/tax/credits-and-incentives/renewable-energy-investment-incentives.html>

"The Public-Private Pathway to the Multimodal City." Bloomberg.com. September 11, 2019.
<https://www.citylab.com/perspective/2019/09/transportation-future-mobility-technology-regulations-data/597748/>.