



>> **Austin** Community Climate Plan



net-zero



OFFICE OF
SUSTAINABILITY

CITY OF AUSTIN

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Austin Transportation Department

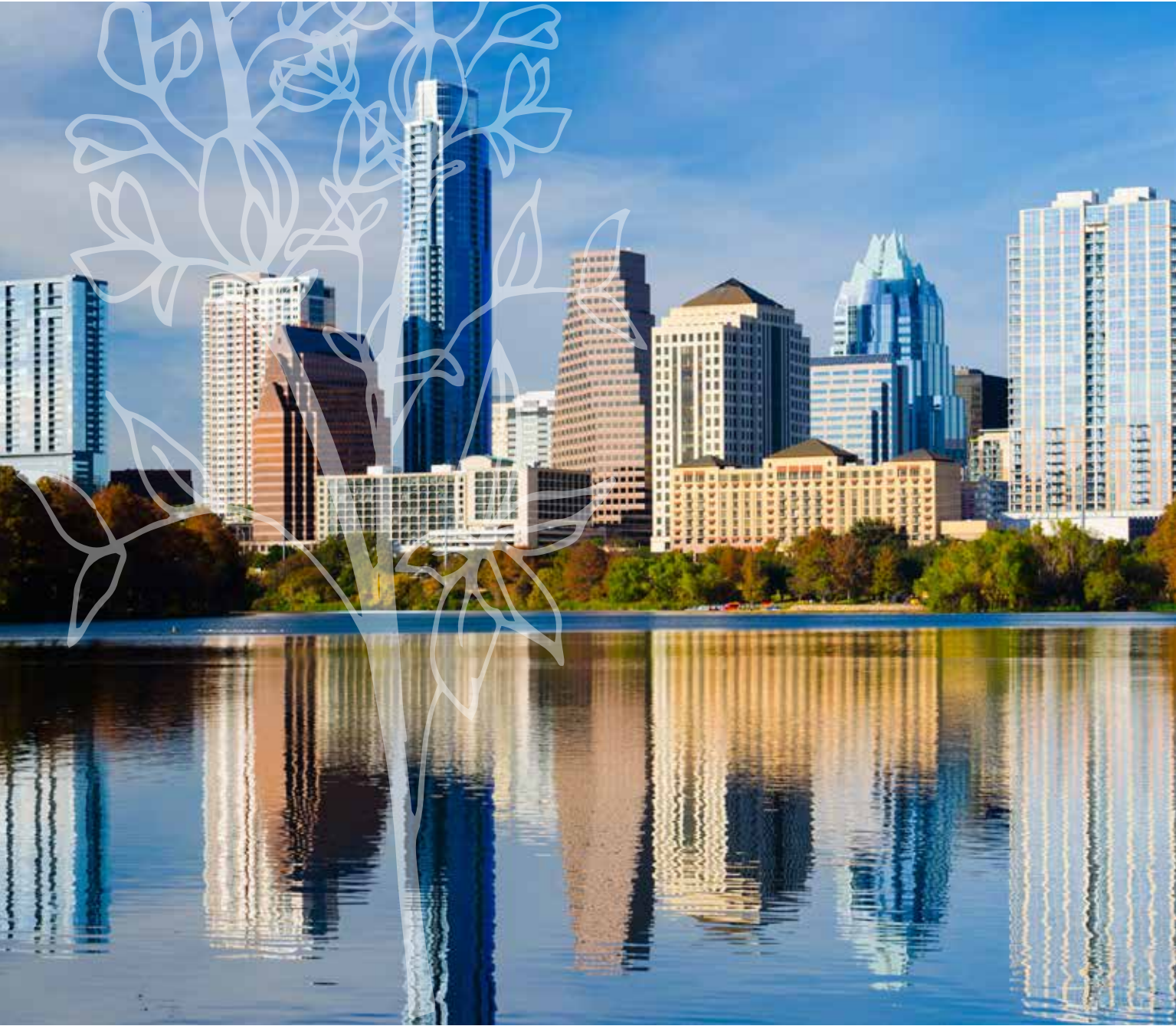




Table of Contents

- 2 Letter from the Steering Committee
- 4 Executive Summary
- 8 Background Information
 - Community Carbon Footprint
 - Plan Development
- 10 Community Climate Action Plan
 - Community Overview
 - How Do You Fit In?
 - Community Support
- 24 City of Austin Climate Action Plan
 - The City's Climate Leadership
 - Policies and Plans that Support Emissions Reductions
 - Climate Resilience Planning
- 32 Recommendations
- 35 Technical Appendices:
 - A: Methodology for Calculations
 - B: Strategies and Actions for All Emissions Sectors
 - C: Electricity and Natural Gas Sector Findings
 - D: Transportation and Land Use Sector Findings
 - E: Materials and Waste Management Sector Findings
 - F: Industrial Process Sector Findings
 - G: Public Input Process and Findings
- 72 Acknowledgements

Letter from the Steering Committee

Dear Mayor and City Council,

In 2014, City Council had the vision to put Austin on a path to economic and environmental sustainability and to establish our city as a global leader in meeting the challenges posed by climate change. The continuing drought is a stark reminder that climate change is one of the biggest threats to our economy and way of life in Central Texas. Scientists stress that it is also one of the biggest challenges that our planet has ever faced – but it does not need to be. Through your leadership today, Austin will set an example to communities around the world and become a powerhouse in the new green economy.



We are honored to have been working with numerous stakeholders and city departments to answer Council’s request for a revised and comprehensive climate protection plan. The Austin Community Climate Plan (ACCP) will establish a blueprint to achieve net-zero community-wide greenhouse gas emissions by 2050, or sooner if feasible.

We know that meeting this target isn’t just about addressing the threats that climate change poses, but also about spurring creativity, rewarding ingenuity, and generating opportunities so that everyone in Austin can participate, benefit, and prosper. We also know that meeting this challenge will require change – change in how we generate and use energy, how we get around town, how businesses measure prosperity, and how we deal with waste. We are optimistic that we can meet the net-zero target in ways that will lower energy bills, make transportation more flexible, clean the air we breathe, and create local jobs.

We also know that the risks of not tackling the challenges posed by climate change will come at a great social, economic, and environmental cost – in health impacts to our most vulnerable citizens, in loss of property from natural disasters, and in increased pollution and water shortages. We are already experiencing these impacts; in 2011, we faced terrible wildfires, the loss of trees and woodlands from both wildfires and drought, and rising utility bills just to keep us cool during a record breaking, hot summer. This will become the new normal in Texas for our children and grandchildren unless we take action.

However, the benefits to be gained are vast. Some people already enjoy carbon-free energy from their solar panels. Some companies have invested in fuel-efficient fleets and alternative vehicles that lower overhead costs. We are already increasing the density of some neighborhoods and are adding more bike lanes by the day. We are investing in clean energy through Austin Energy with more and more of our energy coming from the wind and the sun. We believe the benefits that result from confronting the

challenges of climate change are clear: a secure future for our families, innovation that results in local jobs and a strong local economy, and effective stewardship of the natural resources that make Austin such a special place. If we are all willing to roll up our sleeves and confront the challenges together, everyone can enjoy the benefits.

This Austin Community Climate Plan sets the stage to achieve the goal set by Council because it is:

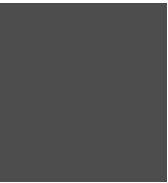
The plan in front of you sets the stage to achieve the goal set by Council because it is:

- **Realistic** – we recognize that everyone will have to take action and we’ve begun to identify how each person and organization can participate in creating Austin’s future.
- **Practical** – we’ve taken existing plans into account to highlight current efforts that will positively contribute to community-wide greenhouse gas reductions.
- **Efficient** – we’ve identified a full list of strategies that are good for the environment and we will continue to analyze them to identify the ones that are also good for our wallets, because a carbon neutral Austin can and should be an affordable Austin.

We also realize that this is just the beginning of our journey. That is why this plan has several policy recommendations for periodic updates, as well as a call for a strong implementation process. But most importantly, it puts an assessment of climate change impacts on the City Council’s management dashboard when major investments and plans are up for consideration.

Adopting this plan sets a strong commitment to a safe, healthy, vibrant Austin for many years to come. We are committed to working with all parties concerned to make the next phase – developing an implementation plan – a success.

Signed by Community Climate Steering Committee Co-Chairs:



Al Armendariz



Francois Levy



Joep Meijer

>> Adopting this plan <<
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Executive Summary

Ultimately, the entire Austin community must be engaged in the effort to realize >> carbon neutrality. <<



In the past few years, the results of a changing climate have directly impacted the Austin region. From the Bastrop fires, to the Halloween Floods in Onion Creek, and to some of the hottest summers on record, Central Texas has seen first-hand how those events can cause major consequences for a community.

Building on the City of Austin's long history of sustainability leadership, the Austin Community Climate Plan offers a robust set of strategies and actions that will aim for net-zero community-wide greenhouse gas emissions by 2050. Implementing this plan will help to create a vibrant, healthy and safe Austin for future generations, as well as increase the quality of life for those who live here today.

Creating effective partnerships with private businesses and non-profit leaders to collectively educate and inform individual choices is an important piece to this plan's success. The City of Austin can provide leadership in identifying opportunities for incentives and rebates that reinforce and promote individual decision-making in support of this plan; mandates should only be used to support actions in areas that are highly cost effective and produce the greatest emissions reductions.

Ultimately, the entire Austin community must be engaged in the effort to realize carbon neutrality. If we all work together, this goal is not only achievable but may also help to address many of the challenges that face Austin, such as affordability, traffic congestion, and disaster preparedness. This plan demonstrates that there are a multitude of benefits that individuals, families, and organizations can realize by making choices that will help us get to net-zero. Taking positive action will enhance everyone's quality of life today.

NET-ZERO COMMUNITY CO-BENEFITS

 Reduced energy costs	 Improved energy security and reliability	 Decreased risk of energy shortages or outages	 Diminished water consumption by power plants	 Reduced pollution
 Improved air quality	 Improved public health	 Thriving local economy and increased consumer spending	 Expanded local jobs creation	 Enhanced transit system
 Reduced traffic congestion	 Safer streets	 Improved disaster preparedness	 Protected and enhanced ecosystems	 Greater affordability for all





Strategies and Actions

The strategies and actions identified in Appendix B will result in both immediate and cumulative reductions in emissions resulting from electricity and natural gas, transportation, materials management, and industrial process sources.

Many of the identified actions can be accomplished through the full and continued implementation of many adopted City plans and other initiatives already underway. Other actions will require further research and development, and some actions may depend on advances in technology or meeting economies of scale in order to become viable. (Detailed information about each sector that contributes to Austin's carbon footprint can be found in the Technical Appendices of this document.)

The six-month process that produced these strategies and actions also identified many synergies that exist across sectors. By choosing growth patterns that create a more compact and connected city, not only does energy use per capita decline, but vehicle miles travelled per person are also reduced. By continued investment in renewable energy sources, the City can feel confident about promoting rapid growth in electric vehicles in order to meet our broader climate goals. Going forward, careful consideration should be given to implementing strategies and actions that optimize these types of synergies to have a greater impact and ensure better outcomes for our community.

Recommendations

The following actions are recommended next steps toward realizing the strategies identified in this plan:

1. Continue to invest resources in making progress on the actions within adopted plans that are identified as "Tier 1" actions.
 - 2. Commit to moving forward upon plan adoption with the following new actions:
- Electricity and Natural Gas
 - 1
 - 2
 - 3

- Transportation and Land Use
 - 1
 - 2
 - 3
 - Materials and Waste Management
 - 1
 - 2
 - 3
3. Develop an implementation plan within one year of adoption that would identify:
 - Prioritized actions to achieve the net-zero by 2050 goal
 - A public outreach and engagement plan to encourage emissions reduction behaviors in the community
 - Budget requirements
 - Interim targets and key milestones
 - Roles and responsibilities of stakeholder groups
 4. Determine feasibility of a carbon impact statement or sustainability impact statement to be used for city decisions related to large expenditures, land development plans, capital projects, and other major departmental planning efforts.
 5. Create departmental budget performance measures related to municipal operations that affect community-wide greenhouse gas emissions.
 6. Determine a strategy to assess options to evolve utility business models
 7. Continue climate resilience planning efforts by
 - Investing in detailed climate projections for Austin
 - Conducting vulnerability assessments to identify strategies that will protect City operations and assets, as well as community infrastructure from the worst impacts from climate change

Following adoption of this Austin Community Climate Plan, report progress and make revisions as follows:

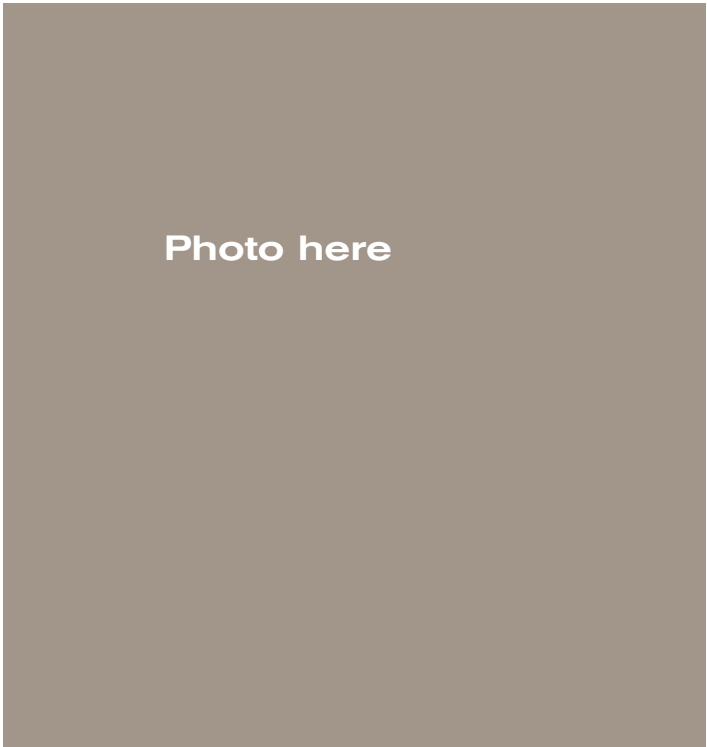


Background Information

>>> There have been unprecedented increases in average global temperatures over the past three decades. <<<

Climate change is largely the result of an increase in atmospheric greenhouse gases, which trap heat that would otherwise escape to space. Most of the scientific community agrees that greenhouse gas emissions created by human activity are playing a significant role in climate change; there have been unprecedented increases in average global temperatures over the past three decades, resulting in the highest recorded temperatures since the mid-1800s.¹

In 2007, the Intergovernmental Panel on Climate Change (IPCC) stated that in order to avoid the worst impacts from climate change, greenhouse gas emissions must be reduced to 40 per cent below 2005 levels by 2030 and 80 per cent below 2005 levels by 2050. These actions may help in keeping the average global temperature from rising more than 3.5°F above pre-industrial levels.² This plan aims to put the Austin region on a path to reach and potentially exceed these important reduction goals.



Plan Development

In April 2014, Austin City Council passed Resolution 20140410-024 which established the goal of net-zero community-wide greenhouse gas emissions by 2050, or earlier if feasible. The Office of Sustainability convened a Community Climate Plan Steering Committee to lead and guide in the development of this plan. In addition, four Technical Advisory Groups (TAGs) were formed to create strategies and action plans for each of the major greenhouse gas emissions sectors in Travis County: Electricity and Natural Gas, Transportation, Materials and Waste Management, and Industrial Processes.

The Steering Committee set the following goals for development of the Austin Community Climate Plan:

This plan will be developed in a way that is open and transparent, balances the interests of the entire Austin community, is realistic within the constraints of currently available information, provides clear and compelling implementation pathways, and maintains Austin's position as a climate leader.

TAGs developed specific recommendations that were reviewed and evaluated by the Steering Committee and Office of Sustainability in terms of feasibility, barriers to implementation, the quantity of avoided emissions, and additional co-benefits to determine prioritized actions to reach the established net-zero goal.

The public was invited to attend and provide comments at regularly scheduled Steering Committee meetings and online tools were used to gather input on the plan's proposed strategies and actions. These included an online forum for people to submit their ideas for consideration, as well as a survey to collect information about individual behaviors related to energy use, transportation, and waste management. This information was used to develop a realistic and implementable plan, understand the barriers to taking action, and identify potential incentives or other motivating factors for reducing a person's carbon footprint.

What Does it Mean?

GHG: Greenhouse gas – a gas in the atmosphere that traps and re-directs heat back toward the earth's surface. The most common and long-lasting GHG is carbon dioxide.

CO2e: The unit of measurement used to standardize other GHGs is carbon dioxide-equivalent (CO2e).

MtCO2e: The unit of measurement used as an international reporting standard for GHG. There are 2204.62 pounds of CO2 in one metric

Carbon Footprint: The total inventory of greenhouse gas emissions within a geographically-bounded area.

Carbon Neutrality: Net-zero greenhouse gas emissions in a geographically-bounded area.

Direct Emissions: GHG that come from sources owned or controlled by an entity. In Austin, these include power plants, energy use in buildings, transportation, waste management, the production of material resources, and industrial processes.

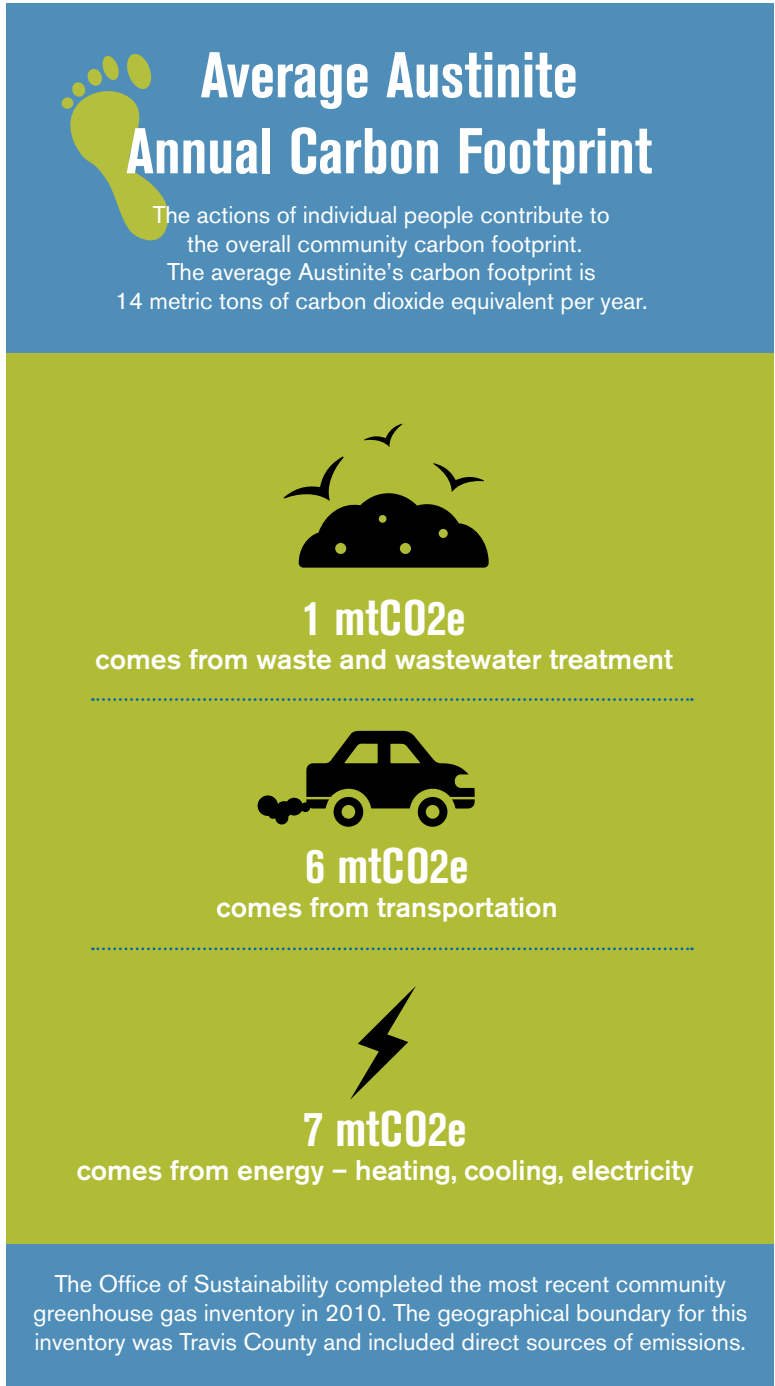
Indirect Emissions: GHG that come from sources that are purchased or outside an entity's direct control, such as food production and delivery, vendor supply chains and other outsourced activities, and long-distance transportation.

¹ IPCC Fifth Assessment Synthesis Report, Approved Summary for Policymakers, 11-1-14, page SPM3
² IPCC 2007 Climate Change Synthesis Report, http://www.ipcc.ch/publications_and_data/ar4/syr/en/contents.html, accessed 11/12/14

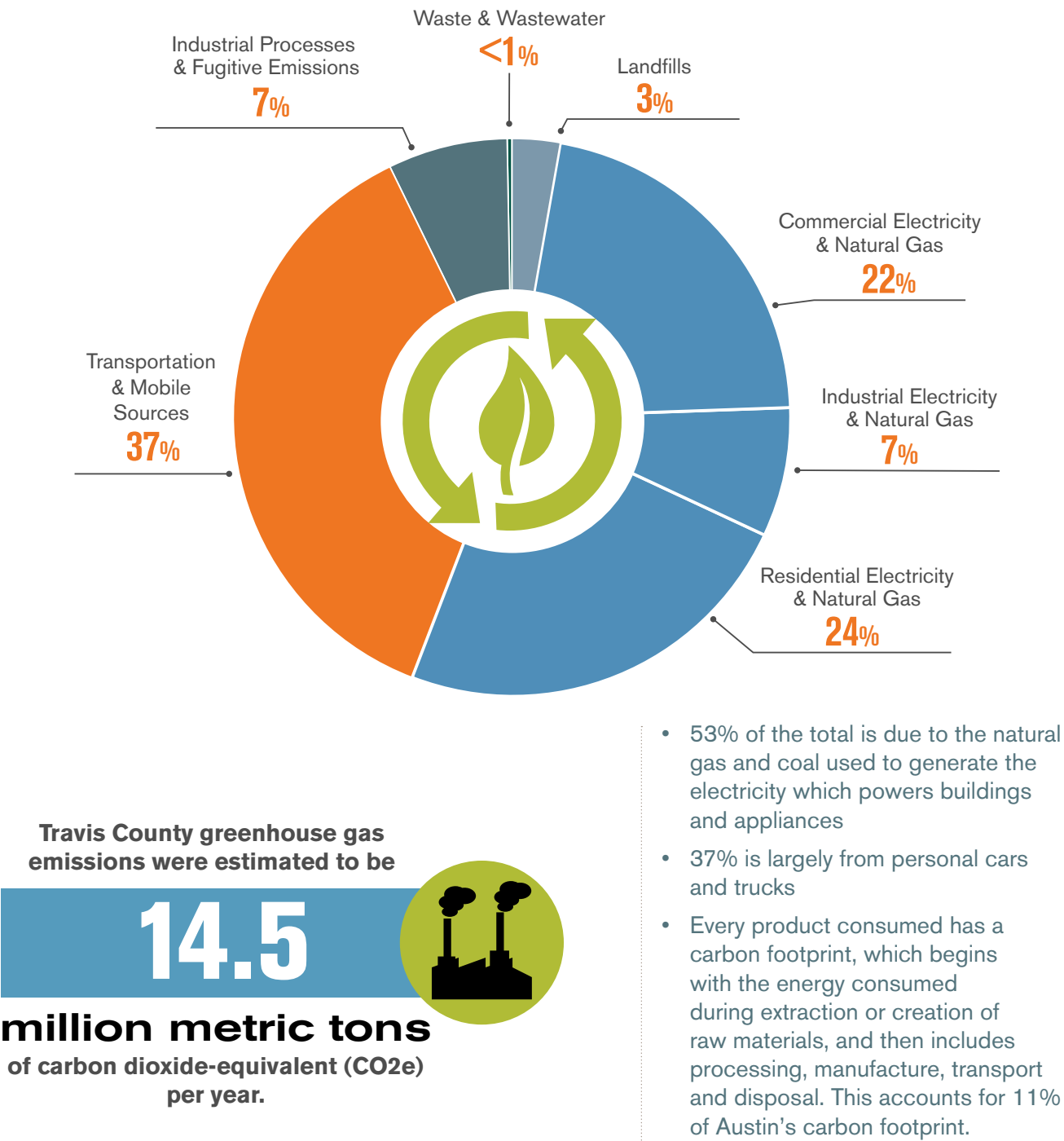
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Community Carbon Footprint

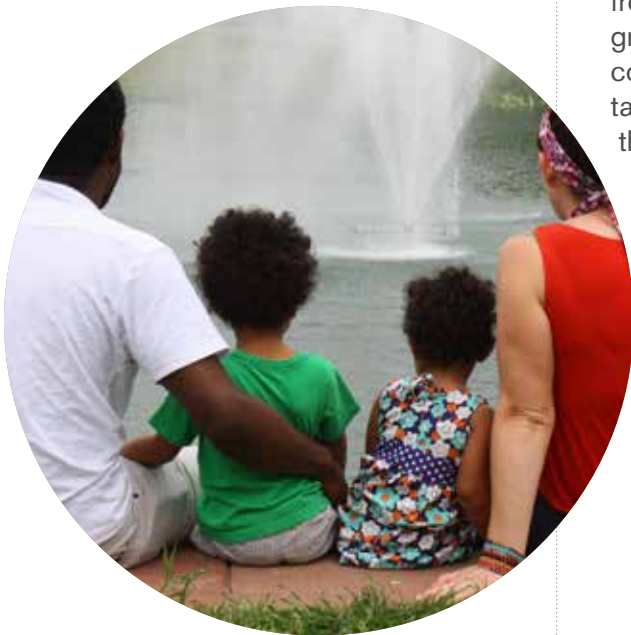
To establish a baseline for plan development, the Office of Sustainability completed a community greenhouse gas inventory based on 2010 data.



Estimated Travis County GHG Inventory

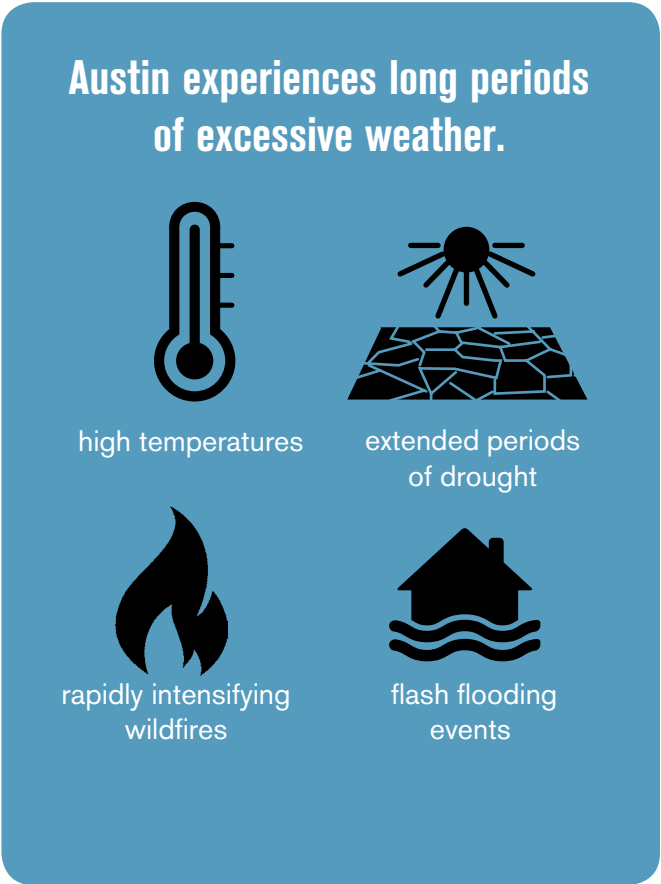
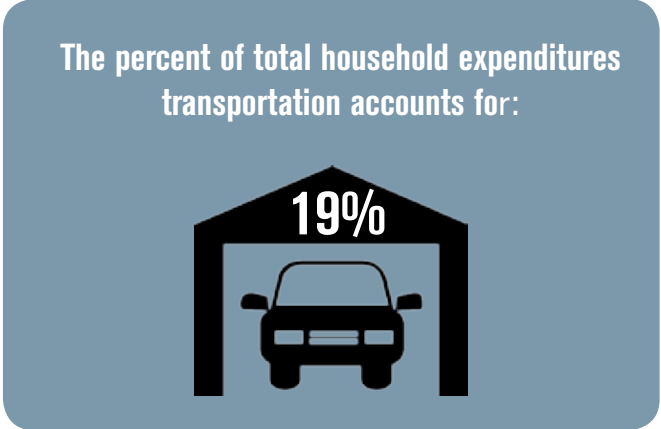
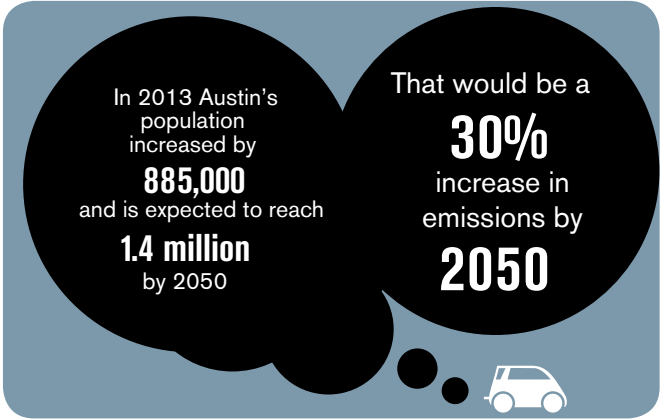


Community Climate Action Plan



As one of the fastest growing cities in America for the last five years, Austin has prepared for and responded to a variety of physical, economic, and social impacts from rapid change. The projections for continued population growth also pose a challenge to meeting the goal of net-zero community-wide greenhouse gas emissions by 2050; it will take concerted effort from the **entire community** to reach this ambitious target. Individual choices and behaviors will have a strong influence on quality of life at the personal level as well as for Austin as a whole.

While this plan is focused on achieving net-zero greenhouse gas emissions community-wide, it is important to note that the strategies and actions identified can also help address many other challenges facing Austin.



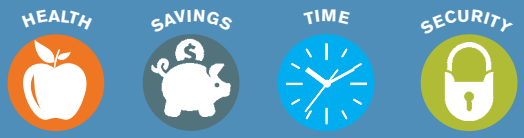
How Do I
FIT IN?

Community Overview

As a majority minority city, Austin has fast-growing Hispanic and Asian populations. Although 56 per cent of the population is under 35 years old, Austin is currently attracting more people in the 55+ age group than almost any other U.S. city. Analysts predict that the 65+ age group will make up as much as 20 per cent of the population by 2050. However, Austin is also experiencing massive growth in the number of children between the ages of 5 and 14 – a 49 per cent increase from 2000 to 2013.

Plan development relied heavily on the use of demographics for the Austin community. On the pages that follow, various strategies and actions are highlighted that will achieve the net-zero goal. They are organized around the groups of individuals and organizations in Austin that are most likely to realize additional benefits beyond the carbon neutrality goal, or who would find it most beneficial to adopt these behaviors. For example, whether or not someone owns their home or building will directly impact their ability to make energy efficient, emissions-reducing physical improvements.

In addition to protecting Austin from the effects of climate change, these actions will also provide multiple benefits to individuals and organizations. Some actions will improve health and well-being and potentially reduce healthcare costs over time. Other benefits include reduced energy costs, improved security in terms of reliability and safety, and less time wasted in traffic.



How Do I
FIT IN?



College Student



Roger is a student at the University of Texas at Austin. He lives in an apartment off-campus with two roommates to help split costs for rent, food, and utilities. The apartment is pretty basic and hasn't been upgraded in more than 10 years, so Roger and his friends are concerned about their energy bill and rising costs rising over time. Recycling and composting are not offered at the complex. Roger regularly rides his bike or takes the bus to get to class, but depends on his car for going out with friends. When he's not studying or working at his part-time job, Roger enjoys the live-music scene along Red River and on Rainey Street.

Related Actions	Outcome
IS-1, IS-2, LU-1, LU-3, TDM-1, TDM-2	Improved ability to take advantage of enhanced public transportation and bicycle and pedestrian infrastructure
BC-2, BC-3, BC-4, BIE-8	Reduced energy use based on available real-time data and information, and participation in fun neighborhood challenges
RR-1, RR-2, RR-3	Outcome: Increased access to low-cost, used goods that stay within the community and out of the landfill



>> Central City Individuals and Families <<



The Davis family lives in Hyde Park in a circa-1945-era home. Even though it's a little small for a family with two kids, they enjoy its quirky charm and the neighborhood character. Bob works downtown and his wife Carrie works at the University; both take public transportation to work occasionally, but often have to drive based on their kids' active schedules. Their home could use some upgrades to be more energy efficient, but increasing property taxes keeps their budget pretty tight. On the weekends, they enjoy gardening in their backyard, biking to a neighborhood park, or going to a local farmer's market to shop for fresh food. For most of their weekend shopping errands they rely on their car, as most of the stops are a long way from where they live.

Related Actions	Outcome:
IS-1, IS-2, LU-1, LU-3, TDM-2, TDM-3	Improved ability to take advantage of enhanced public transportation and bicycle and pedestrian infrastructure for work commutes, personal trips, and recreation
BIE-1, BIE-2, BIE-4, BIE-5, GT-3	Outcome: Improved ability to take advantage of programs that help with energy and water efficiency upgrades and installing solar power
RR-1, RR-2, RR-3	Outcome: Increased access to low-cost, used goods that stay within the community and out of the landfill



>> Suburban Individuals and Families <<



Jim and Susan Thomas live in a recently constructed, 2,500 square foot home in Cedar Park with their three children, Hannah, Jack, and Casey. The home is energy efficient but it is large, so they are interested in exploring ways to lower their utility bill. However, their transportation budget is higher than average as both parents spend a considerable amount of time each day commuting to and from work. They take separate cars so that one can drop off the kids at school on the way to work, and the other can pick them up on the way home. For running errands and the occasional dinner out, the Thomas family opts to go to convenient shopping centers near their home.

Related Actions	Outcome
IS-1, IS-2, TDM-1, TDM-4, TDM-7, TDM-8	Increased ability to commute to work with enhanced alternative transportation options
BIE-1, BIE-2, BIE-4, BIE-5, GT-3	Improved ability to take advantage of programs that help with energy and water efficiency upgrades and installing solar power
RE-1, RE-3, OD-2	Ability to maximize household waste diversion with improved convenience and expanded programs



>> Retired Individuals and Couples <<



Maria retired from the Austin Independent School District after working there for nearly 40 years. She has built up a decent retirement nest egg, but she will live on a flat, modest budget at this point in her life. After so many years of working in education, she misses the daily interaction; recently she began volunteering with a local non-profit that is trying to spark the desire for education in future generations of kids. Maria plans to stop driving in a couple of years, so she will depend on public transportation and a good sidewalk network to get around. She firmly believes that both of her grandchildren should complete college and hopes to help them achieve this. She lives in an older home in East Austin that needs some work, but her fixed income and desire to help her grandchildren with college have left her short on the funds to take on any significant renovations.

Related Actions	Outcome
IS-1, IS-2, LU-1, LU-3, TDM-1, TDM-2	Outcome: Improved ability to take advantage of enhanced public transportation and bicycle and pedestrian infrastructure for volunteering, personal trips, health and recreation
BC-1, BC-2, BC-3, BIE-8, GT-3	Reduced carbon-based energy use based on new Austin Energy rate structures, easier to understand real-time data and information, and community solar offerings
RR-1, RR-2, RR-3	Outcome: Increased access to low-cost, used goods that stay within the community and out of the landfill



>> Small Businesses and Non-Profits <<



Andrea started her coffee shop less than a year ago after a trip to Italy, where she fell in love with having a daily cappuccino. She's faced many challenges getting the business up and running – paying rent for a prime location, hiring employees, developing relationships with vendors, and building a loyal customer base. In the first year of operations, she was barely able to break even; this year, she's hoping for a modest profit. Andrea lives in the surrounding neighborhood, which allows her to spend a lot of her time at the shop. She's found that works best for her employees as well; there isn't a lot of parking around the shop and there are no convenient bus stops nearby, so most find it easiest to walk or bike to work.

Related Actions	Outcome
LU-1, LU-2, PP-1	An adequate supply and diversity of leasable office space throughout the city
BIE-1, BIE-2	Easier access to financial resources to help with making investments in efficiency upgrades
RE-1, RE-2, RE-3, RE-4, OD-1, OD-4, RR-1	Ability to maximize business waste diversion with improved convenience and expanded programs



>> Large Companies and Employers <<



Carlos is the Vice President of Business Development for a large, multinational company with offices in three buildings on a corporate campus in North Austin. His job is to ensure that the company leads the competition in their industry, so he focuses on enhancing the company's reputation, attracting and retaining the best talent, and delivering a quality product that customers will demand. He's finding that the best employee candidates expect the company to provide transportation options to and from work. Customers are also asking Carlos about what the company does to give back to the community and about its impact on the environment.

Related Actions	Outcomes
TDM-1, TDM-4, TDM-7, TDM-8, VFE-1	Better understanding of trip reduction strategies and tools and current public transportation options to business location; can develop programs to offer employees
BIE-1, BIE-2, BIE-3	Easier access to financial resources to help with making investments in efficiency upgrades
RE-1, RE-2, RE-3, RE-4, OD-1, OD-4, RR-1	Ability to maximize business waste diversion with improved convenience and expanded programs



>> Tourists <<



Larry flies to Austin from Minneapolis for the Austin City Limits Music Festival each year and usually tacks on a few extra days to enjoy the city. He rents a room in a house near Barton Springs Road that offers short-term rentals during the festival. He walks to and from the festival each day, but rents a car to get around town on the days after. Larry seeks out the businesses, restaurants, and entertainment that is unique to Austin when he's here – he wants the full local experience. While he's here he struggles to make his normal sustainable lifestyle choices; he is eating food to-go that is heavily packaged and he throws everything in the trash because he's not sure what can be recycled or composted.

Related Actions	Outcome
IS-1, IS-2, LU-1, LU-2, LU-3, TDM-2, TDM-5	Festival attendees, general visitors, and business travelers are able to use alternative transportation options for their respective needs
BC-2, BC-3, BIE-8	Outcome: All visitors understand their energy use while they stay in hotels or residences in Austin
RE-1, RE-2, RE-4, OD-1, OD-4	All visitors understand their options for discarding materials while in in public or private spaces

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subsection

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for the Community Support
subsection

Austin City Climate Action

Austin is home to the State of Texas, Travis County, and the City of Austin governments. There are also federal offices located here, as well as a variety of intergovernmental bodies that oversee many regional issues like transportation and other services. These bodies control billions of tax payer dollars, decide on policies that affect the entire community, ranging from land use, to transportation policy, to waste collection.

With thousands of employees coming from all over the city and from neighboring counties, the footprint of governmental activities is extensive. Each governmental body has a large real estate portfolio and expansive vehicle fleets that are constantly in operation to meet business needs. Actions that support cost effectiveness can benefit the organization and its investors - the citizens. Government should estimate true life-cycle costs in order to invest public funds wisely. Taking actions that help reinvest dollars into the local economy also helps sustain the community.

The City of Austin has a long history and strong track record of sustainability leadership through initiatives that benefit prosperity and jobs, conservation and the environment, and community health, equity, and cultural vitality. In 2007, the Austin City Council adopted a resolution to “make Austin the leading city in the nation in the effort to reduce the negative impacts of global warming,” establishing a local goal aligned with the IPCC reduction targets.

The 2007 Climate Protection Plan included five key goals:

- 1. Municipal operations** - all City of Austin facilities, fleets, and operations will be carbon neutral by 2020.
 - The City has seen a 67% reduction of GHG emissions from our baseline, and all City-owned buildings are now on 100% renewable energy.
- 2. Utility generation mix** - reach 35% renewables by 2020.
 - Austin Energy continues to purchase renewable energy as prices become competitive with fossil fuels, and it is expected that we will reach this goal four years earlier than required.
- 3. Homes and buildings** - reach 800 megawatts of energy efficiency savings by 2020.
 - Austin Energy energy efficiency programs include everything from installation of onsite solar, to water heater, lighting, appliance, water pump, and insulation upgrades. Since 2007, Austin Energy has achieved 440 of the 800 megawatt reduction target.
- 4. Community planning** - develop an inventory of community-wide emissions and set a target and strategies for reductions
 - The first community-wide inventory was completed in 2010 and this plan will achieve the second part of this goal.
- 5. Carbon Neutral Programs and Assistance** - provide tools for Austinites to mitigate their own emissions.
 - An online calculator is available for individuals to determine their carbon footprint and a pilot program is underway to offset the emissions generated from large events and festivals.

In 2007, the Austin City Council adopted a resolution to “make Austin the leading city in the nation in the effort to reduce the negative impacts of global warming”

AUSTIN’S CLIMATE LEADERSHIP

Since adoption of the 2007 Climate Protection Resolution, Austin has made significant progress on understanding and limiting emissions growth.

2007

Adoption of Climate Protection Resolution which set the goal of carbon neutral municipal operations by 2020

2010

Adoption of Austin Energy Generation Plan which set the goal of 35% renewables and a total energy use of 800MW by 2020

Late 2010

Creation of the Office of Sustainability, which includes the Climate Protection Program

2012

City of Austin municipal facilities 100% powered by renewables

2013

Austin City Council adopts Climate Resilience Resolution

2014

Austin City Council sets a target of net-zero community-wide greenhouse gas emissions by 2050

POLICIES AND PLANS THAT SUPPORT EMISSIONS REDUCTION:

Since the 2007 Resolution, there are a number of other City plans that indirectly support the goal of community-wide emissions reduction:



Transportation and Land Use Plans

- Imagine Austin
- 2014 Austin Strategic Mobility Plan
- Austin Bicycle Master Plan
- Urban Trails Master Plan

Waste Plans

- Austin Resource Recovery Master Plan
- ARR Zero Waste Plan

Building Energy Plans

- Austin Energy Generation Plan
- City of Austin Building Codes

Climate Resilience Planning

- City of Austin Hazard Mitigation Plan
- Watershed Protection Ordinance
- Office of Sustainability Climate
- Resilience Efforts

Electricity & Natural Gas Sources of Emissions:

Because the City of Austin owns its electric utility and can direct generation planning decisions, it can implement strategic policies to achieve significant emissions reductions. The following initiatives are currently underway:

- **Austin Energy Generation Plan:**
Updated in Fall 2014 to include 55% renewables by 2025, 600 megawatts of utility-scale solar power, an additional 450 megawatts of wind power, a potential new 500 megawatts natural gas-fired power plant, and retirement of the Fayette Power Project by 2022.
- **Energy Conservation Audit & Disclosure Ordinance:**
Requires commercial property owners, multi-family properties, and sellers of single-family homes to conduct energy audits and disclose their power usage; the ECAD ordinance is designed to help identify opportunities for energy efficiency retrofits.
- **Austin Energy Green Building:**
This rating system for design and construction of both single-family residences and commercial buildings is another platform that helps meet energy efficiency targets.
- **Energy Codes Updates:**
Adoption of the International Energy Conservation Code (IECC) has resulted in a 31% reduction in energy use by new homes.
- **Research and early adoption of smart grid, electric vehicle charging network:**
The City of Austin continues to invest in research and development of technologies that maximize the efficient use of energy from the power grid.



Transportation and Land-Use Sources of Emissions

The City directs general land use policy and makes some strategic transportation investments that will help meet the 2050 community-wide target:

- **Imagine Austin Comprehensive Plan:**

Provides a set of defined goals, principles, policies, and actions for the city's future growth that include:

- A more compact and connected city that provides for housing and businesses within activity centers.
- An integrated, expanded, and affordable transportation system that is affordable and supports a variety of transportation choices, while reducing sprawl, congestion, and travel times.
- Safe bicycle and pedestrian facilities with well-designed routes that provide connectivity throughout Austin.

- **Austin Strategic Mobility Plan:**

Sets three primary goals: 1) to invest in all travel modes simultaneously, 2) maximize efficiency of major travel corridors, and 3) expand travel choices to influence behavior and meet diverse traveler needs.

- **Austin Bicycle Master Plan**

Aims to significantly increase bicycle use and improve bicycle safety throughout Austin by creating an all ages and abilities bicycle network, which is expected to significantly reduce automobile congestion in key travel corridors.

- **Urban Trails Master Plan**

At full implementation, this plan would provide a cohesive recreational and transportation network of non-motorized, multi-use pathways to safely travel long distances across all of Austin.



Waste and Materials Management Sources of Emissions

The City only controls approximately 25 per cent of the amount of annual waste generated, so there is a heavy reliance on working with private sector partners to achieve these goals.

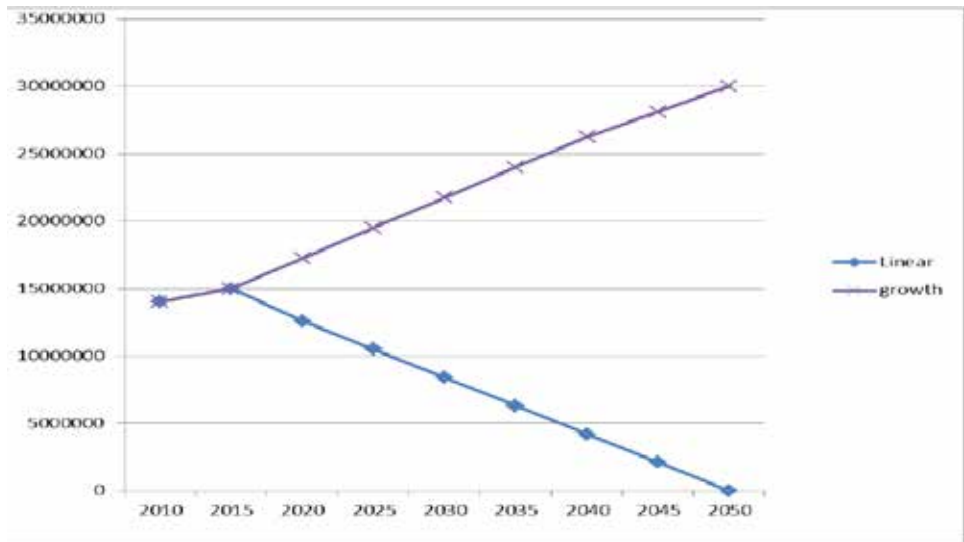
- **Austin Resource Recovery Master Plan**

Sets the goal of reaching 90% diversion (i.e. solid waste and materials that are not disposed of in a landfill or incinerator) by 2040, along with the strategies for how to accomplish that goal.



Greenhouse gas emissions will be avoided by implementing all of the plans and policies described here. Despite this progress in mitigating emissions, the strength of the local economy and sustained population growth will continue to drive up the total amount of emissions in Austin.

Achieving the 2050 goal of net-zero community-wide emissions will require prioritizing and maintaining momentum on plans, policies, and programs already in place, as well as implementing additional measures that mitigate emissions. These additional strategies and actions are listed in Appendix B.





Climate Resilience Planning

Climate impacts everything in the natural and built environment. As the climate in Texas continues to change it has contributed to various environmental impacts.

- During the summer of 2011, Austin had 90 days with temperatures of at least 100°F.
- The entire region is in the midst of a hydrologically unprecedented drought that has severely depleted our sources of water, stressed vegetation and ecosystems, and negatively impacted water quality.
- Wildfires destroyed homes and 32,000 acres of forest surrounding Bastrop in 2011.
- The Halloween flood of 2013 resulted in loss of life, caused extensive damage to homes and businesses around Onion Creek, and displaced many people from their homes. In addition, the loss of vegetation from intense precipitation combined with prolonged drought conditions may increase flooding severity in the future.

These and other changes are consistent with trends across the United States and around the world that have been attributed to human-induced climate change – the result of carbon dioxide and other heat-trapping gases released during fossil fuel combustion, deforestation, agriculture, and other activities. These emissions that have accumulated in the atmosphere will continue to change the climate for years to come. Bearing this in mind, it is not enough to create plans for mitigating future emissions; we must also become resilient to climate change.

In November 2013, City Council passed a resolution to analyze climate change projections, determine how departmental planning efforts integrate future impacts of climate change, and identify a process for performing departmental vulnerability assessments.

The Office of Sustainability hired ATMOS Research, led by climate scientist Dr. Katherine Hayhoe from Texas Tech University, to conduct climate modeling for Central Texas using the same methodology used in the 2014 National Climate Assessment. Dr. Hayhoe's analysis used data from the weather station at Camp Mabry. Her study projected climate changes through 2100 to include:

- Increases in annual and seasonal average temperatures, with more days over 100°F and more nights over 80°F
- More frequent high temperature extremes of over 110°F
- Little change in annual average precipitation, but more frequent extreme precipitation, with more days of 2 inches or more in rainfall and increased durations of extreme rainfall
- A slight increase in the number of dry days per year
- More frequent drought conditions in summer due to hotter weather

To proactively take steps to become more resilient to climate change, we must manage the risk of impacts to both new and existing capital investments. This may involve infrastructure design and material decisions that ensure adequate service despite climate change projections. It will also mean ensuring high levels of service to residents and the ability to effectively protect human life during extreme weather events.

On November 21, 2013, City Council passed a resolution that resulted in the Office of Sustainability working with nine departments to determine how planning efforts integrate future impacts of climate change, and to identify a process for performing departmental vulnerability assessments. The resolution requested that the following be included in the scope of the assessment: transportation, electric utility, water utility, and drainage infrastructure; community health and wellness efforts; and disaster preparedness and emergency response management.

It is also important to understand that some issues are out of the City's direct control such as grid-wide energy capacity, basin-wide water availability, regional food supply, and regional evacuees. In addition, some regional entities may not acknowledge climate change or recognize its risks. Climate variability also makes strategic planning a complex and ongoing process; there is a high degree of uncertainty in predicting the occurrence of when, where, and how strong extreme weather events will be. Although planning for uncertain weather may seem daunting, the City can act to ensure that departments and community members are resilient to the impacts of climate change.

Climate impacts
everything in the
>> natural and <<
built environment.

Recommendations

Recommendations

The following actions are recommended next steps toward realizing the strategies identified in this plan:

1. Continue to invest resources in making progress on the actions within adopted plans that are identified as “Tier 1” actions.
 - 2. Commit to moving forward upon plan adoption with the following new actions:
- Electricity and Natural Gas
 - 1
 - 2
 - 3
- Transportation and Land Use
 - 1
 - 2
 - 3



- Materials and Waste Management
 - 1
 - 2
 - 3
3. Develop an implementation plan within one year of adoption that would identify:
 - Prioritized actions to achieve the net-zero by 2050 goal
 - A public outreach and engagement plan to encourage emissions reduction behaviors in the community
 - Budget requirements
 - Interim targets and key milestones
 - Roles and responsibilities of stakeholder groups
 4. Determine feasibility of a carbon impact statement or sustainability impact statement to be used for city decisions related to large expenditures, land development plans, capital projects, and other major departmental planning efforts.
 5. Create departmental budget performance measures related to municipal operations that affect community-wide greenhouse gas emissions.
 6. Determine a strategy to assess options to evolve utility business models
 7. Continue climate resilience planning efforts by
 - Investing in detailed climate projections for Austin
 - Conducting vulnerability assessments to identify strategies that will protect City operations and assets, as well as community infrastructure from the worst impacts from climate change

Following adoption of this Austin Community Climate Plan, report progress and make revisions as follows:



Appendices

Methodology for Calculations

Protocol

The Office of Sustainability follows the *U.S. Community GHG Protocol* developed by ICLEI. According to this protocol, five basic emissions generating activities must be included:

- Use of Electricity by the Community
- Use of Fuel in Residential and Commercial Stationary Combustion Equipment
- On-Road Passenger and Freight Motor Vehicle Travel
- Use of Energy in Potable Water and Wastewater Treatment and Distribution
- Generation of Solid Waste by the Community

The intent of this protocol is to include all significant emissions sources that contribute to the community's total greenhouse gas emissions inventory, while establishing practical limits on the extent of insignificant sources that are to be reported. By following this standard, the community inventory process is relevant, accurate, complete, measurable, consistent, comparable, and transparent. The Office of Sustainability completes a community-wide greenhouse gas inventory every 3 years, with the most recent inventory based on 2010 data.

Boundary

The community greenhouse gas emissions inventory used in this document is based on emissions that originate from sources located within Travis County or that directly serve the needs of the area.

Greenhouse Gases Included

General source categories that have been included in the community greenhouse gas inventory are consistent with the *U.S. Community GHG Protocol's* accounting guidelines. The greenhouse gas constituents included are carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydro fluorocarbons (HFCs), per fluorocarbons (PFCs), and sulfur hexafluoride (SF6). The Office of Sustainability currently adheres to the IPCC second assessment for reporting global warming potentials and converts amounts of individual greenhouse gas emissions to CO2 equivalents (CO2e).

Data Sources

This plan used primary data and information from sources including:

- Austin Energy
- Austin Transportation Department
- Austin Water Utility
- Austin Resource Recovery
- Texas A&M Transportation Institute
- Texas Gas Service
- EPA Facility Level Information on Greenhouse Gases Tool (FLIGHT)
- Pedernales Electric Cooperative
- Bluebonnet Electric Cooperative

APPENDIX B

TAG	Strategy #	Strategy Category	Actions	Timeframe	Currently in an Adopted City Plan?	Action Status	Who Will Implement the Action?	Who Will Participate or be an Active Stakeholders	Barriers or Limiting Factors to Implement the Action	Scale of Avoided Emissions	Ancillary Benefits
				2015-2020 2020-2030 2030-2050		Current In Development Planned New	Business Government MultiFamily Nonprofit, NGOs Residents, All SF-Single-family	Business Government MultiFamily Nonprofit, NGOs Residents, All SF-Single-family	Funding Policy Behavior Change Technology	Direct Indirect Large Small Conceptual/ NA	Quality life Affordable Health Jobs Water
Electricity and Natural Gas											
ENGTAG	BC-1	Behavior Change and Education	Implement time of use / dynamic rates programs, including user educational efforts, supported by smart meters	2015-2020	N, but in budget docs?	D (Time of use);	G	All	T, BC	DS	Major cost savings by avoiding peak prices
ENGTAG	BC-2	Behavior Change and Education	Educational efforts through social media, applications, and exposure/Media campaigns using local celebrities to drive behavior change	2015-2020	N, but AE has programs	C, N	G, N	B,R	F	DS	More informed citizenry
ENGTAG	BC-3	Behavior Change and Education	Promote programs for individuals to manage their own carbon footprint (carbon diet)	2015-2020		D	G,B,N	B,R,N	BC	DS	
ENGTAG	BC-4	Behavior Change and Education	Neighborhood EE projects -neighbor vs neighbor efficiency challenge. Customized for neighborhoods.	2015-2020		N	G,R	R	P,BC	DS	
ENGTAG	BIE-1	Buildings and Integrated Efficiency	Increase funding for energy efficiency rebates; new offerings or higher amounts may attract new customers	2015-2020		P	G	All	F	DL if on a large scale	
ENGTAG	BIE-2	Buildings and Integrated Efficiency	Explore new financing mechanisms: on-bill repayment for improvement costs; implement a PACE program and others; mechanisms targeted at promoting/enabling RE and EE	2015-2020		N	G	G, B (Lenders, contractors), R (multi-family), N	P	DL if on a large scale	
ENGTAG	BIE-3	Buildings and Integrated Efficiency	Identify high energy users in all sectors; target incentives for highest impact	2015-2020		P	G	All	P,BC	DL	
ENGTAG	BIE-4	Buildings and Integrated Efficiency	Specific strategies: Envelope improvements (biggest impact), Lighting (LEDs), HVAC, Water heating, Plug loads	2015-2020	Y	C	G,B,R	All	P,F,BC,T	DS	
ENGTAG	BIE-5	Buildings and Integrated Efficiency	Programs to reduce energy use and carbon intensity associated with water consumption	2015-2020	Y	C	All	All	F,BC	DS	
ENGTAG	BIE-6	Buildings and Integrated Efficiency	Coordinated effort with AWU to reduce energy use and carbon intensity associated with consumption, treatment, and delivery of water, including peak shifting	2020-2030	Y	C	G	G	T,F	DL	
ENGTAG	BIE-7	Buildings and Integrated Efficiency	Automated demand response for all technologies	2015-2020		N	B	All	BC,T	DS	
ENGTAG	BIE-8	Buildings and Integrated Efficiency	Increase meter reading frequency and use the information to identify opportunities for utility action within energy efficiency and demand response programs and for customer usage choices	2015-2020	Y, smart meter program	P	G	R, G	F	DS	
ENGTAG	BIE-9	Buildings and Integrated Efficiency	Create a new minimum standard for existing building energy use; enforce the new standard	2020-2030		N	G	All	P	DL	
ENGTAG	BIE-10	Buildings and Integrated Efficiency	Consider the potential for net-zero new construction of residential and commercial buildings	2020-2030		P	G	All	P	DL	
ENGTAG	RT-1	Resource Technologies	Prioritize investment in zero carbon resources at utility and/or customer scale, with consideration of affordability goals: Utility-scale and distributed solar, including concentrating solar and community solar; Utility-scale wind (inland and coastal)	2015-2020	Y	C	G,B	G,B,R	F,T,P	DL	
ENGTAG	RT-2	Resource Technologies	Regular evaluation of resource technologies, with consideration of affordability goals: Analyze investment and impact of storage technologies as a resource; Analyze further investment in distributed chilled water as a resource option; Analyze whether biomass/geothermal/nuclear are viable resource options	Perpetual	Y	C	G	All	F,P,T	DL	

TAG	Strategy #	Strategy Category	Actions	Timeframe	Currently in an Adopted City Plan?	Action Status	Who Will Implement the Action?	Who Will Participate or be an Active Stakeholders	Barriers or Limiting Factors to Implement the Action	Scale of Avoided Emissions	Ancillary Benefits
				2015-2020 2020-2030 2030-2050		Current In Development Planned New	Business Government MultiFamily Nonprofit, NGOs Residents, All SF-Single-family	Business Government MultiFamily Nonprofit, NGOs Residents, All SF-Single-family	Funding Policy Behavior Change Technology	Direct Indirect Large Small Conceptual/ NA	Quality life Affordable Health Jobs Water
Transportation and Land Use											
TTAG	EPS-1	Economic and Pricing Systems	Pursue a fair market value for parking through demand-based commodity pricing.	2020-2030		D	G, B	All	P, BC, T	DS	Q, J
TTAG	IS-1	Infrastructure and Service	Continue planning efforts to complete a connected network of proven high-capacity transit, including intracity and intercity systems, using the major projects identified in the Austin Strategic Mobility Plan and Project Connect to improve Austin's transportation and economic connections with other major cities in Texas.	2015-2020, 2020-2030, 2030-2050	Imagine Austin, 2014 Austin Strategic Mobility Plan	P	G	All	F, BC	DL	A, J
TTAG	IS-2	Infrastructure and Service	Protect the safety of all right-of-way users and increase mobility by managing traffic speeds with regular synchronizing/retiming all traffic signals along arterials, adjusting speed limits within the urban core as appropriate, adding more volume-count stations to make informed traffic system improvements, installing more roundabouts, using enhanced bicycle signal detection technologies, and installing Pedestrian Hybrid Beacons.	2015-2020	2013 Austin Mobility	P	G	All	F	DL	Q, A, H, J
TTAG	IS-3	Infrastructure and Service	Extend transit service to suburban areas while providing more service interconnections, exploring additional transit centers/park-and-rides, and transit vehicle amenities.	2020-2030		C	G	All	F, P	DL	Q, A, J
TTAG	LU-1	Land Use	Prioritize mixed use development integrated with transit and the creation of compact, walkable and bikeable places with a commitment to plan transportation systems using objective analysis of environmental consideration, demand models, congestion models, safety, and full life cycle cost/ benefit analysis.	2015-2020	Imagine Austin Comprehensive Plan	P	G, B	All	F	DL	All
TTAG	LU-2	Land Use	Promote growth within designated activity centers as identified in Imagine Austin where dense, mixed use development support centers and transit corridors, and consider incentives for infill development with long-term affordability for residents and businesses; develop an outreach program for the available incentives and enhanced property locator tools (e.g. location efficient mortgages, tax credits).	2020-2030		P	G, B	All	F	DL	All
TTAG	LU-3	Land Use	Create pedestrian- and bicycle-friendly districts connecting urban centers and transit stops, optimizing safety for people of all ages and abilities through clearly marked, dedicated, and separated urban trails and bike lanes and wayfinding systems that incorporate national best practices.	2015-2020, 2020-2030		P	G, B	G, B	F, BC	DL	All
TTAG	LU-4	Land Use	Ensure that affordable housing and residential neighborhoods are within a quarter mile of existing or funded new transit options.	2015-2020		P	G, B	All	F, BC	DL	Q, A, H, J
TTAG	PP-1	Policy and Planning	Establish intergovernmental agreements between municipalities that include commitments to increase density around Centers.	2020-2030		N	G	G	P	IL	Q, A, H, J
TTAG	TDM-1	Transportation Demand Management	Work with large employers and academic institutions to implement and improve trip reduction programs that include a regular survey of how the workforce commutes, explanation of benefits to commuters, and includes promotion of transportation alternatives (e.g. carpool/vanpool, bus/rail, bike/walk, flex/compressed work schedules) to their employees; celebrate successful programs	2020-2030		P	G	B, N	BC	DL	Q, A, H, J

TAG	Strategy #	Strategy Category	Actions	Timeframe	Currently in an Adopted City Plan?	Action Status	Who Will Implement the Action?	Who Will Participate or be an Active Stakeholders	Barriers or Limiting Factors to Implement the Action	Scale of Avoided Emissions	Ancillary Benefits	
				2015-2020 2020-2030 2030-2050		Current In Development Planned New	Business Government Multi-Family Nonprofit, NGOs Residents, All SF-Single-family	Business Government Multi-Family Nonprofit, NGOs Residents, All SF-Single-family	Funding Policy Change Behavior Change Technology	Direct Indirect Large Small Conceptual/ NA	Quality life Affordable Health Jobs Water	
TTAG	TDM-2	Transportation Demand Management	Seek opportunities to provide separate dedicated lanes prioritizing public transit, and seek financing to extend service hours and frequency to make public transit services more attractive and increase use of public transit.	2015-2020	Imagine Austin	P	G	All	F, BC	DL	All	
TTAG	TDM-3	Transportation Demand Management	Increase bicycle and pedestrian mode share by promoting cycling for workers living near their workplace and children commuting to school. Increase safety and program performance based engineering, enforcement, education, and evaluation. Encourage the development of web-based tools/mobile applications/other educational materials. Increase the scope and impact of bike promotional events (e.g. Bike to Work Day and VIVA Streets!).	2015-2020	Urban Trails Master Plan, Austin Bicycle Master Plan	P	G, B	All	F, BC	DL	Q, A, H	
TTAG	TDM-4	Transportation Demand Management	Develop programs that help commuters make first and last mile transit connections including promotion of first/last mile modes such as free circulator buses, collective zoned vanpool service, flex route system, skateboards, and folding bicycles.	2015-2020		C, N	G, B, N	All	F, BC	DL	Q, A, J, H	
TTAG	TDM-5	Transportation Demand Management	Work with major event promoters to establish innovative transportation plans that ensure visitors to the City have full information about transportation options.	2015-2020	2013 Austin Mobility	P	G, B	All		DL	Q, A, J	
TTAG	TDM-6	Transportation Demand Management	Perform education and outreach to fleet owners on how to conduct a business evaluation of fleet usage, including operation and right-sizing analysis, and identify which incentives are available to replace older, higher-emission vehicles.	2015-2020		N	G, N	B	BC	DL	A, J	
TTAG	TDM-7	Transportation Demand Management	Provide amenities and incentives for programs that support active transportation, such as showers, tree shading, community gardens, neighborhood bike ambassadors, mobile bike repair, and bike cages.	2015-2020	Imagine Austin	P	G, B	All	F, BC	DS	Q, A, H, J	
TTAG	TDM-8	Transportation Demand Management	Consider incentive programs that reduce fossil fuel consumption and encourage residents to limit single occupancy vehicle trips by taking alternative modes of transportation (e.g. carpool/vanpool, bus/train, bike/walk); use incentives and disincentives to discourage single occupancy vehicles, tax credits for cyclists, time-of-use pricing for electric vehicle owners.	2020-2030		C	G	All	F, BC	DL	All	
TTAG	VFE-1	Vehicles and Fuel Efficiency	Expand electric/alternative fuel infrastructure and consider incentives for the purchase of electric/alternative fuel vehicles by individuals and fleet owners, and pursue code options to increase "charger ready" parking.	2015-2020		C	G, B	All	F, BC	DL	Q, A, J, W	

TAG	Strategy #	Strategy Category	Actions	Timeframe	Currently in an Adopted City Plan?	Action Status	Who Will Implement the Action?	Who Will Participate or be an Active Stakeholders	Barriers or Limiting Factors to Implement the Action	Scale of Avoided Emissions	Ancillary Benefits
				2015-2020 2020-2030 2030-2050		Current In Development Planned New	Business Government MultiFamily Nonprofit, NGOs Residents, All SF-Single-family	Business Government MultiFamily Nonprofit, NGOs Residents, All SF-Single-family	Funding Policy Behavior Change Technology	Direct Indirect Large Small Conceptual/ NA	Quality life Affordable Health Jobs Water
Materials and Waste Management											
MMTAG	OD-1	Organics Diversion	ARR maximizes effectiveness of Universal Recycling Ordinance in diverting organic materials.	2015-2020	ARR Master Plan (adopted 2010)	C	G	B, MF	BC, F	DL	1, 4, 5
MMTAG	OD-2	Organics Diversion	ARR expands collection of food residuals and other compostable, non-recyclable materials to all residential customers.	2015-2020	ARR Master Plan (in progress)	D	G	R	F, BC, T	DL	1, 5
MMTAG	OD-3	Organics Diversion	Austin Water's Hornsby Bend compost operation transitions from yard trimmings to other carbon sources and bulking agents, such as clean lumber and tree trimmings from other City departments and their contractors.	2015-2020	ARR Master Plan	P	G	G	P, F	DS	3, 5
MMTAG	OD-4	Organics Diversion	Private haulers collect all organics, non-recyclable materials from their customers.	2020-2030	Partial	D,P	G, B, N	All	F, P, BC, T	DL	1, 2, 3, 4, 5
MMTAG	OD-5	Organics Diversion	Urban agricultural operations, from community gardens to regional farmers, produce and use compost from local sources.	2020-2030		D	G, B, N	All	F, P, BC, T	DL	1, 2, 3, 4, 5
MMTAG	PU-1	Purchasing	City refines construction and building specifications to increase use of reclaimed materials.	2015-2020	ARR Master Plan	P	G	G	F, P	IL, C	1, 2, 4
MMTAG	PU-2	Purchasing	City adopts specifications for materials reuse, reduced packaging, materials with recycled content, and locally manufactured products and encourages other agencies and enterprises to follow suit.	2020-2030			G, B, N	G, B, N, R	P, T, F + Analysis	IL	1, 2, 4, 5
MMTAG	MM-1	Methane Management	ARR refines landfill gas capture and combustion system to destroy methane.	2015-2020	ARR Master Plan (in progress)	D	G	G	F, T	DL	Renewable energy
MMTAG	MM-2	Methane Management	Area landfill operators refine landfill gas capture and combustion system to destroy methane at their landfills.	2015-2020	ARR Master Plan (in progress)	D	G	G	F, T	DL	Renewable energy
MMTAG	MM-3	Methane Management	With City encouragement, eligible landfills in Travis County participate in EPA landfill methane outreach voluntary programs.	2020-2030		N	B	G	F	DL	More renewable energy + innovation
MMTAG	RE-1	Recycling	ARR expands materials accepted by curbside recycling service and increases the service to weekly.	2015-2020	ARR Master Plan (in progress)	D	G	R, B	T, BC	IL	3, 4
MMTAG	RE-2	Recycling	ARR increases convenience, efficiency, and effectiveness of downtown trash and recycling alley collection service.	2015-2020	ARR Master Plan (in place)	C	G	B, MF	F, BC	IL	1, 3, 4
MMTAG	RE-3	Recycling	City updates its Pay-As-You-Throw rate structure to strengthen financial incentives for residential customers to reduce disposal.	2015-2020	ARR Master Plan	P	G	SF	P	DL/IS	3, 4
MMTAG	RE-4	Recycling	ARR maximizes effectiveness of Universal Recycling Ordinance in diverting recyclable materials.	2015-2020	ARR Master Plan (in progress)	D	G	B, MF, N	F, BC	DL, C	1, 2
MMTAG	RR-1	Reduction/Reuse	ARR adds four new Reuse Centers, including for hard-to-recycle items.	2015-2020	ARR Master Plan	P	G	G, B, N, R	P, F	IL	2, 4
MMTAG	RR-2	Reduction/Reuse	City supports local economic development through the (re)Manufacturing Hub, Austin Materials Marketplace, and reuse enterprises for repairing goods/products.	2015-2020	ARR Master Plan	P	G	B, R, N	F, BC	IL , DS	2, 4
MMTAG	RR-3	Reduction/Reuse	City supports local economic development through the (re)Manufacturing Hub, Austin Materials Marketplace, and reuse enterprises for reuse of production byproducts or general reuse of goods.	2015-2020	ARR Master Plan (in progress)	D	G	B, G	F, BC	IL , DS	2, 4
MMTAG	RR-4	Reduction/Reuse	City implements policies to reduce the use of single-use products in addition to carryout bags.	2015-2020	ARR Master Plan (adopted 2012)	C	G	B, R	BC	IL	1

Electricity and Natural Gas Sector

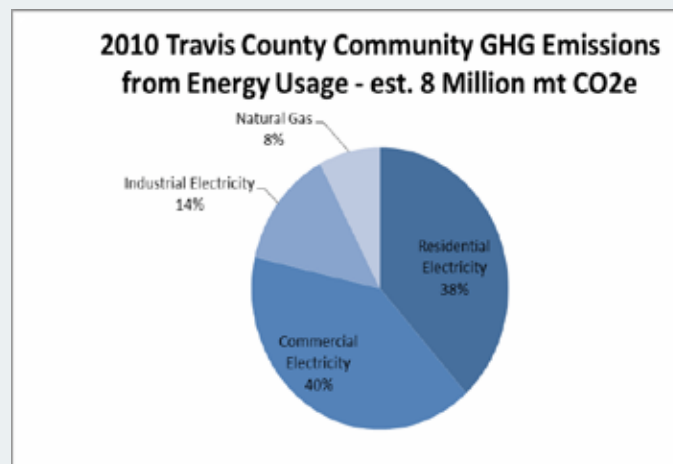
Appendix C: Electricity and Natural Gas Sector Findings

Introduction

The Electricity and Natural Gas sector comprised 53% of total community greenhouse gas emissions in 2010, the majority of which are indirect emissions associated with the consumption of electricity (see Box 1). Approximately 8% of emissions from this sector are direct emissions associated with methane distribution and consumption for heating, cooking, etc. Figure 1 shows the relative breakdown of greenhouse gas emissions for this sector by use in 2010.

Box 1: Emissions from Electricity Use. Understanding the greenhouse gas impacts of electricity use starts by understanding how the electricity grid works. Electricity in most of Texas is provided via an interconnected network of wires (the grid) that covers most of the state and is overseen by the Electric Reliability Council of Texas (ERCOT)¹. All electricity users are connected to this grid which includes meters, distribution lines, utility poles, substations, and transmission wires. All power plants connected to this grid supply energy to maintain the right frequency on the grid, which in turn ensures the electricity is there for the end user when needed. ERCOT balances the frequency by constantly forecasting and monitoring electricity demand everywhere throughout the grid and then dispatching power plants as needed. Although the locations of power plants relative to load centers are important, it is not possible to say that one end use is being served directly by a certain power plant. All electricity use at any given time is made possible by all of the power plants generating into the grid at that time. The emissions associated with that electricity use can be estimated as the average emissions from all power plants on the grid.

Figure 1: Breakdown of Greenhouse Gas Emissions for Electricity and Natural Gas.



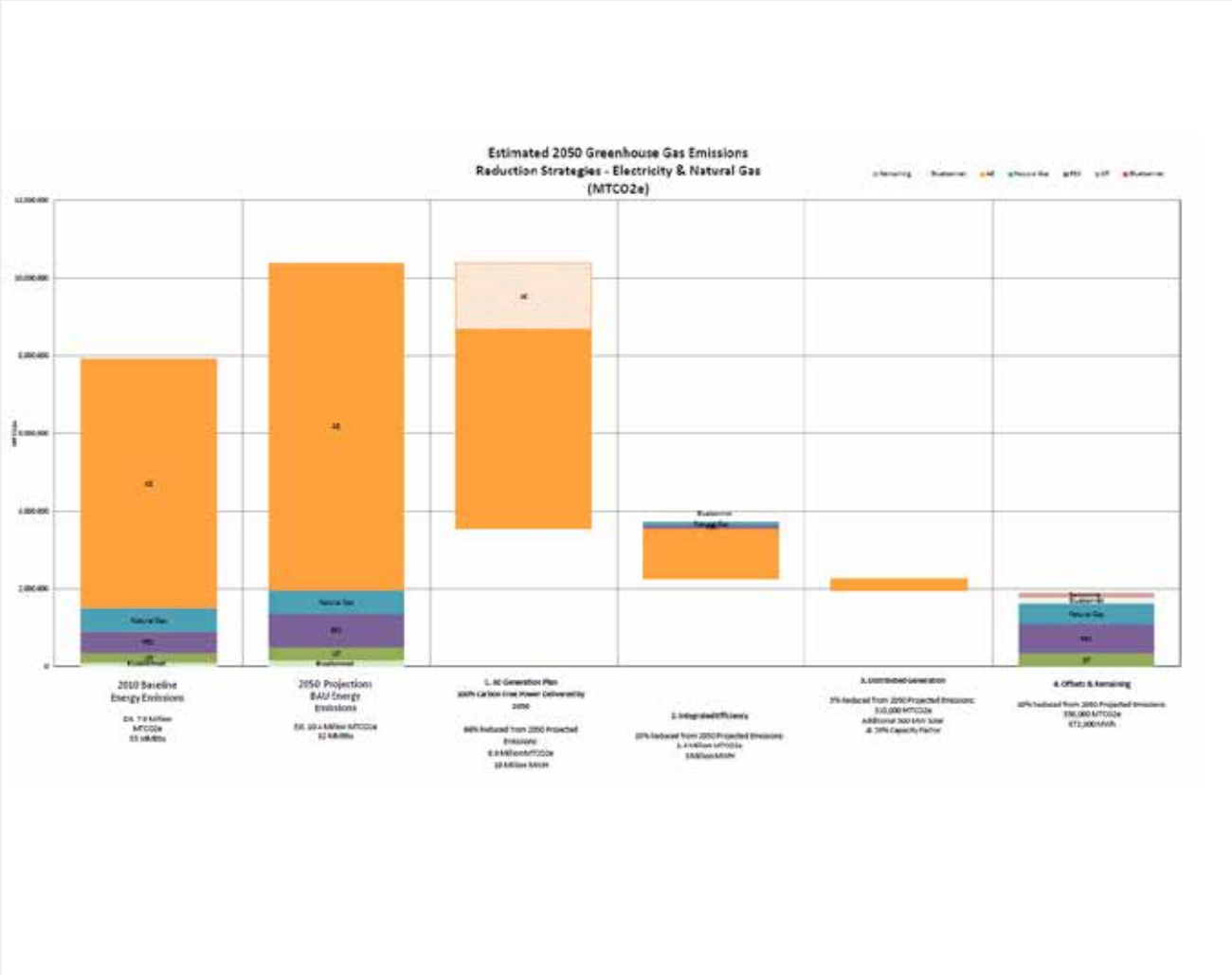
¹ See <http://www.ercot.com/about>

A key consideration for this Technical Advisory Group (TAG) was how to properly account for emissions associated with electricity use in the community. The TAG decided to base emissions from electricity use on consumption, but adjusting those emissions to reflect the actual emissions intensity of any owned resources or resources with which local utilities have a long-term power purchase agreement and for which the location of the resource is known. In this way, the community's greenhouse gas footprint is related to the generation resources owned or contracted by the local utility, as opposed to the average emissions profile of all power plants on the ERCOT grid. The City of Austin currently uses this method to account for Austin Energy's fleet in emissions inventories, and to the extent other local utilities either own their generation resources or have long-term agreements with specific resources, they can calculate their emissions in this way. Otherwise, by default, those emissions are calculated based on grid-average emissions factor (scope 2) and local decisions about generation resources have no impact on total community greenhouse gas emissions.

For this plan, the City is considering all of Travis County as the boundary for community emissions. Electricity use in areas served by Bluebonnet Electric Cooperative, Pedernales Electric Cooperative, and the University of Texas at Austin is included when calculating and projecting greenhouse gas emissions. This definition provides an opportunity for the City to collaborate with the other non-City electricity providers in the County to share ideas and strategies for emissions reductions, and promote reaching long-term carbon goals beyond just the City of Austin borders. The City will also need to collaborate with Texas Gas Service as they provide natural gas to residents in the community, accounting for approximately 8% of the sector emissions.

Business As Usual (BAU) emissions projections were developed for this sector and the reductions needed via different strategies discussed below are shown in the waterfall chart in Figure 2. Most of the emissions in this sector are currently associated with the electricity provided by Austin Energy. Austin Energy recently proposed a plan to replace older greenhouse-gas intense resources with renewables and more efficient resources, and to continue to pursue aggressive energy efficiency and renewable goals for the community by 2030. The plan also proposes to have no greenhouse gas resources by 2050. This generation plan alone would reduce community emissions by close to 67% from what would otherwise occur. Another 16% is projected to be reduced from additional integrated efficient and distributed generation beyond what is planned today. 19% of BAU emissions are from sources that either do not fall under a long-term plan or for which non-fossil fueled alternatives are not readily apparent. The Technical Advisory Group recommends that the City begin considering the use of offsets and/or carbon sinks as ways to reach net zero emissions from this sector in case total independence from burning fossil fuels is not achieved.

Figure 2: Electricity and Natural Gas Sector Projected Reductions Needed to Reach Net-Zero Emissions by 2050



Challenges and Opportunities

- Electricity sector trends
 - The electricity sector is transforming – technology developments, new regulations, and consumer preferences are leading to opportunities for the electric sector to transition away from carbon-based generation resources.
 - Traditional utility business models could begin to limit the potential of new technologies and trends to reduce greenhouse gas emissions from the sector; changing these models is both a major

opportunity and a challenge but will be necessary and possibly urgent if new technologies evolve and are deployed at a rapid pace.

- Demand side management and renewables
 - Austin Energy has been meeting record demand growth almost entirely with demand side management and renewable energy investments, but the pace and extent of that transition must be balanced with the City's commitment to maintain affordable electric rates.
 - Energy efficiency remains an affordable way to meet growth and offset the need fossil-fueled energy resources, but as programs mature and the most cost-effective actions are exhausted, it will cost the utility and its ratepayers more to continue to realize the same benefit. Resistance to more aggressive building codes and mandates also is a key barrier.
 - Renewable resources are increasingly cost-competitive with traditional fossil resources and although they are carbon-free, they remain carbon-reliant because they are backed up by dispatchable resources from the grid; non-fossil fueled dispatchable resources will be the key to meeting net-zero goals.
 - Distributed renewable energy resources have the potential to replace grid energy, but grid modernization will be required to fully realize their potential.
- Systems approach
 - The City must take a systems approach in coordinating climate activities and strategies among different sectors to ensure there is no leakage or unintended consequences. A prime example relates to a potential massive increase in adoption of electric vehicles in the transportation sector and the need for more electricity resources to meet grid demand in this sector.

ACCP Electricity and Natural Gas Strategies

Strategy 1: Decrease Energy Use in New and Existing Buildings

The City of Austin will continue to be a national leader in energy efficiency and reduced demand programs as a result of existing goals programs. The TAG discussed the potential for significant energy savings if a new minimum standard for existing building energy use was created and enforced. Minimum standards enforced through building codes could greatly help drive emissions reductions as opposed to offsetting new demand.

An important consideration is to note that greenhouse gas benefits of reduced and more efficient building energy use become less significant if the source of electricity is greenhouse gas-free. An Austin Energy customer who subscribes to AE's GreenChoice program (sourced with 100% renewables), for example, could save money by conserving electricity but they would not realize a greenhouse gas benefit. Austin Energy plans to have a less carbon-intensive generation fleet by 2030, meaning the effectiveness of building strategies in helping meet the 2050 net zero goal will be diminished as it relates to GHGs but customers could still recognize savings on their energy bills. Local utilities should continue to justify programs by balancing financial benefits to the customer and the utility, considerations of customer preferences, and carefully weighing the greenhouse gas benefits considering future generation resource plans.

Tier 1 Actions

- BIE-1: Increase funding for energy efficiency rebates; new offerings or higher amounts may attract new customers
- BIE-2: Explore new financing mechanisms: on-bill repayment for improvement costs; implement a PACE program and others; mechanisms targeted at promoting/enablingrenewable energy and energy efficiency
- BIE-3: Identify high energy users in all sectors; target incentives for highest impact
- BIE-4: Specific strategies: Envelope improvements (biggest impact), Lighting (LEDs), HVAC, Water heating, Plug loads
- BIE-5: Programs to reduce energy use and carbon intensity associated with water consumption
- BIE-6: Coordinated effort with AWU to reduce energy use and carbon intensity associated with consumption, treatment, and delivery of water, including peak shifting
- BIE-7: Automated demand response for all technologies
- BIE-8: Increase meter reading frequency and use the information to identify opportunities for utility action within energy efficiency and demand response programs and for customer usage choices
- BIE-9: Create a new minimum standard for existing building energy use; enforce the new standard
- BIE-10: Consider the potential for net-zero new construction of residential and commercial buildings

Strategy 2: Lower Greenhouse Gas Intensity of Generation Resources Serving the Community

Generation resource planning is a complex economic modeling and risk management exercise since resource decisions are typically long-term commitments that “lock-in” both environmental benefits as well as costs to ratepayers. Austin Energy developed a generation resource plan in 2014 with input from stakeholders, an independent advisory committee, third party reviewers, and extensive internal modeling and analysis². The TAG did not attempt to duplicate this detailed resource planning exercise and assumes that the 2007 Climate Protection Plan goals and the recent Council-approved 2014 resource plan will determine the City’s actions in the short term.

For local utilities owning and operating a less greenhouse gas intensive fleet to serve its own load can directly and significantly lower the community’s greenhouse gas emissions. The City of Austin already makes generation resource decisions to minimize greenhouse gas emissions while remaining within the affordability limits set by the City Council, and this planning happens bi-annually with participation from stakeholders and the public. The TAG acknowledges that a full transition to renewables by an integrated utility to serve its entire load is not realistic today, since renewables remain intermittent resources and utilities need the ability to deploy dispatchable resources to manage cost risk to its customers. A local utility without any dispatchable resources would indirectly depend on dispatchable, greenhouse gas emitting resources for reliable power.

² See www.austinenenergy.com/wps/portal/ae/about/reports-and-data-library/2014-generation-resource-planning-process

The TAG assumes that the City will continue to follow resource plans that minimize greenhouse gas emissions in the most affordable and least risky way for its customers, and it developed the following general recommendations for continuing on a path towards net-zero greenhouse gas emissions over the long-term.

Tier 1 Actions

- RT-1: Prioritize investment in zero carbon resources at utility and/or customer scale, with consideration of affordability goals: Utility-scale and distributed solar, including concentrating solar and community solar; Utility-scale wind (inland and coastal)
- RT-2: Regular evaluation of resource technologies, with consideration of affordability goalsAnalyze investment and impact of storage technologies as a resource; Analyze further investment in distributed chilled water as a resource option; Analyze whether biomass/geothermal/nuclear are viable resource options

Box 3: Nuclear Energy. Nuclear energy is a logical choice if only considering a greenhouse gas perspective because it provides greenhouse gas-free base load energy. The greenhouse gas benefit of using this resource in ERCOT today is significant because most base load power is provided by coal plants, the most greenhouse gas intense resource. The TAG acknowledges there are environmental and safety concerns associated with nuclear plants that may not be acceptable to the Austin community. Evaluation of nuclear energy risks relative to others was beyond the scope of this TAG, and not all TAG members are supportive of using nuclear energy as a resource. However as long as nuclear resources continues to dispatch as would a coal plant, local utilities should continue to evaluate them as a greenhouse gas reduction option

Strategy 3: Promote Behavior Change to Reduce Greenhouse Gases

Consumer preferences and willingness to pay upfront for actions that result in lower energy use over time, and concurrently support zero and low-greenhouse gas resources, are key to the extent to which strategies and actions can be effective. The TAG discussed and identified a number of actions that are low-cost and relatively easy to implement.

Tier 1 Actions

- BC-1: Implement time of use / dynamic rates programs, including user educational efforts supported by smart meters
- BC-2: Educational efforts through social media, applications, and exposure; media campaigns using local celebrities to drive behavior change
- BC-3: Promote programs for individuals to manage their own carbon footprint (carbon diet)
- BC-4: Neighborhood EE projects -neighbor vs neighbor efficiency challenge (Customized for Neighborhoods)

Additional recommendation: Evaluate Utility Business Models

Traditional utility models whereby centralized power plants provide electricity and large utilities distribute the electricity and recover costs on a per kilowatt hour basis, are increasingly being seen as incompatible with evolving technology and customer needs. The TAG reviewed different models and concepts that attempt to remove financial disincentives for utilities to encourage or directly support end-use energy efficiency and distributed generation. Decoupling, for example, is a general term for ways to remove the association between all or part of a utility's revenue and its sales. Revenue targets are based on the utility's known costs so financial uncertainty associated with sales forecasting is avoided. This is in contrast to the current model of having fixed base rates that stay in place for several years and cannot easily accommodate for reduced revenue from energy efficiency measures, economic slowdowns, or mild weather patterns.

Changing a utility's business model or rate structure can be a significant undertaking requiring careful consideration of economic and social impacts. Many of the actions identified in this process to achieve net zero emissions could be enabled or made more effective under a different utility model.

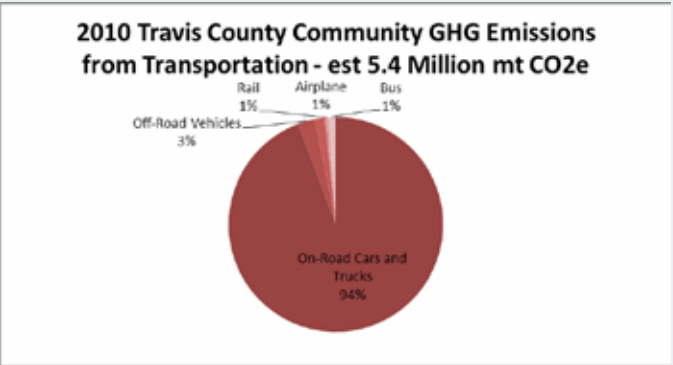
Next Steps

Upon adoption of this plan, the City and community partners would focus on the tier 1 actions and continue to fully evaluate and prioritize the remaining proposed actions to complete an implementation plan. Another key recommendation from the Electricity and Natural Gas TAG is to form a group, including representatives from local electric and gas utilities, to evaluate possible new business models and/or rate structures via an open transparent public process. All utilities that serve electricity and gas to the community might benefit from a single collaborative effort, rather than performing these evaluations independently.

Appendix D: Transportation and Land Use Sector Findings

Introduction

In the United States, greenhouse gas emissions (GHG) from the transportation sector mainly come from burning fossil fuel for our cars, trucks, ships, trains, and planes. In Travis County, ~37% of community-wide GHG emissions come from the transportation sector, and nearly 95% of the transportation-related GHG emissions in Travis County are from on-road vehicles (cars and trucks). Off-road vehicles, rail, air traffic, and bus contribute a minimal amount of GHG emissions to the community-wide total but must also see reductions in order to meet the goal of net zero by 2050.



To reduce the GHG emissions from the transportation sector either vehicle miles travelled must be lowered or vehicle fuel efficiency standards must improve. Coordinated transportation and land use decisions provide significant opportunities for GHG emission reductions by giving Austinites more options to live, work, and play in compact and connected communities. Specifically, the community must focus on solutions that prioritize affordable, mixed use developments along with integrated mobility options for community members for both personal trips and work commutes.

Challenges and Opportunities

- City action versus individual choices
- The City has produced strategic plans and has been investing in alternative transportation options including extended hours for the Metrorail commuter rail, miles of new/enhanced bicycle lanes and trails, and various proposals for high capacity transit. However, it will take many individuals making choices on a regular basis to use these options for real emissions reductions to occur.

- Economic impacts
 - The cost of car ownership can be significant, especially for people who live far from where they work. For individuals who choose to use alternative forms of transportation, the cost savings can be measurable and substantial on a monthly budget.
 - The economic effect of extreme traffic congestion can have a real impact on the local economy if the flow of business is disrupted or if on a broader level it is the deciding factor on a company's decision to move to the Austin area.
- Limiting factors and growth
 - Although the population of the Austin region continues to grow quickly, vehicle miles travelled has begun to level off with more people choosing to drive less and some people choosing to use alternative transportation when possible.
 - While vehicle fuel efficiency standards are mandated by federal regulations to increase over time, the progress is slow going and the new cars sold today may be on the road for decades to come.
 - There are more electric vehicle models being offered each year, and battery technology continues to improve.
- Co-benefits of reducing emissions
 - Better health outcomes if walking and biking are chosen for alternative commutesCleaner air and less pollution through reduced number of vehicles on the road. Money saved by reducing reliance on car ownership (purchase, insurance, gas, maintenance). Some people may see time saved in their day by avoiding traffic situations

Existing Plans and Initiatives

The Transportation Technical Advisory Group identified several existing plans that have elements which contribute to the overall climate plan goal of net zero community wide GHG emissions by 2050. To achieve the GHG goal each of the plans listed below they should be funded and implemented.

Imagine Austin Comprehensive Plan

The 2012 *Imagine Austin* plan reflects the first community-wide comprehensive plan for guiding the city's future growth since the *Austin Tomorrow Comprehensive Plan* which was formally adopted in 1979. *Imagine Austin* provides a set of defined goals, principles, policies, and actions, many of which support greenhouse gas emissions reductions. The plan's goals include:

- A more compact and connected city: interconnected development patterns that support public transit and a variety of transportation choices, while reducing sprawl, congestion, and travel times through a focus on infill and redevelopment opportunities

- An integrated transportation system that is well-maintained, minimizes negative impacts on natural resources, and is affordable for all users
- Safe bicycle and pedestrian facilities with well-designed routes that provide connectivity throughout the greater Austin area and access to new development in activity corridors and centers
- An expanded transit network and increased transit use

Austin Strategic Mobility Plan

The *2014 Austin Strategic Mobility Plan* lays out three main goals: to invest in all travel modes simultaneously, maximize efficiency of major travel corridors, and expand travel choices to influence behavior and meet diverse traveler needs. Project Connect is one piece of the vision that displays a future in which activity centers in Central Texas are linked together through a high-capacity transit system. The goal is to connect people, places and public transit opportunities in an easy and efficient way, while also addressing regional growth projections. The potential modes of focus for Project Connect include Regional and Commuter Rail, Bus Rapid Transit, Urban Rail, and Express Lanes. The Advanced Traffic Management System is another key piece of the ASMP that aims to use technology to optimize traffic flow along key corridors.

Austin Bicycle Master Plan and Urban Trails Master Plan

Austin has also held a long commitment to developing alternative transportation options. The City Council adopted the *Austin Bicycle Master Plan* (ABMP) in November 2014, and the plan's overarching goal is to significantly increase bicycle use and improve bicycle safety throughout Austin by creating an all ages and abilities bicycle network. By implementing the best practice of focusing on physically protected bicycle lanes, the City hopes to see an increase of 25% of riders. As most trips are less than three miles, implementing the plan could significantly help to relieve automobile congestion in key travel corridors. The *Urban Trails Master Plan* (UTMP) was adopted in September 2014, and it was developed to work in conjunction with the on-street bicycle network proposed by the *ABMP*. At full implementation, the *UTMP* would provide a cohesive recreational and transportation network of non-motorized, multi-use pathways to travel long distances across all of Austin safely and serenely.

Complete Streets Policy

The City of Austin Complete Streets Policy is integral to a core Imagine Austin Priority Program of investing in a compact and connected Austin. Achieving this goal requires a shift in how we define the role of roadways: they are public spaces that are designed to move people, not just cars. Complete Streets improvements support safe, efficient, and convenient mobility for all roadway users (pedestrians, bicyclists, transit riders, and motorists) regardless of age or ability. Complete Streets are necessary to support compact development patterns. They expand everyone's mobility choices for safe and convenient travel by different modes between destinations throughout Austin. GHG reductions will be realized over time as the complete streets policy is implemented and community members start to use the streets for more than just single occupancy vehicle travel

The Capital Area Metropolitan Planning Organization’s 2035 Regional Transportation Plan

This plan’s vision is to “develop a comprehensive multimodal regional transportation system that safely and efficiently addresses mobility needs over time, is economically and environmentally sustainable, and supports regional quality of life.” The plan was developed to ensure that the transportation system is coordinated throughout the region and serves the region’s current needs while anticipating future needs. Wise investment in the region’s future demands a plan that balances smart decisions regarding transportation, land use, and natural resources. CAMPO works with regional partners to reduce greenhouse gas emissions from area vehicles in the following ways:

- reduce vehicle miles traveled,
- increase anti-idling awareness,
- increase publicly accessible alternative fuel sites,
- increase alternative fuel vehicle use, and
- secure grant funding to repower and/or replace older vehicles with more fuel-efficient, cleaner burning options.

Austin-Round Rock Metropolitan Statistical Area Ozone Advance Program Plan

In January 2014, the Clean Air Coalition (CAC) entered into its fourth voluntary plan with the U.S. Environmental Protection Agency under the Ozone Advance Program. The Ozone Advance Plan includes three categories of emission reduction measures: those intended for region-wide implementation, those implemented by the CAC member jurisdictions, and those implemented by other participating organizations. Although the Ozone Advance Plan was written to mitigate ozone pollution there are many measures in the plan that also support GHG reductions: commute solutions, development, energy and resource conservation, fleet and fuel efficiency, outreach and awareness, regulation and enforcement, sustainable procurement, and operations. The City of Austin has committed to complete over 30 measures in the plan and Travis County has committed to nearly 20 measures.

ACCP Transportation and Land Use Strategies

Each strategy category contains a list of actions that require more technical work to review, assess feasibility, and refine into near-term solutions that can be implemented effectively to position the community to meet the long-term zero greenhouse gas emissions goal.

Strategy 1: Infrastructure and Service

Major GHG emission reductions can be achieved when infrastructure and service projects are implemented, such as high capacity transit, signal enhancements, or right of way improvements.

Tier 1 Actions

- IS-1 Continue planning efforts to complete a connected network of proven high-capacity transit, including intracity and intercity systems, using the major projects identified in the Austin Strategic Mobility Plan and Project Connect to improve Austin’s transportation and economic connections with other major cities in Texas.
- IS-2 Protect the safety of all right-of-way users and increase mobility by managing traffic speeds with regular synchronizing/retiming all traffic signals along arterials, adjusting speed limits within the urban core as appropriate, adding more volume-count stations to make informed traffic system improvements, installing more roundabouts, using enhanced bicycle signal detection technologies, and installing Pedestrian Hybrid Beacons.
- IS-3 Extend transit service to suburban areas while providing more service interconnections, exploring additional transit centers/park-and-rides, and transit vehicle amenities.

Strategy 2: Land Use

Imagine Austin, the comprehensive plan for the Austin community, suggests making a shift from an auto-centric to a more people-centric environment. To make that shift a reality complete communities must be built that are compact and connected, including activity centers and corridors that promote transportation integration. The way development occurs in the next few decades, with mixed use development using green infrastructure and green building techniques, will have a significant impact on how residents of the community choose to travel, live, work, and play. It would help to reduce vehicle miles travelled and GHG emissions while increasing quality of life.

Tier 1 Actions

- LU-1 Prioritize mixed use development integrated with transit and the creation of compact, walkable and bikeable places with a commitment to plan transportation systems using objective analysis of environmental consideration, demand models, congestion models, safety, and full life cycle cost/benefit analysis.
- LU-2 Promote growth within designated activity centers as identified in Imagine Austin where dense, mixed use development support centers and transit corridors, and consider incentives for infill development with long-term affordability for residents and businesses; develop an outreach program for the available incentives and enhanced property locator tools (e.g. location efficient mortgages, tax credits).
- LU-3 Create pedestrian- and bicycle-friendly districts connecting urban centers and transit stops, optimizing safety for people of all ages and abilities through clearly marked, dedicated, and separated urban trails and bike lanes and wayfinding systems that incorporate national best practices.
- LU-4 Ensure that affordable housing and residential neighborhoods are within a quarter mile of existing or funded new transit options.

Strategy 3: Transportation Demand Management

Transportation Demand Management is comprised of many approaches that work together to ease mobility demand, specifically aimed at diverting people from driving alone. Some key approaches that can lead to reduced GHG emissions, include:

- trip avoidance through options like telework or flexible work schedules;
- improved intercity and intracity public transit service;
- connecting people with carpool or vanpool options that allow them to travel more efficiently; and
- enriched options for community members to bicycle or walk to destinations near where they work or live.

In 2050, the community will be a vibrant, livable place that supports GHG emissions reduction through a variety of mobility choices that are integrated with a compact and connected landscape and technologies available that allow people to do more in less time.

Tier 1 Actions

- TDM-1 Work with large employers and academic institutions to implement and improve trip reduction programs that include a regular survey of how the workforce commutes, explanation of benefits to commuters, and includes promotion of transportation alternatives (e.g. carpool/vanpool, bus/rail, bike/walk, flex/compressed work schedules) to their employees; celebrate successful programs
- TDM-2 Seek opportunities to prioritize public transit within the network, and seek financing to extend service hours and frequency to make public transit services more attractive and increase use of public transit.
- TDM-3 Increase bicycle and pedestrian mode share by promoting cycling for workers living near their workplace and children commuting to school. Increase safety and program performance based engineering, enforcement, education, and evaluation. Encourage the development of web-based tools/mobile applications/other educational materials. Increase the scope and impact of bike promotional events (e.g. Bike to Work Day and VIVA Streets!).
- TDM-4 Develop programs that help commuters make first and last mile transit connections including promotion of first/last mile modes such as free circulator buses, collective zoned vanpool service, flex route system, skateboards, and folding bicycles.
- TDM-5 Work with major event promoters to establish innovative transportation plans that ensure visitors to the City have full information about transportation options.
- TDM-6 Perform education and outreach to fleet owners on how to conduct a business evaluation of fleet usage, including operation and right-sizing analysis, and identify which incentives are available to replace older, higher-emission vehicles.

- TDM-7 Provide amenities and incentives for programs that support active transportation, such as showers, tree shading, community gardens, neighborhood bike ambassadors, mobile bike repair, and bike cages.
- TDM-8 Consider incentive programs that reduce fossil fuel consumption and encourage residents to limit single occupancy vehicle trips by taking alternative modes of transportation (e.g. carpool/vanpool, bus/train, bike/walk); use incentives and disincentives to discourage single occupancy vehicles, tax credits for cyclists, time-of-use pricing for electric vehicle owners.

Strategy 4: Policy and Planning

Effective land use policies and planning efforts will require both public and private collaboration across municipal boundaries to reap the full potential benefits across the community. Making the climate goal a key priority in community transportation and land use policy and planning efforts can leverage additional opportunities to prioritize affordable, mixed use development that integrates transportation choices for all community members.

Tier 1 Action

- PP-1 Establish intergovernmental agreements between municipalities that include commitments to increase density around Centers.

Strategy 5: Vehicles and Fuel Efficiencies

Realizing that travelling by car, truck or bus will still be a high priority option for some it is important for the community to focus on the integration of cleaner vehicles and fuels, supporting advancements in fuel economy, and shifting away from conventional fuels (gasoline and diesel) to alternative fuels, such as, biodiesel, hydrogen, or electric. Additionally, improving freight movement and taking an active role in developing better intercity travel can boost efforts to limit GHG emissions.

In the long-term, large GHG reductions will be realized through a strong adoption of hybrid and all-electric vehicles community wide and a leading presence to reduce vehicle emissions through a variety of approaches such as improved fuel/emissions standards, enhanced freight movement, and efficient intercity travel.

Tier 1 Action

- VFE-1: Expand electric/alternative fuel infrastructure and consider incentives for the purchase of electric/alternative fuel vehicles by individuals and fleet owners, and pursue code options to increase “charger ready” parking.

Strategy 6: Economic and Pricing Systems

Parking management and road pricing strategies can have a substantial impact on the reduction of GHG emissions by encouraging people to think about the costs associated with driving a vehicle. By utilizing different pricing strategies individuals may choose to take alternative transportation options instead of driving which will reduce community GHG emissions.

In coordination with regional transportation partners, the long-term goal would be to implement pricing systems that have the ability to reduce GHG emissions along with reducing traffic congestion, increasing mobility efficiency, and potentially generating revenue to fund other desired transportation-related projects.

Tier 1 Action

- EPS-1 Pursue a fair market value for parking through demand-based commodity pricing.

Additional Strategy: Technology Solutions

Technology solutions are moving traffic more efficiently through improved traffic planning and traffic management and automation of private and public fleets. Private web and mobile platforms are helping individuals make smart travel choices to get more done. Expanding accessibility and speed of our internet infrastructure will also increase the viability of telecommuting and teleworking. Emerging technologies may offer great GHG reductions and Austin policy should seek to accelerate early adoption of technology advancements across all modes.

While there are not any tier 1 actions being proposed in this strategy, there are some tier 2 actions that could be done in the near term that may still provide some benefit to the community and in reaching the overall goal.

Next Steps

Each strategy category contains a list of actions that require much more technical work to review, assess feasibility and refinement into near-term solutions that can be implemented effectively to position the community to meet the long-term zero greenhouse gas emissions goal.

Implementation of the transportation and land use sector climate protection plan is a community effort to equitably transition transportation and land use actions so that they work for all community members, including but not limited to:

1. Meet the needs of all residents including college students, families, visitors, the aging, people with disabilities, and lower income residents.
2. Assist existing residents and businesses to remain, enhance, and thrive in walkable, transit-oriented communities.
3. Expand lower-cost transportation options to mitigate the impacts of economic signals that increase the cost of transportation, especially for lower income residents.
4. Seek early adoption of new technologies that increase efficiencies of our transportation system and which use cleaner, non-fossil fuels.

Realizing the full GHG emissions reduction potential of these strategies will be advanced with new and sustained funding sources at the local, regional, and state levels.

Materials and Waste Management Sector Findings

Introduction

Every product consumed in Travis County has a carbon footprint, which begins with the energy consumed during extraction or creation of raw materials and includes the processing, manufacture, and transport of the product. Associated with each product are so much raw material and discards that the product itself represents only the tip of a huge iceberg of materials consumed in mining, manufacturing, and distributing the product during its lifecycle.

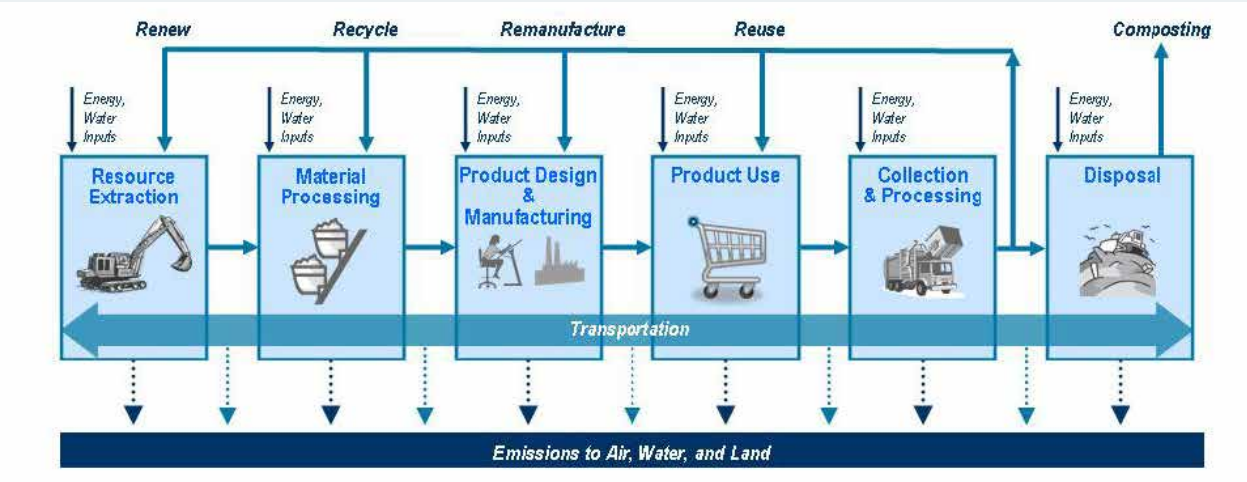
Returning materials and products to the economy reduces that carbon footprint by displacing materials that incurred GHG emissions during their life cycle. In the Figure XX below, materials are diverted from disposal along the solid blue arrows labeled Composting, Renew, Recycle, Remanufacture, and Reuse. That diversion reduces GHG emissions indicated by the dotted line arrows labeled Emissions to Air, Water, and Land.

The calculations for these material-flow emissions (also called Scope 3 emissions) rely on national data with regional adjustments, rather than direct measurements. As such, they are broad and difficult to quantify. Consequently, they are outside the scope of this plan and not incorporated into the net zero GHG goal set by the City of Austin.

Input from the technical advisory group and the community, however, stressed that including indirect or conceptual benefits from lifecycle analysis (LCA) in the plan was important as the City takes a leadership role in climate protection. Reducing emissions through materials management is important because, as a measurable portion of the total GHG inventory, the community cannot get to net zero otherwise.

FIGURE XX. FLOW OF MATERIALS

Also contributing to some products' carbon footprint is the anaerobic decay in area landfills producing



landfill gas comprised primarily of carbon dioxide and methane. Landfills continue to emit landfill gas long after they close and no longer bury materials, increasing the importance of diverting organic material sooner than later.

The four landfills in Travis County have been burying materials for decades, the youngest being in operation since 1991. The oldest, the City of Austin landfill on FM 812, opened in 1968 and closed in 2008. The Republic Services landfill in northeast Austin off US 290 is expected to close in 2015. Recent projections are that the landfills operated by Texas Disposal Systems and Waste Management will remain open until 2037 and 2031, respectively, based on current permitted volumes and performance levels.

All the landfills in Travis County capture and destroy methane to varying degrees, producing carbon dioxide. The Republic and Waste Management landfills produce energy, while the other two currently flare the gas. Texas Disposal Systems is designing a full gas collection and utilization system that will replace its partial gas collection system installed prior to regulatory requirements, which will result in significant emission reductions. The closed City landfill will continue to monitor capture rates and tune the system to maximize methane concentration to optimize flaring or electricity generation, if indicated by a feasibility analysis.

While both flaring and energy production reduce harmful methane to biogenic carbon dioxide, energy production has the added benefit of displacing a fossil-fuel source of energy.

Rather than measure GHG emissions, which is impractical, U.S. EPA publishes calculated estimates that use models, emission factors, and constants that do not take into account an individual landfill's operating practices.

TABLE YY. ESTIMATED QUANTITIES

Measure	City of Austin (opened 1968 closed 2008)	Republic Services (opened 1982)	Texas Disposal Systems (opened 1991)	Waste Management of Texas (opened 1981)
Methane (metric tons)	2,123	5,586	15,600	2,700
Landfill Capacity (metric tons)	9,200,000	24,154,220	28,278,369	25,912,577
Surface area with waste (sq meters)	655,436	1,017,795	408,732	744,638
2013 Waste Disposal (metric tons)	0	684,889	660,871	208,095
2013 Reported GHG emissions (mtCO2e)*	53,070	139,648	390,004	67,491

*GHG from: 2013 Greenhouse Gas Emissions from Large Facilities (<http://ghgdata.epa.gov/ghgp/main.do>)

As a large point source for GHGs, landfills present opportunities for large emission reductions through changes in policies or practices for a handful of organizations.

Challenges and Opportunities

- City action versus Individual action
 - Landfill Gas Management: The City owns only one of four landfills in Travis County on the emissions inventory, and it is already closed. The City has no direct control over how other landfills manage methane onsite.
 - Materials Diversion: Initiatives in ARR Master Plan call for ARR and the private sector providing various services to divert materials from landfills but the Master Plan does not currently call for mandating participation so the performance of these diversion initiatives depends on everybody taking action.
- Economics
 - Landfill Gas Management: According to EPA's Landfill Methane Outreach Program, landfill gas-to-energy systems reduce the costs associated with regulatory compliance by converting pollution into a valuable resource.
 - Materials Diversion: On one hand, economies of scale and simplified handling of commingled recyclables has reduced the cost for diversion services to compete favorably with disposal services. On the other hand, the financial aspects of an organization's materials management program are vulnerable to several factors:
 - International economy, which affects material prices
 - Local building conditions, which can affect demand for some materials
 - Public attitudes and behavior, which affect contamination levels and participation rates which in turn affect material handling costs and revenue
- Limiting factors and growth
 - Materials Diversion: ARR Master Plan affects only ~75% of the Travis County population, meaning hundreds of thousands of Travis County residents and workers outside Austin may not have the level of convenient access to diversion required in Austin. The collection and processing infrastructure developed in response to Austin initiatives, however, has fostered similar initiatives throughout the region.
 - Materials Diversion: Waste reduction strategies are critical to emissions reductions, which include keeping recyclable and organic materials out of landfills. However, even aggressive diversion initiatives face the challenges of a fast-growing county population and the legacy of years of disposal.
- Co-benefits of reducing emissions
 - Landfill Gas Management: If a sufficient quantity and methane concentration exists, the captured landfill gases can produce process heat, propulsion, or electricity potentially offsetting GHG emissions from fossil-fuel energy sources.

- Materials Diversion: Materials returned to the economy improve public health, boost employment, save resources, reduce air and water pollution, and conserve energy and water.

Existing Plans and Initiatives

Austin Resource Recovery Master Plan

In December 2011, the Austin City Council approved the Austin Resource Recovery (ARR) Master Plan, setting a path to Zero Waste by 2040. A few of the many policies, programs, and services outlined in the ARR Master Plan that are already gathering momentum include:

- Zero Waste goal for 2040 as well as interim milestones
- Waste minimization and reduction, reuse of materials, and recycling of virtually all material streams in Austin (recyclable and compostable materials from ARR's residential and small business customers and private haulers' multifamily and commercial customers)
- Managing landfill gas emissions from the City of Austin closed landfill
- Improved routing efficiencies and utilizing CNG and alternative fuel technologies for its vehicle fleet

Independent analysis utilizing the EPA Waste Reduction Model (WARM) estimated that implementing the ARR Plan could reduce life-cycle emissions by ~20 million metric tons of CO2e from 2014 through 2040.¹

Other initiatives include:

- Regional Solid Waste Management Plan 2002-2022 adopted by the Capital Area Council of Governments
- The Sustainable Food Policy Board recommendations regarding food production and delivery
- The City's Sustainable Purchasing Guidelines

ACCP Materials and Waste Management Strategies

The Materials Management Technical Advisory Group identified the following strategies and Tier 1 actions as having significant contributions to reducing GHGs. The actions in Strategy 1 apply to landfill operations to control landfill gases. Those in Strategies 2-5 divert the high-carbon materials from landfills that are most conducive to producing methane in anaerobic conditions, such as leaves, grass, food residuals, office paper, and corrugated boxes. In addition, these actions avoid Life Cycle Analysis (LCA) GHGs by reducing new material use by returning materials to the economy through reusing or recycling.

Underlined actions listed below are not in an existing plan.

Strategy 1: Methane (Landfill Gas) Management (MM)

This strategy aims to “destroy” methane through landfill gas (LFG) capture and combustion.

EPA-published methane emissions from landfills are estimates of the emissions that escape landfill gas capture systems plus those that are captured but not fully combusted by flares or generators. Methane emissions from landfills are considered anthropogenic. The carbon dioxide generated from within the landfill or from burning methane, however, is deemed biogenic because the carbon was contained in recently living biomass. The same CO2 would be emitted as a result of the natural decomposition of the organic waste materials outside the landfill environment.

A UT study states that increasing the total area of the landfills under active gas collection and flaring landfill from 40% to 100% could avoid more than 860,000 tonnes per year of GHGs in 2030.

Tier 1 Actions

- MM-1: ARR refines landfill gas capture and combustion system to destroy methane.
- MM-2: Area landfill operators refine landfill gas capture and combustion system to destroy methane at their landfills.
- MM-3: With City encouragement, eligible landfills in Travis County participate in EPA landfill methane outreach voluntary programs.

Strategy 2: Recycling (RE)

This strategy aims to divert recyclables from residential and commercial sources, which could total 21 million tons from within Austin from 2010 to 2030, according to ARR’s Master Plan. Local governments set policies on and promote diversion programs. Private haulers provide collection and processing services for their customers who would set aside recyclable materials.

Tier 1 Actions

- RE-1: ARR expands materials accepted by curbside recycling service and increases the service to weekly.
- RE-2: ARR increases convenience, efficiency, and effectiveness of downtown alley trash and recycling collection service.
- RE-3: City updates its Pay-As-You-Throw rate structure to strengthen financial incentives for residential customers to reduce disposal.
- RE-4: ARR maximizes effectiveness of Universal Recycling Ordinance in diverting recyclable materials.

Strategy 3: Organics Diversion (OD)

This strategy aims to divert food residuals, yard trimmings, and non-recyclable organic materials, which could total 3 million tons from within Austin from 2010 to 2030, according to ARR’s Master Plan. It builds on the ARR Master Plan to make this diversion a community-wide habit. Residents and commercial generators would subscribe to and participate in organics diversion services. Haulers would transport organics from generators to compost or mulch producers. Residents, businesses, community gardens, and urban and regional farms would use or produce compost and mulch, expanding markets for the products.

Tier 1 Actions

- OD-1: ARR maximizes effectiveness of Universal Recycling Ordinance in diverting organic materials.
- OD-2: ARR expands collection of food residuals and other compostable, non-recyclable materials to all residential customers.
- OD-3: Austin Water’s Hornsby Bend compost operation transitions from yard trimmings to other carbon sources and bulking agents, such as clean lumber and tree trimmings from other City departments and their contractors.
- OD-4 Private haulers collect all organics, non-recyclable materials from their customers.
- OD-5 Urban agricultural operations, from community gardens to regional farmers, produce and use compost from local sources.

Strategy 4: Purchasing (PU)

This strategy aims to change consumption habits to increase the efficiency of material use through purchasing decisions. The purchasing power of large institutions and enterprises can wield considerable influence. Favoring reused or recycled-content products or requiring vendors to take back their products avoids the LCA GHGs illustrated in Figure XX, above.

Tier 1 Actions

- PU-1: City refines construction and building specifications to increase use of reclaimed materials.
- PU-2: City adopts specifications for materials reuse, reduced packaging, materials with recycled content, and locally manufactured products and encourages other agencies and enterprises to follow suit.

Strategy 5: Reuse/Reduce (RR)

This strategy aims to reduce consumption by increasing the efficient use of products. Organizations and individuals would share materials and products, reusing them multiple times before discarding occurs. Building contractors and product manufacturers would optimize material use and minimize material waste when designing and making structures and goods.

Tier 1 Actions

- RR-1: ARR adds four new Reuse Centers, including for hard-to-recycle items.
- RR-2: City supports local economic development through the (re)Manufacturing Hub, Austin Materials Marketplace, and reuse enterprises for repairing goods/products.
- RR-3: City supports local economic development through the (re)Manufacturing Hub, Austin Materials Marketplace, and reuse enterprises for reuse of production byproducts or general reuse of goods.
- RR-4: City implements policies to reduce the use of single-use products in addition to carryout bags.

Next Steps

With direction to complete an implementation plan, responsible parties of this sector would establish reporting methods to determine avoided emissions associated with ARR initiatives. It would focus on how to track, evaluate, report, and improve upon emissions reductions.

The Austin Community Climate Plan should be used to help prioritize and support initiatives in the ARR Master Plan, particularly those that increase diversion of food residuals or paper. The City would continue implementation of the tier 1 actions listed above that are in adopted City plans, and it would begin to determine what would be needed to implement the additional proposed actions as well as prepare for the tier 1 actions included in the 2020-2030 timeframe. ARR would conduct a material characterization study to gather data that could gauge the material streams with the highest Scope 1 or Scope 3 GHG impacts.

¹Dr. Mike Blackhurst from the UT Civil and Environmental Engineering department used the WARM model to estimate avoided LCA GHGs for four scenarios of implementing the ARR Master Plan from 2014 to 2040. His two Realistic Scenarios projected net GHG reductions of 17 to 25 million MTCO₂e for 2014 to 2040

Industrial Process Sector

Appendix F: Industrial Process Sector Findings

Austin-area industrial manufacturers employ thousands of people, contribute to the tax base, and create useful products. The four companies represented in this plan – Austin White Lime, Samsung Austin Semiconductor, Freescale Semiconductor, and Spansion LLC – produce carbon dioxide (CO₂) or carbon dioxide-equivalent (CO₂e) as a manufacturing byproduct, either directly through the use of certain process chemicals or from burning fuel, or indirectly from electricity usage. With multiple drivers dictating company policies, including safety, regulatory compliance, industry group participation, product demand, and economic competitiveness, achieving reductions in greenhouse gas emission is not a simple proposition.

Sources of Emissions

Austin White Lime (AWL)

Lime is produced from the calcination of limestone. Calcination describes the process that occurs when limestone is heated in kilns to drive off CO₂ and convert the limestone into lime. Kilns are fueled by natural gas, coal, or petroleum coke, singularly or in any combination based on business conditions. AWL's CO₂ emissions are inherent to the process and directly tied to their production volume.

Semiconductor Firms (Samsung, Freescale, Spansion)

Approximately 70% of the CO₂/CO₂e emissions from semiconductor facilities are indirectly emitted as a result of the electricity used for operating manufacturing equipment, and for climate control in the cleanrooms and support areas. The use of perfluorinated manufacturing chemicals accounts for another 20% of the total emissions. The remainder comes from natural gas used to heat buildings and abate organic materials, heat transfer fluids used to cool manufacturing equipment, and N₂O and CO₂ consumed as process gases.

Benefits of Industry in Austin

Austin White Lime is the only lime manufacturer located in the Austin Metropolitan Statistical Area (Bastrop, Caldwell, Hays, Travis and Williamson Counties) and one of only three lime producers in the entire state of Texas. AWL is located outside of Austin city limits, in the extra-territorial jurisdiction. The company is locally-owned, and for over a century has supplied high-quality lime products to a variety of industries throughout the Southern United States. AWL employs approximately 150 people who live and work in the Austin area and takes pride in providing a stable work environment with many long-term employees.

AWL product uses include, but are not limited to:

- Softening and removing impurities from drinking water
- Preventing acid rain and removing harmful pollutants from power plant and industrial facility stack gases (flue gas desulfurization)
- Stabilizing soil during local and regional construction projects

- Manufacturing aluminum and steel
- Adjusting the pH of acidic wastewater at industrial facilities and in mining operations
- Various applications in the food processing industry
- Treating bio-solids and wastewater

Austin’s **semiconductor manufacturers** provide over 10,000 local jobs with wages that are well above average for the rest of US manufacturing. Samsung, Freescale, and Spansion continue to invest in their Austin operations; Samsung alone has made a \$7 billion investment since 2010. All three companies have active sustainability and community outreach programs through which employees regularly volunteer on company time and generous donations are made to local nonprofit organizations.

Semiconductors are the integrated circuits that enable technology for all modern electronics, such as computers and cell phones, cars and health care devices, and communications and military systems.

Challenges and Opportunities:

Businesses in this sector must address a number of issues in their day-to-day operations:

- **Safety:** Ensuring the health and safety of employees and neighbors is always a top priority.
- **Regulatory compliance:** Operating in a manner that meets or exceeds all applicable laws and regulations, including those promulgated by the U.S. Environmental Protection Agency and the Texas Commission on Environmental Quality. Anticipating and responding to changes in this arena is an integral part of corporate responsibility.
- **Product demand:** Meeting customer demand remains the core of each business.
- **Maintaining economic competitiveness:** Operating in a profitable manner by implementing efficiency measures and making cost reductions that also result in source reduction and waste minimization.
- **Trade association leadership and participation:** Collaborating with others in the same industry to establish competitive benchmarks that measure environmental and safety performance promotes efficient manufacturing methods.

Industrial Process Possible Strategies and Actions

CO2 and CO2e are inherent in the manufacturing processes for semiconductor and lime production. Austin manufacturers have limited opportunities for actions and reductions without risking negative impacts to business. Many require significant capital funding and would have to offer an acceptable return on investment. Some entail a production change which must be qualified and approved. Others would be accomplished only if there was a regulatory driver. Each potential

strategy and action would need to be examined thoroughly so that all impacts, especially those which are unintended, are weighed and evaluated adequately. Examples of potential reduction actions include:

- Fuel switching to less carbon intensive fuels
- Emission capture and destruction
- Chemical substitutions and reduction of use
- Energy conservation and efficiency
- The generation or purchase of renewable energy
- Investing in local carbon reduction projects that would “offset” industrial emissions

Next Steps

Manufacturing facilities in the Austin area are continuously looking for efficiency opportunities that would still meet economic demands, including those which focus on CO2e reduction. These businesses take action when possible, as long as these actions ensure compliance with applicable regulations and continue to provide jobs that support the local economy. In the short-term, some are already making energy reduction projects a priority, which will decrease or at least offset increases in CO2. In the longer term, each will benchmark and collaborate with industry peers to ensure that best practices are incorporated locally.

Public Input and Community Support

“What We Heard”: Public Input Received

A variety of public engagement strategies were utilized to collect input that would inform development of the Austin Community Climate Plan. We conducted regular in-person meetings with the Steering Committee, led planning charrettes and presentations to community organizations and Boards & Commissions groups, and used online forums and personal surveys to generate a robust level of interest and feedback that helped craft the plan’s content.

Steering Committee

Formed in July 2014, the Steering Committee met bi-weekly for over six months. Web pages were developed on www.austintexas.gov that documented the Steering Committee’s efforts, including the meeting schedule, agendas for each meeting, and meeting notes and presentations. In addition, links for comments and questions were included on the web page. The first part of each Steering Committee meeting was open for public comment; there were also two planning sessions that involved general members of the public.



Speak Up Austin

Speak Up Austin is an online forum that allows individuals to share their ideas and proposals on various topics, which can then be voted or commented on by other members of the public. An open discussion board on Speak Up Austin was used for the Austin Community Climate Plan that encouraged any and all ideas for consideration; it received over 30 responses. Once specific draft strategies and actions were developed for the plan, three forums were provided to allow the public to review these proposals; over 150 comments and votes were received.

Individual Survey

The Office of Sustainability used a digital survey application to engage people about actions they are currently taking, actions they would be willing to take in the future, and the barriers that prevent them from taking a new action. With over 1,100 responses from all across the city, the results provided real insight into which strategies and actions should be prioritized to achieve significant progress. This information will also inform the outreach and engagement plan for implementation of key actions.

Public Input Next Steps

This engagement process received a significant amount of public interest and feedback that informed the plan’s development. For the next phase of planning, it will be critical to continue to involve the public to increase the likelihood of successful implementation.

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- Francois Levy, Francois Levy Architect
- Joep Meijer, Founder, Climate Buddies
- Mike Blackhurst, Professor, University of Texas School of Engineering
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