



City of Phoenix



CLIMATE ACTION PLAN

DRAFT



JUNE 2021

TABLE OF CONTENTS

- LETTER FROM THE MAYOR..... 3
- ACKNOWLEDGMENTS..... 4
- EXECUTIVE SUMMARY..... 5
- THE VISION: 2050 GOALS..... 9
- HOW TO READ THE CLIMATE ACTION PLAN..... 12
- INTRODUCTION..... 13
- STATIONARY ENERGY SECTOR (SES) GOALS..... 22
- TRANSPORTATION SECTOR (TS) GOALS..... 48
- WASTE AS A RESOURCE (WR) GOALS..... 75
- PHOENIX RESILIENCE..... 99
 - FINANCIAL SUSTAINABILITY INITIATIVES..... 99
 - AIR QUALITY (AQ) GOALS..... 100
 - LOCAL FOOD SYSTEM (LFS) GOALS..... 109
 - HEAT (H) GOALS..... 132
 - WATER (W) GOALS..... 154
 - EQUITY AND ENVIRONMENTAL JUSTICE..... 167
- REFERENCES..... 178
- ACTIONS MATRIX..... 182

LETTER FROM THE MAYOR



Phoenicians have a unique understanding of our relationship with our environment. Here in the heart of the Sonoran Desert, we know intimately the importance of wise water management, living with resilience to extreme heat, and the joys and dangers of our monsoon season. While we are not naïve to the immense challenges posed by a warming climate, Phoenicians look with bold vision toward the future. In 2015 voters declared their commitment to making Phoenix the most sustainable desert city on the planet.

This Climate Action Plan outlines actions necessary to achieve this vision, charting the path to carbon neutrality and zero waste by 2050 or sooner. It is data-driven and uses the bi-annual greenhouse gas emissions inventory conducted in partnership with Arizona State University to establish baseline emission levels and track progress. It is designed as a living document, able to continuously respond to the ever-changing and unique needs of our city through regular updates. The effectiveness of the actions outlined in this plan will be analyzed and modeled with the support of C40 Cities, a global network of leading cities working to mitigate climate change.

I'd like to acknowledge the enormous time and energy that city staff across departments have dedicated to this project, with special thanks to the Office of Environmental Programs for leading the effort and driving collaboration among departments and external stakeholders. Phoenix is proud to have dedicated public servants who are committed to our shared success. We also appreciate the time, ideas,

and feedback contributed by residents and other stakeholders. The effectiveness of this plan depends on the continued commitment of all collaborators, both within the City of Phoenix and throughout the community.

Climate action is not only a public health and environmental imperative—it is central to ensuring equity and accessibility, modernizing our economy, fostering new jobs and talent in response to emerging markets, and ensuring Phoenix remains competitive. Companies in Phoenix are establishing climate goals and developing the technologies that will power a low-carbon, zero waste economy. We are poised to drive the development of solutions that will support the global paradigm shift to a more sustainable world.

Our city got its name from the symbolism of 'rising from the ashes' of an ancient civilization, the Hohokam people, who irrigated this land with canals that serve as the foundation for the canal system we depend on today. This valley has long been home to resilient and enterprising people, and I believe Phoenix has the ingenuity and courageous spirit to honor this legacy and create a better city, and a better world, for future generations to come.

Phoenix Mayor Kate Gallego

ACKNOWLEDGMENTS

Thank you to the climate liaisons who contributed their efforts, expertise, and leadership to help create the first community-wide climate action plan for all Phoenix.

Office of Environmental Programs

Dr. Matthew Potzler
Nancy Allen
Rosanne Albright
Katrina Gerster
Karen Ibarra

Office of Sustainability

Mark Hartman
Nick Brown
Darice Ellis
Karen Apple

City Council Members

Kate Gallego, Mayor
Carlos Garcia, Vice Mayor and Councilmember, District 8
Ann O'Brien, Councilmember, District 1
Jim Waring, Councilmember, District 2
Debra Stark, Councilmember, District 3
Laura Pastor, Councilmember, District 4
Betty Guardado, Councilmember, District 5
Sal DiCiccio, Councilmember, District 6
Yassamin Ansari, Councilmember, District 7

City Manager's Office

Ed Zuercher, City Manager
Karen Peters, Deputy City Manager

Department Climate Liaisons

Elizabeth Grajales, (retired), Office of Arts and Culture
Mitch Menchaca, Office of Arts and Culture
Ed Lebow, Office of Arts and Culture
Rebecca Godley, Aviation Department
Cynthia Parker, Aviation Department
Alexa Martin, Budget and Research Department
Monica Gonzalez, City Clerk Department
Michael Hammett, Communications Office
Alejandro Montiel-Cordova, Communications Office
Joseph Rossell, Community and Economic Development
Michael Campos, Phoenix Convention Center
Marquita Beene, Equal Opportunity Department
Donald Logan, Equal Opportunity Department
Rosalinda Erives, Equal Opportunity Department
Gustavo Nava, Finance Department
Zack Wallace, Finance Department
Rayne Gray, Fire Department
Kathya Hidalgo, Office of Government Relations
Yolanda Martinez, Housing Department
Terisha Ellis, Housing Department
Stephanie Zuffranieri, Human Resources Department
Ricardo Duran, Human Services Department
Felicia Thompson, Information Technology Services
Stephen Wetherell, Law Department
Monique Coady, Law Department
Todd Shackelford, Phoenix Public Library
Luis Aguilera, Phoenix Public Library

Sonia Murillo, Phoenix Public Library
Spencer Self, Neighborhood Services Department
Kimberly Dickerson, Neighborhood Services Department
Travis Ekenberg, Neighborhood Services Department
Brent Olson, Office of Homeland Security and Emergency Management
Rick Templeton, (retired), Parks and Recreation Department
Cuong Dinh, Parks and Recreation Department
Danielle Poveromo, Parks and Recreation Department
Larry Polk, Parks and Recreation Department
Joshua Bednarek, Planning and Development Department
Odette Bakker, Planning and Development Department
Nikki Hicks, Police Department
Joe Bowar, Public Transit Department
Rodney Merrill, Public Transit Department
Kelly Murray, Public Transit Department
Felissa Washington Smith, Public Works Department
Brandie Barrett, Public Works Department
Keith Carbajal, Public Works Department
Mikaela Castle, Public Works Department
Marcia Wilson, Retirement Office
Kini Knudson, Street Transportation Department
Eric Froberg, Street Transportation Department
Lance Cosby, Water Services Department

Participants in Climate Action Projects

Arizona Commerce Authority
Arizona Department of Transportation
Arizona Public Service
Arizona State University
Bureau of Reclamation
City of Peoria
City of Tucson
First Southern Baptist Church
Grand Canyon University
Greater Phoenix Economic Council
Maricopa County Flood Control
Mr. Bults Inc.
Pueblo Grande Museum
Resource Innovation Campus
Salt River Project
Secretary of State's Office
U.S. Environmental Protection Agency
U.S. Army Corps of Engineers

Technical Assistance

C40 Cities

Special thanks to Joe Gibbs, Retired

Thank you to Joe Gibbs, retired Air Quality Specialist, who devoted many years of public service in the city of Phoenix and Arizona Department of Environmental Quality. Joe initiated many programs that have improved the life of the residents of Phoenix. We want to recognize Joe and thank him for all the climate-related work he did previously that has allowed us to reach completion of a climate action plan for all Phoenix.

EXECUTIVE SUMMARY

Phoenix is a modern desert city with a unique backstory of human ingenuity and the harnessing of natural resources to sustain life, dating back thousands of years to the Hohokam. For Phoenix to continue to rise and thrive, we need a data-driven guidebook to address and overcome resource challenges and climate threats. This Climate Action Plan will lead the way, providing an actionable framework for growth and development, while building a strong, equitable, and resilient city.

Phoenix (“city”) is the fifth largest city in the U.S. and part of the fastest growing county in the nation. It is ranked as the 4th most desirable city for millennials and the 11th best city to start a business. Its residents enjoy 300 days of sunshine and have access to the largest municipal park system in the nation consisting of 48,000 acres of parks and preserves. The Phoenix economy is strong. With direction from Mayor Gallego and the City Council and solid fiscal management, the city realized a \$158 million surplus in 2021.

To add to these successes, Phoenix voters supported an ambitious vision in the 2015 General Plan **to become the most sustainable desert city on the planet**. A sustainable city improves the quality of life for everyone while allowing nature to thrive.

The Phoenix City Council adopted the 2050 Sustainability Goals that set long-term outcomes necessary to fulfill this vision, and now, this draft Climate Action Plan (CAP) proposes actions to put Phoenix on a path to achieving the ambitious, long-term 2050 goals. In 2020, the city joined C40 Cities Climate Leadership Group, a network of the world’s major cities committed to addressing climate change. C40 has asked leading cities to commit to stop any rise in emissions after 2020 as well as achieve carbon emissions reductions by 2030 to help curb global emissions and to limit temperature rise to 1.5 degrees Celsius or 2.7 degrees Fahrenheit.

GHG Emissions decreased from 2012 to 2018 while our population and the economy grew.

Climate action planning is not new to Phoenix. Phoenix has invested \$600 million in climate actions in recent years including:

- \$30 million in LED Streetlight project replacing 100,000 streetlights
- \$15 million in a state-of-the-art compost facility
- \$25 million in a biogas facility
- \$30 million in retrofits underway to reduce energy use in City buildings
- \$530 million dollars in transit since 2016 under the Phoenix Transportation Plan (T2050) for extended bus and paratransit operating hours, and increased local bus frequency to every 30 minutes or less citywide
- 45 miles of cool pavement installed—more than any other city in the world

These actions and others have resulted in a decrease in per capita greenhouse gas (GHG) emissions from 2012 to 2018, which is significant because this occurred when the city’s population grew 12% and the metro area economy grew 26%. While the goals identified in the plan put the city on a path to carbon neutrality by 2050, they also necessitate additional actions to achieve the city’s goal of 67% reduction in emissions by 2030. As a C40 city, Phoenix is committed to this goal. This 67% reduction would require a much more aggressive approach to carbon reductions including commitments and support from businesses and residents.

This draft Climate Action Plan, published for public comment, was developed based on public and stakeholder input on the Climate Action Plan Framework. It separates the goals and actions into the categories of energy, transportation, waste and resilience. Highlighted below are the ten significant goals identified in the plan for the city to achieve the vision:

Ten Significant Climate Actions Included in This Report:

1. Lead by example by transitioning **city operations electrical use to carbon neutral by 2030** through energy use reduction and implementation of local and utility scale solar projects.
2. Reduce community carbon emissions by from buildings, transportation, and waste to move toward becoming a **carbon-neutral city by 2050**.
3. **Support increased energy efficiency, renewable energy and new electric vehicle charging requirements in building codes**, to achieve carbon neutral buildings city-wide by 2050 with all new construction being net-positive in both energy and materials by 2050.
4. Attract businesses that turn **waste into resources** and create a thriving Resource Innovation Campus by 2030 to put the city on the path to zero waste by 2050.
5. Support and prepare for **280,000 electric vehicles in the city by 2030** and rapidly expand bus, rapid bus, and light rail service to achieve **carbon-neutral transportation by 2050**.
6. Become a top tier **Heat-Ready City by 2025**—implementing the Tree and Shade Master Plan by 2030 and building a network of **200 “cool corridors” by 2050**.
7. Continue to lead internationally in water stewardship – providing a **clean and reliable 100-year water supply**.
8. Create and maintain a **healthy, sustainable, equitable, and thriving local food system** with healthy, affordable and culturally appropriate food for all Phoenix residents by 2050.
9. Create an **inclusive and equitable city**, prioritizing investments in previously underserved communities, proactively seeking community input on all major climate policy and related budget decisions and embedding equity in all climate actions.
10. Significantly improve air quality in the region to **meet federal air quality standards**.

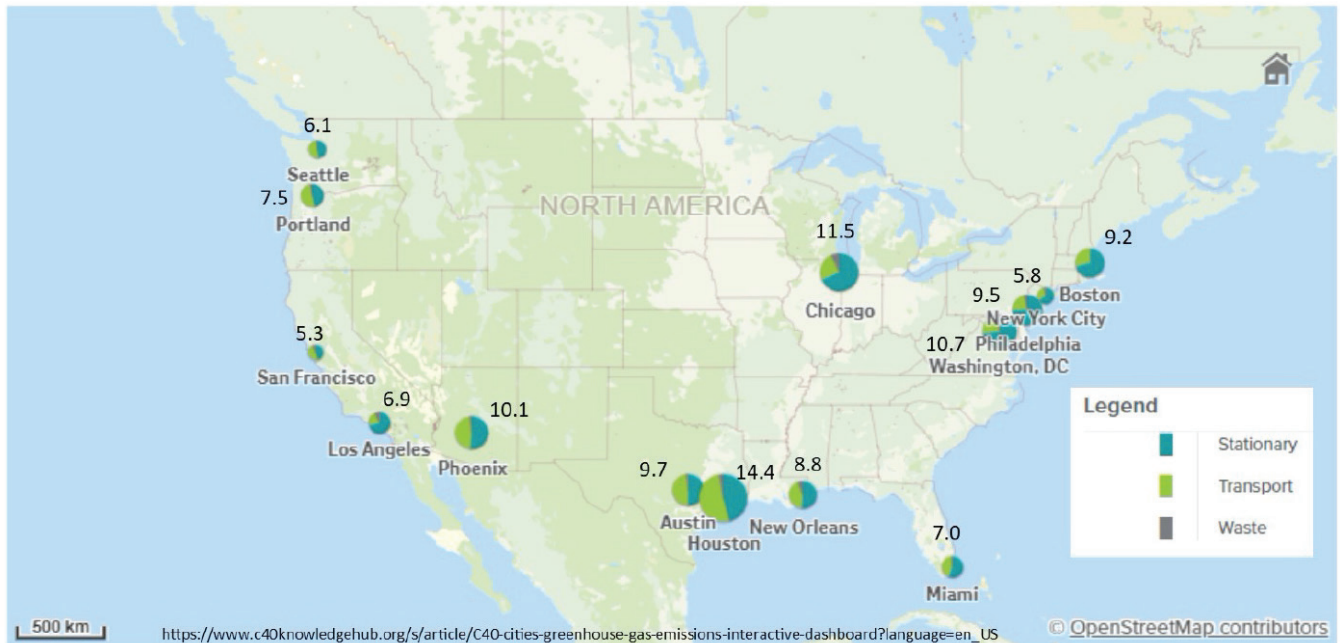
The Pathway to Carbon Neutral by 2050

Phoenix has accomplished many initiatives, programs, and projects that have led to GHG reductions and provided social, economic and environmental benefits. This plan details those accomplishments and maps out actions, some underway now and some proposed, that will reduce GHG emissions in Phoenix. Many actions described in this plan aim at strengthening community resilience and represents growth. This Plan is dynamic: it is built on community input and data. Because the plan’s very foundation relies on new information, this plan will be updated at least every other year as new information is available, technological innovations are made, and market conditions change.

GHG EMISSIONS IN PHOENIX

The city has completed GHG inventories for both city operations and community wide for several years. The most recent inventory for 2018 showed that GHG emissions were down 0.5% from the baseline year of 2012. This decrease occurred during a period where the city's population grew 12% and the metro area economy grew 26%. Per capita emissions have also decreased from 2012 to 2018. The map below shows the per capita emissions in large American cities.

Per Capita Emissions Per Year, C40 Cities (US) June 10, 2021



GHG emissions are inventoried in three sectors: Stationary Energy, Transportation and Waste. The latest inventory from 2018 showed the following:

- **THE STATIONARY ENERGY SECTOR – 51% OF GHG EMISSIONS.**

GHG emissions occur from energy used in residential buildings, commercial buildings and facilities, manufacturing industries, agriculture, forestry and fishing energy use, and electricity transmission and distribution energy losses.

GHG emissions from the Stationary Sector continue to decrease as the electricity grid increasingly relies on natural gas and renewable sources.

- **THE TRANSPORTATION SECTOR - 47% OF GHG EMISSIONS.**

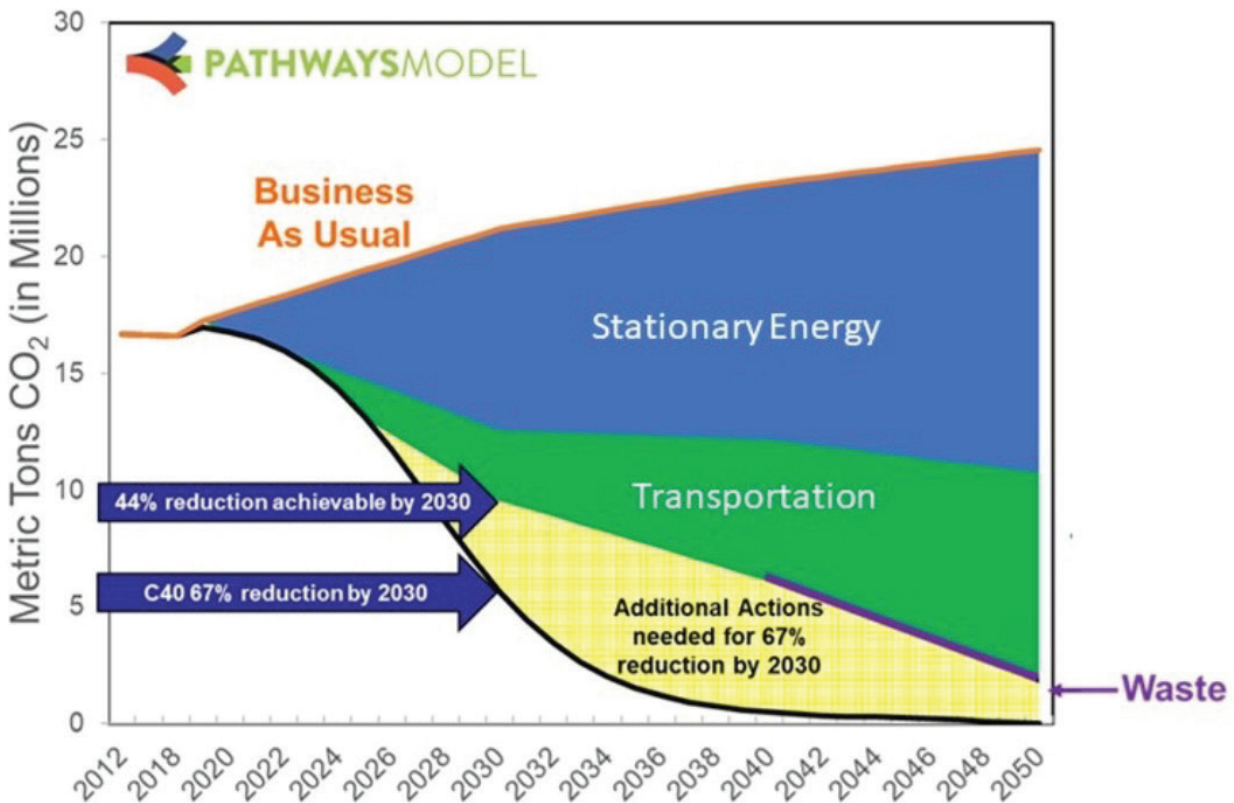
GHG emissions occur from commercial and civil aviation, on road transportation, non-road vehicle use, freight and light rail. **GHG emissions from this sector continue to increase along with population growth**, with the majority of emissions resulting from the use of gasoline-fueled vehicles.

- **THE WASTE SECTOR – 2% OF GHG EMISSIONS.**

GHG emissions occur from solid waste disposal, the biological treatment of waste (composting), and wastewater treatment. **The GHG emissions from waste have decreased over time** with the installation of landfill gas capture systems and decreasing emissions from decommissioned landfills.

GHG reductions have been modeled using C40’s Pathways model with Phoenix data to set a baseline, or “Business as Usual (BAU)” GHG emissions scenario. The GHG emissions reductions from planned and proposed climate actions, like the city’s 2050 Sustainability Goals, additional actions within this draft plan, and expected market changes, have been estimated. As actions are proposed, they will be evaluated for their effectiveness at reducing GHG emissions.

Currently, the city is on target with existing actions to achieve a 44% GHG emissions reduction by 2030. Additional emissions reductions of 23% are needed to achieve the 67% reduction commitment by 2030. The chart below shows the reductions from buildings (blue), transportation (green) and waste (purple) from current and proposed actions. The yellow section highlights the additional reductions needed to meet our goals by 2050.



C40 Pathways model showing 44% reduction in greenhouse gas emissions by 2030 as a result of existing and planned actions described above.

Achieving 67% GHG Emissions Reductions by 2030

The remaining 23% of emissions reductions by 2030 will require collaboration from business, residents, and other government agencies, advancements in technology, market improvements, and potential changes in policy or state legislation to occur. The city has initiated regional discussions with other cities, local and state agencies, nonprofit organizations, and academic institutions to explore partnerships to address climate challenges, such as heat and air quality. Phoenix will continue to develop new partnerships, advocate for policies at the municipal, state, and federal level that will address our challenges, and engage and incorporate community input regularly and often.



THE VISION: 2050 GOALS

GREENHOUSE GAS EMISSIONS REDUCTIONS GOALS:



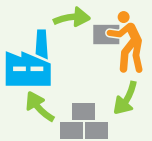
Stationary Energy

All buildings will be powered with net-zero GHG sources of energy. All new buildings will be “net-positive” in terms of energy and materials. At the community scale, we will enhance 15 compact centers where the services are provided locally. Residents will be able to live, work and play, all within walking or biking distance.



Transportation

All forms of transportation will be fueled with net-zero GHG sources of energy. Make walking, cycling, and transit commonly used, enjoyed, and accessible for every Phoenix neighborhood, including our disabled community. This goal will result in 90% of the population living within one-half mile of transit, and projects 40% of the population will choose to commute by walking, biking, transit or car share.



Waste as a Resource

Phoenix will create zero waste through participation in the Circular Economy where recycled materials are repeatedly used in products, instead of using raw materials.

RESILIENCY GOALS:



Air Quality

Phoenix will achieve a level of air quality that is healthy for humans and the environment. Air quality will meet U.S. EPA National Ambient Air Quality Standards and World Health Organization standards, and will achieve a visibility index of good or excellent on 90 percent of days or more.



Heat

Reduce urban heat-island effect through green infrastructure as well as doubling the current tree and shade canopy to 25 percent. Have all residents within a five-minute walk from a park or open space by adding new parks or open space in underserved areas, adding 150 miles of paths, greenways, and bikeways throughout the city, and transforming an additional 150 miles of canals into vibrant public space.



Local Food System

Maintain a healthy, sustainable, equitable, and thriving local food system with healthy, affordable, culturally appropriate food for all residents.



Water

Provide a clean and reliable 100-year water supply.

THE PATH FORWARD: GREENHOUSE GAS EMISSIONS REDUCTIONS GOALS

Stationary Energy Sector (SES)

- Goal SES1:** Achieve net-zero GHG emissions for municipal operations electricity use by 2030 through renewable energy projects, energy efficiency upgrades, and utility partnerships.
- Goal SES2:** Support energy-efficiency upgrades to existing buildings throughout the city by developing three new community-wide conservation and renewable-energy programs by 2025.
- Goal SES3:** Promote development of community-wide energy projects, including microgrids, that improve the sustainability and resilience of the surrounding community's electricity grid.
- Goal SES4:** Design and construct all new buildings within the city to Living Building Challenge, Net-Positive Design, or equivalent design standards by 2050.
- Goal SES5:** Obtain electricity from an electricity grid that is carbon-neutral by 2050.

Transportation Sector (TS)

- Goal TS1:** Implement the city's Complete Streets Policy and Active Transportation Program to encourage multiple modes of transportation.
- Goal TS2:** Increase the community-wide use of low carbon fuels (i.e., fuels other than gasoline and diesel).
- Goal TS3:** Promote electric vehicles (EVs) and related charging infrastructure in the community to triple the EV charging capacity on City property by 2025 and support EV adoption resulting in 30% of new car sales being EVs by 2030.
- Goal TS4:** Reduce the percent of single occupant vehicle trips taken to 60% of all trips, while maintaining a thriving economy.

Waste as a Resource (WR)

- Goal WR1:** Implement programs to reduce waste, increase the reuse, recycling and recovery of waste materials and promote social and economic value.
- Goal WR2:** Reduce GHG emissions resulting from the degradation of waste by capturing landfill gas and converting 100% of the methane (up to 1500 SCFM) from the SR 85 landfill into renewable natural gas as a substitute for fossil natural gas. Have contract executed and facility constructed and operational by March 2023.
- Goal WR3:** Increase waste-diversion participation by all residents and businesses.
- Goal WR4:** Transition to green alternatives from environmentally hazardous materials.
- Goal WR5:** Expand brownfield redevelopment along the Rio Salado in Phoenix.
- Goal WR6:** Reduce GHG from water and wastewater treatment by capturing biogas from treatment processes and increasing renewable sources of energy.

THE PATH FORWARD: RESILIENCY GOALS

Air Quality (AQ)

Goal AQ1: Meet U.S. EPA National Ambient Air Quality Standards (NAAQS).

Local Food System (LFS)

Goal LFS1: All people living in Phoenix will have enough to eat and have access to affordable, healthy, local, and culturally appropriate food.

Goal LFS2: Businesses that produce, process, distribute, and sell local and healthy food will be recognized as integral to the economy and encouraged to grow and thrive in Phoenix.

Goal LFS3: Growing food in Phoenix and the region will be easy and valued, for personal or business use.

Goal LFS4: Food-related waste will be prevented, reused, or recycled via sustainable food production practices that maintain a healthy environment.

Goal LFS5: Develop food policies and actions that address local and global challenges posed by climate change, urbanization, political and economic crises, population growth and other factors.

Heat (H)

Goal H1: Create a network of 30 cool corridors in vulnerable communities by 2030 to facilitate movement from residents' homes to their places of employment, education and play.

Goal H2: Increase shade provided by trees or constructed shade in 'flatland' parks, not the preserves, streets and rights-of-way to achieve a 25% tree & shade canopy in pedestrian areas by 2030 prioritizing communities most vulnerable to heat.

Goal H3: Provide resources and services to residents to manage heat.

Goal H4: Increase the use of high albedo, or reflective, materials in infrastructure projects.

Goal H5: Develop HeatReady certification for cities in partnership with ASU by 2025.

Water (W)

Goal W1: Identify and implement infrastructure projects to ensure water security.

Goal W2: Improve conservation of water resources by improving stormwater management, optimizing water use, conducting water audits, and utilizing wastewater.

Goal W3: Increase outreach and provide programs to residents and businesses to reduce water use to 155 GPCD by 2030.

HOW TO READ THE CLIMATE ACTION PLAN

TWO SETS OF GOALS

1 Greenhouse Gas Emissions Reduction Goals

Reduce emissions of greenhouse gases to limit the effects of climate change from the following sectors

- Energy Sector
- Waste as a Resource
- Transportation Sector

2 Resiliency Goals

Increase resilience of the city against the effects of climate change in the following focus areas

- Air Quality
- Heat
- Local Food System
- Water

Each sector or focus area will have goals with associated targets and baselines and have this appearance within the document.

GOAL 1
The goal's description.

TARGET 1
Measurable target for each goal.

BASELINE
The starting point.

Each goal will be followed by actions that will help meet the target and will have an appearance like this example from the Stationary Energy Sector (SES) Chapter.



Install solar energy generation systems on affordable housing developments.

Housing developments will include solar power generation as part of the APS Solar Communities Program.

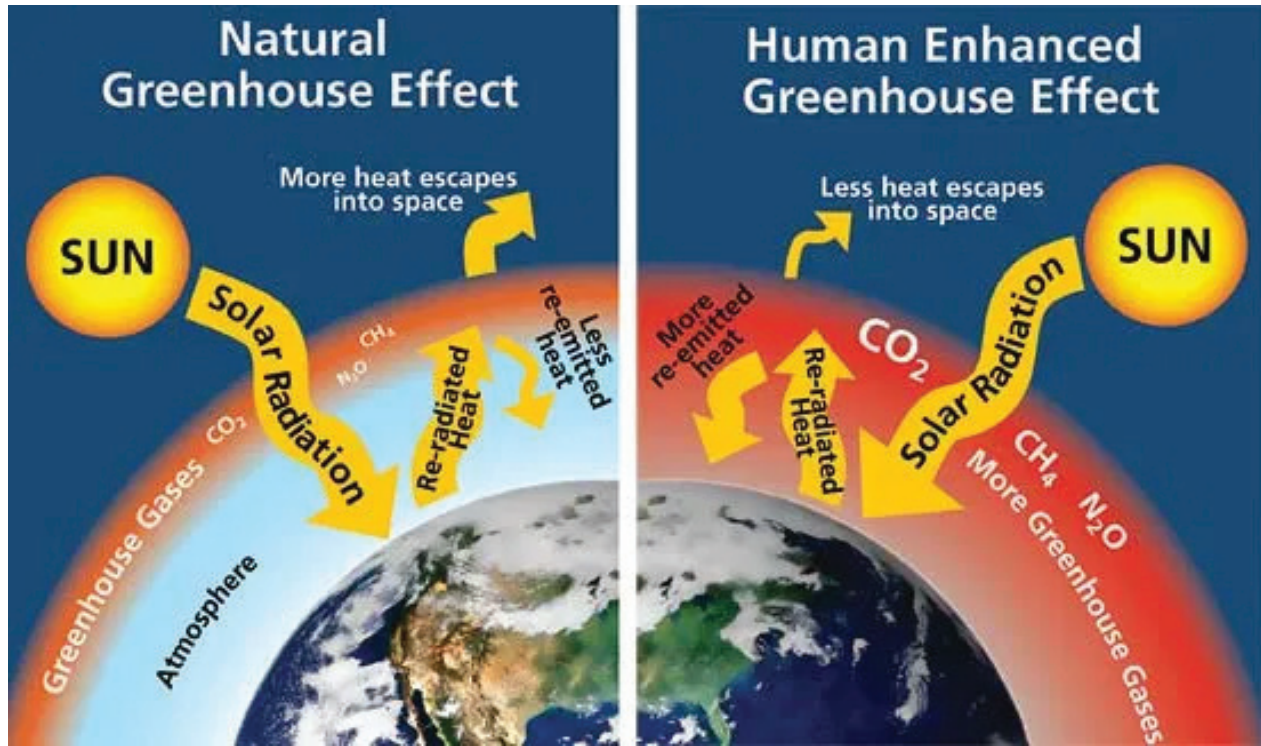
- CITY LEAD** // Housing ← *Lead is responsible for the implementation of the action and reporting on progress.*
- PARTNERSHIPS** // APS ← *Partner has a role in implementing the action alongside the Lead.*
- TIMEFRAME** // Short Term

Quickstart Actions	<i>Actions that can be completed by 2025.</i>
Ongoing Actions	<i>Actions that are in progress.</i>
Pending Actions	<i>Actions being considered.</i>

	Short Term	Medium Term	Long Term
	2020	2030	2040
	2025	2035	2045
			2050

INTRODUCTION

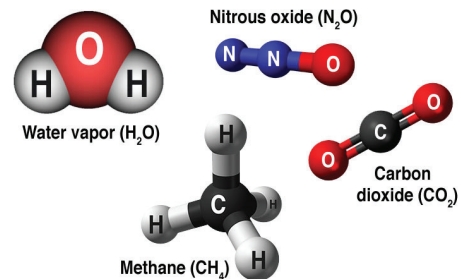
Greenhouse Gas Emissions and Climate Change



(Source: National Park Service)

Greenhouse Effect and Climate Change

GHG emissions from human activities have increased dramatically over the past century and a half. These emissions, primarily the burning of fossil fuels for electricity, heating, and transportation, are accelerating climate change. Sunlight warms the atmosphere containing GHGs and the surface of the Earth. GHGs absorb the heat and make the Earth suitable to sustain life. With an increase in GHG concentrations from human activities, more heat is absorbed and retained, rather than being released back into space. This changes our climate, affecting infrastructure, public health, and management of natural resources.



GHGs include water vapor (H₂O), carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄) and fluorinated gases.

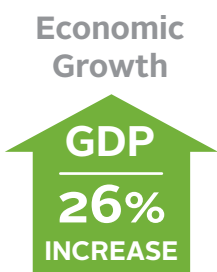
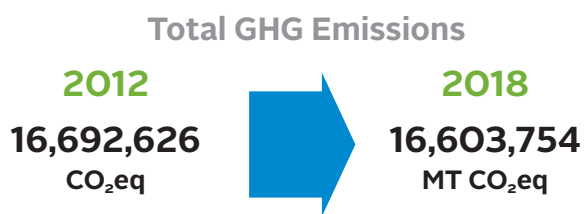
Understanding Phoenix's Greenhouse Gas Emissions

COMMUNITY-SCALE GHG EMISSIONS

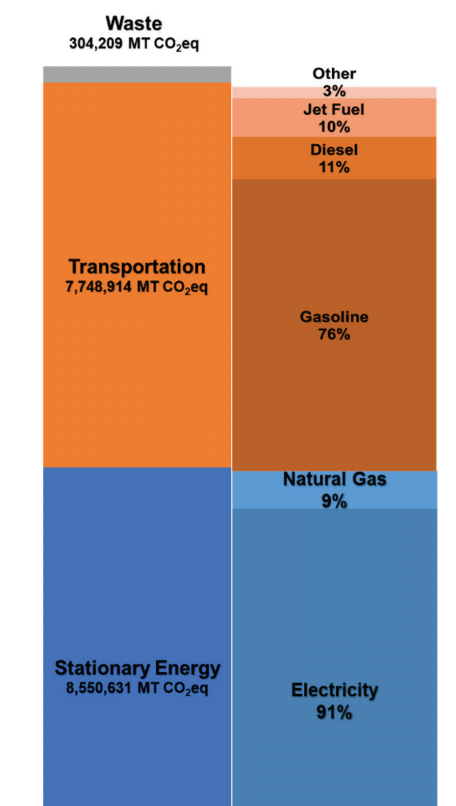
The city of Phoenix has completed a community-scale greenhouse gas (GHG) emissions inventory for calendar year 2018 (the most recent inventory with an inventory for 2020 in progress) in partnership with Arizona State University (ASU) Rob and Melani Walton Sustainability Solutions Service. The 2018 community-scale GHG inventory is the third community-scale inventory completed by the city following the 2012 and 2016 community-scale GHG inventories. The emissions inventories are conducted using the Global Protocol for Community-Scale GHG Emission Inventories (GPC). The GPC is a worldwide standard for quantifying and reporting city-induced GHG emissions developed by the World Resources Institute, C40 Cities Climate Leadership Group, and Local Governments for Sustainability (ICLEI). The GPC categorizes direct and indirect GHG emissions into three sectors: Stationary Energy, Transportation, and Waste. Direct GHG emissions occur within city boundaries, while indirect GHG emissions are induced by activity within the city boundary. In February 2021, the New York Times wrote an article¹ about a study² that compared Northern Arizona University's Vulcan carbon dioxide emissions data to self-reported inventories from US cities, including Phoenix. Phoenix's overall community-wide emissions for 2012, the year in the study, were remarkably close to their estimates with only a 3% relative difference. Since the release of the 2012 greenhouse gas emissions inventory, we have continued to make progress to refine the results from these inventories with the aid of experts from ASU and Northern Arizona University.

- The **Stationary Energy Sector** includes GHG emissions that occur from energy used in residential buildings, commercial buildings and facilities, manufacturing industries, agriculture, and forestry.
- The **Transportation Sector** includes GHG emissions from commercial and civil aviation, on-road transportation, non-road vehicle use, freight and light rail.
- The **Waste Sector** includes GHG emissions from solid waste disposal, the biological treatment of waste (composting), and wastewater treatment.

Progress Towards Net-Zero Emissions



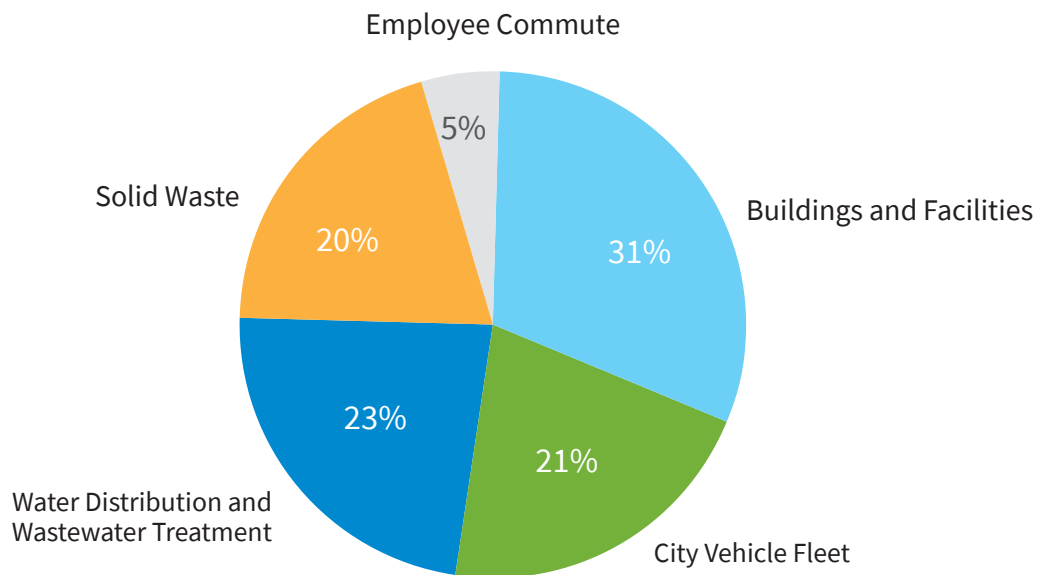
2018 GHG Inventory Results



LOCAL GOVERNMENT GHG EMISSIONS

The city of Phoenix has completed a municipal operations GHG emissions inventory for calendar year 2018 (the most recent inventory with an inventory for 2020 in progress) for local government operations in partnership with ASU Rob and Melani Walton Sustainability Solutions Service. The 2018 local government GHG inventory is the fourth completed local government inventory by the city following the 2005, 2012, and 2015 GHG inventories. The local government GHG emissions inventories are conducted using the Local Government Operations Protocol (LGOP), developed by Local Governments for Sustainability (ICLEI), the California Climate Action Registry (CCAR), the California Air Resources Board (CARB), and The Climate Registry (The Registry). The LGOP serves as a national standard for quantifying and reporting emissions associated with government operations. The inventory includes emissions from those operations for which the local government has the authority to introduce and implement operating policies, as those most accurately represent GHG emissions sources within the City's control. The inventory report is organized into five sectors: **Buildings and Facilities**, **City Vehicle Fleet**, **Water Distribution and Wastewater Treatment**, **Solid Waste**, and **Employee Commute**.

2018 Government Operations GHG Inventory Results



Progress Towards Net-Zero Emissions



To view the greenhouse gas inventories for a more detailed analysis and methodology, please visit <https://www.phoenix.gov/climate>

Phoenix Climate Hazard Assessment

Located in the Sonoran Desert, summer temperatures in Phoenix can reach near 120 degrees Fahrenheit (F) or 49 degrees Celsius (C), with mild winter temperatures. The average annual precipitation is 7 inches or 178 mm. Precipitation generally is divided equally between winter precipitation and summer monsoon storms that can deliver intense rainfall in short periods of time. Recent global anthropogenic emissions of greenhouse gases are the highest in history and the effects these emissions are having on climate are already being observed. The continued emission of GHG gases will cause further warming and impact people and ecosystems, irreversibly so. These changes will be long-lasting. Significant reductions in GHG emissions are required along with adaptation actions to limit risks due to climate change. The predicted GHG emissions vary over a wide range and are dependent upon socio-economic development and global climate policy.³ The future will be hotter and the future will be drier, but those impacts will not be experienced equally by all residents of Phoenix.

HEAT

Predicted average surface temperatures will increase mildly, if GHG emissions are moderately decreased (Representative Concentration Pathway (RCP) 4.5), or severely, if GHG emissions continue to increase unabated (RCP 8.5).⁴ All predictions indicate that surface temperature will increase over the 21st century and heat waves will occur more often and last longer across the globe.

Exposure to hotter temperatures and heat waves has increased heat-associated deaths in Arizona. During high ozone pollution advisory days, mortality risk is increased if concurrent with a heat wave. The region also has a disproportionately high number of cases of West Nile virus, plague, hantavirus pulmonary syndrome, and Valley fever cases. Wildfires have burned twice the area than what would have had climate change not occurred from 1984 until 2015. Increased heat and drought will affect agriculture as heat stress reduces yield.⁵ The Maricopa County Multi-Jurisdictional Hazard Mitigation Plan indicates that extreme heat events are highly likely for Phoenix and has a high significance in emergency preparedness planning.⁷

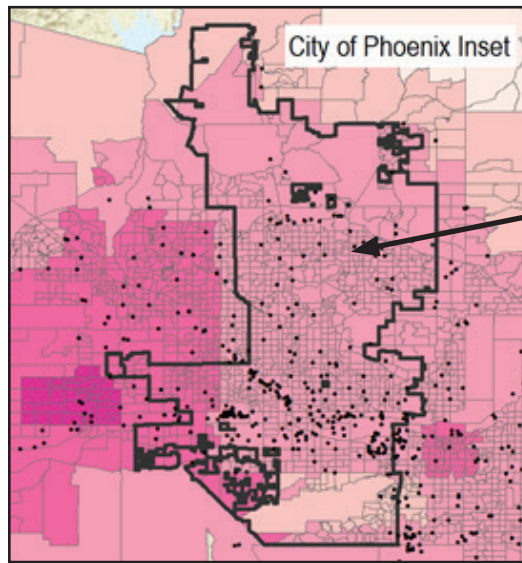
DROUGHTS

The Southwest region has the hottest and driest climate of the United States. Higher temperatures are increasing the drought in the Colorado River Basin and have resulted in a loss of 60% of the volume in Lake Mead, from which Phoenix, along with other cities and agricultural users, draws water via the Central Arizona Project. Risk of water shortages has increased as a result of reduced water volume in Lake Mead and Lake Powell. A Drought Contingency Plan (DCP) was created by governments across the seven U.S. states that use of Colorado River water, the federal governments of the U.S. and Mexico, and local water utilities. The DCP requires voluntary decreases in water use to maintain levels at Lake Powell and Lake Mead. In addition, Arizona's average monsoon rainfall is expected to be reduced by 30-40% by 2100. The number of drought months will increase slightly under the low GHG emissions scenario, but will increase for all areas of the city, especially for the northern and western areas. The Maricopa County Multi-Jurisdictional Hazard Mitigation Plan shows droughts are likely and has moderate significance in emergency preparedness planning.⁷

EXTREME HEAT: Maximum Summer Temperature

Phoenix recently completed a study in partnership with RTI International (formerly Research Triangle Institute) and US Environmental Protection Agency (EPA) to create a Phoenix-specific assessment regarding indicator-based community vulnerability from site and waste management facilities following extreme events, including extreme heat and drought. On the maps below, the darker the shade the higher the temperature.

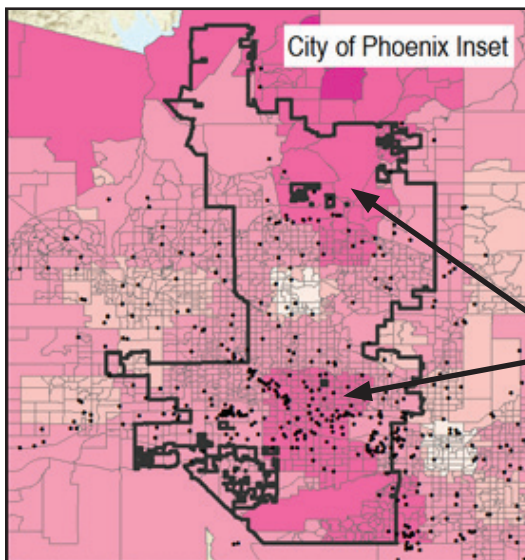
Historical (Average from 1986-2005)



115 degrees F
(46 degrees C)

Model of the Future (Average from 2040-2059)

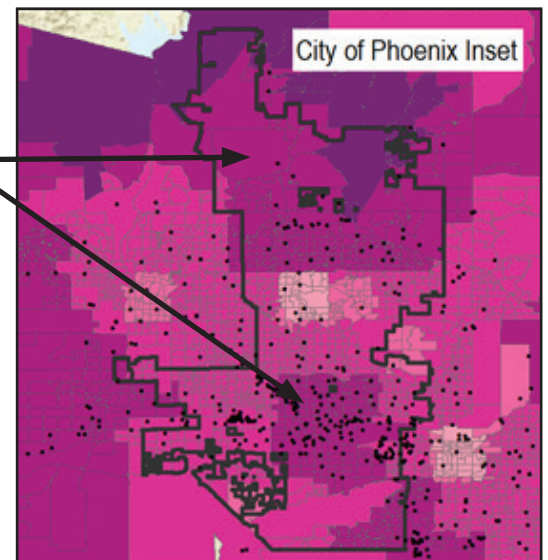
Moderate GHG Emissions Decrease (RCP 4.5)



121 degrees F
(49 degrees C)

119 degrees F
(48 degrees C)

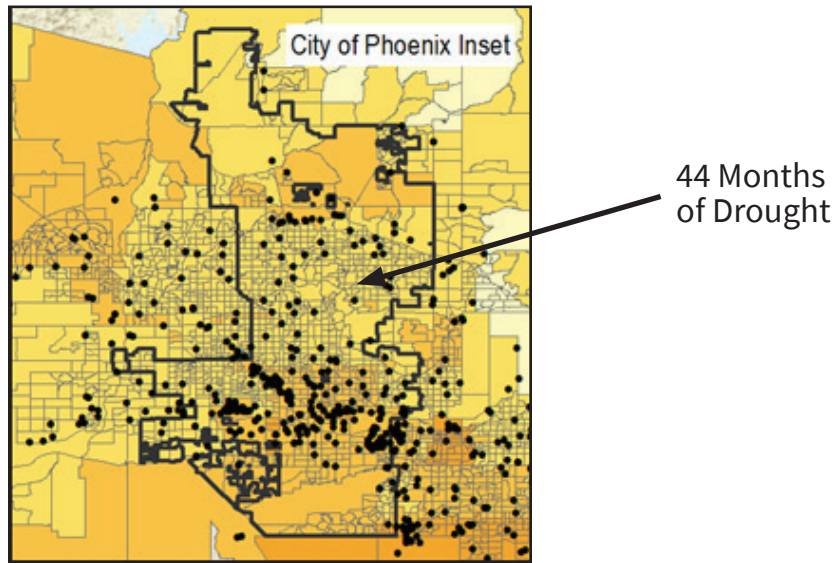
Business as Usual (RCP 8.5)



DROUGHT: 12-Month Standardized Precipitation Evapotranspiration Index

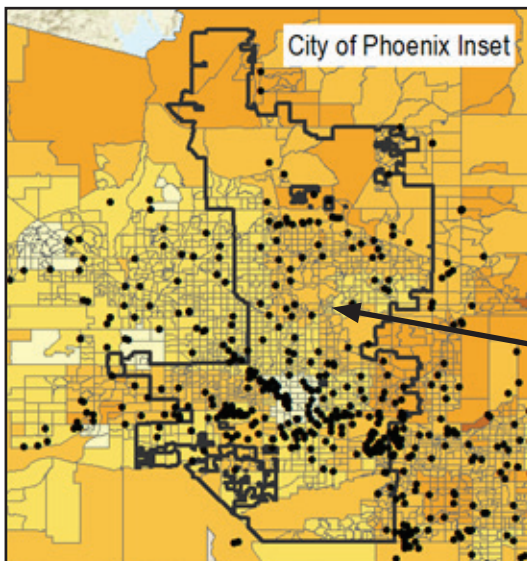
On the maps below from the RTI/EPA study, the darker the shade the more months with drought.

**Historical
(Total Drought Months from 1986-2005)**

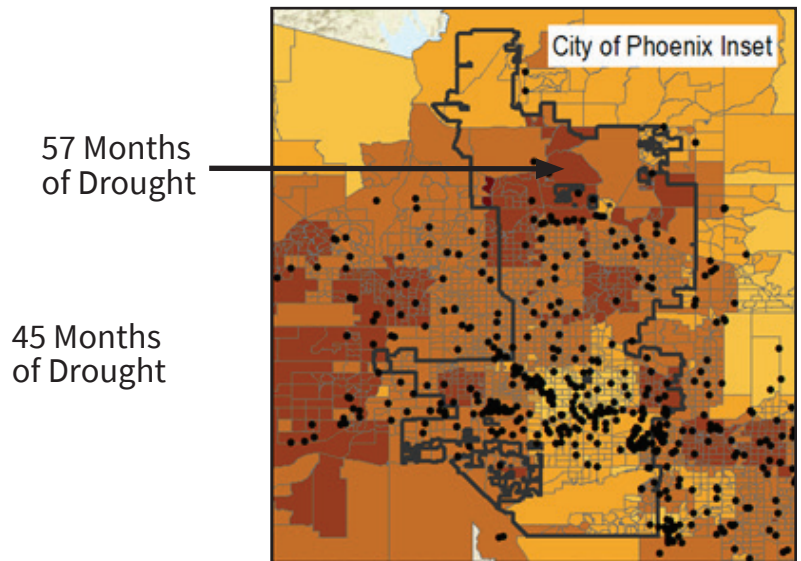


**Model of the Future
(Average from 2040-2059)**

**Moderate GHG Emissions Decrease
(RCP 4.5)**



**Business as Usual
(RCP 8.5)**

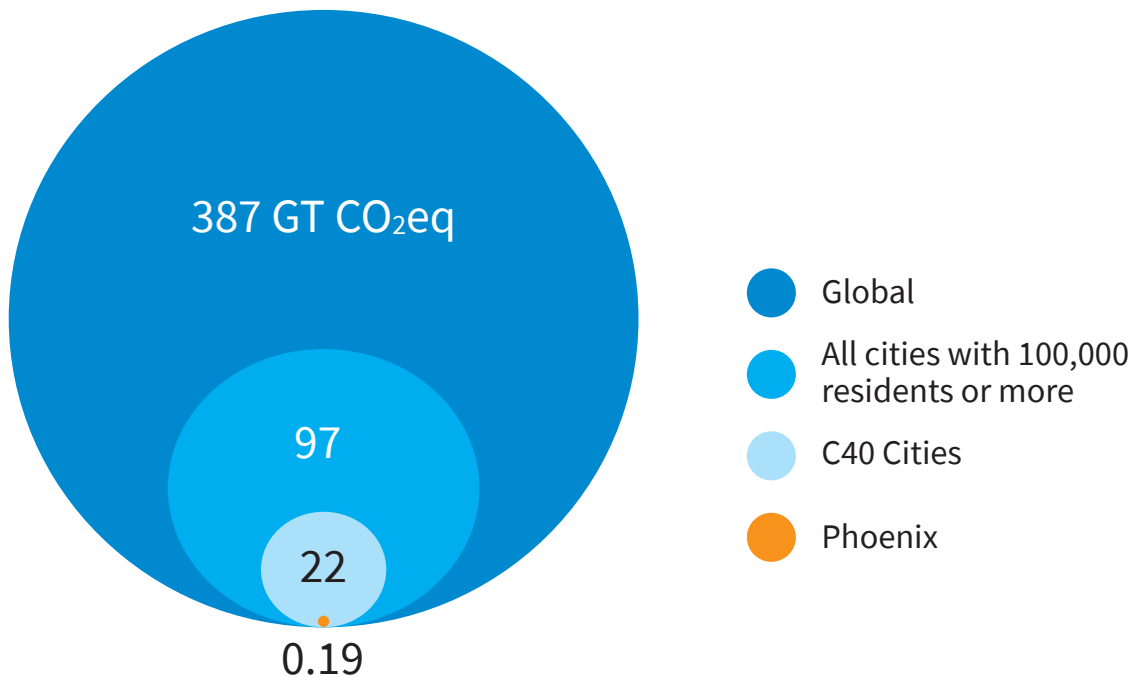


C40 Cities Deadline 2020

The C40 Cities Climate Leadership Group connects 96 of the world's greatest cities, representing one-twelfth of the population and one-quarter of the global economy. C40 Cities was created and is led by the world's cities. C40 Cities is focused on tackling climate change and driving urban action that reduces greenhouse gas emissions and climate risks, while increasing the health, wellbeing and economic opportunities of its residents. Deadline 2020 provides a route map C40 member cities toward achieving the Paris Agreement to pursue efforts to limit the temperature increase to 2.7 degrees F (1.5 degrees C) above pre-industrial levels, which will limit the risks associated with climate change.⁸

CARBON BUDGET

C40 Cities has determined the remaining amount of greenhouse gases that can be released to stay within 2.7 degrees F (1.5 degrees C) above pre-industrial levels. For Phoenix, that amount is 0.19 metric gigatons of carbon dioxide equivalent (0.19 GTCO₂eq).⁸



PER CAPITA EMISSIONS

To remain within a 1.5 degree temperature rise, average per capita emissions across all C40 cities need to drop from over 5 MTCO₂eq per capita today to around 2.9 MTCO₂eq per capita by 2030. **Phoenix would need to decrease per capita emissions from 10 MTCO₂eq per capita (2018) to 3 MTCO₂eq by 2030 to meet the goal.**⁸

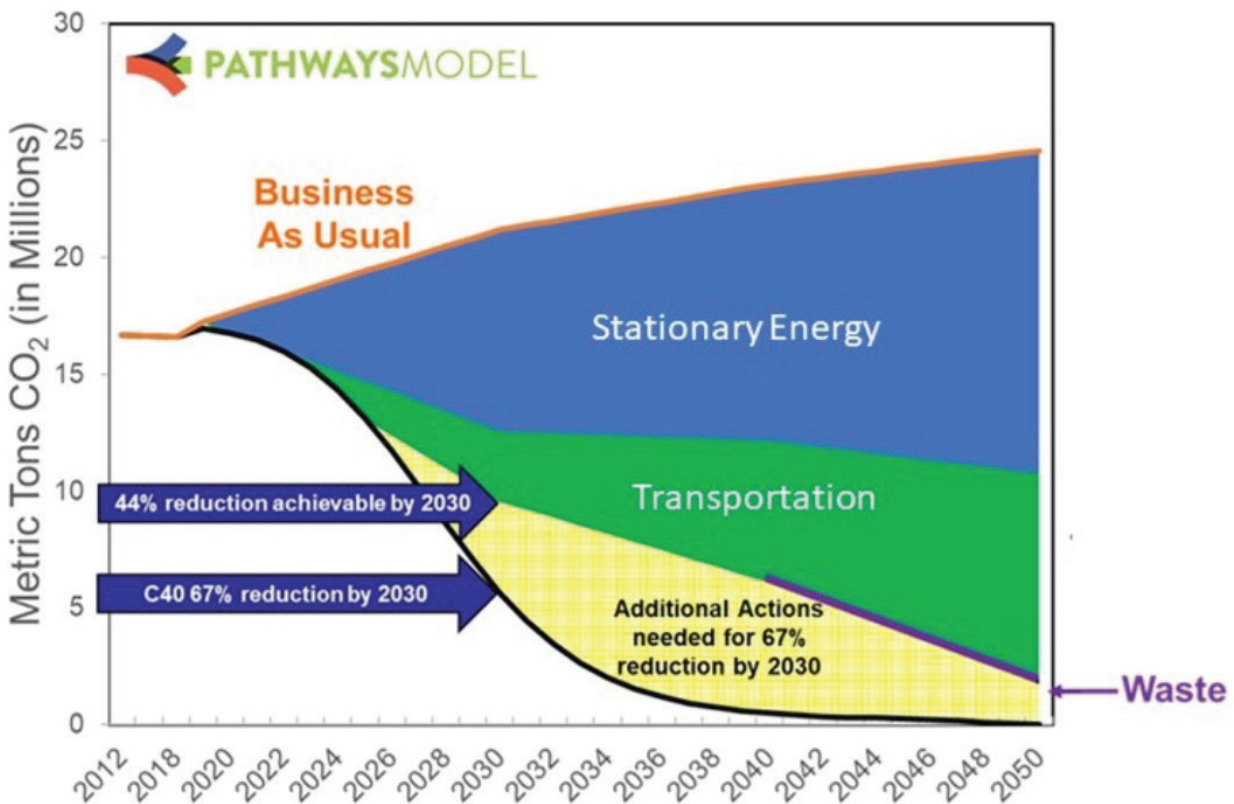
Greenhouse Gas Emissions Reductions Model

Phoenix used the Pathways model developed by C40 Cities to evaluate the greenhouse gas (GHG) emissions reductions that would result from planned and proposed climate actions. A Business as Usual (BAU) scenario was first estimated using Phoenix's previous GHG emissions inventories. The purpose of this work is to determine what climate actions would be necessary to comply with the Paris Climate Agreement and achieve Phoenix's goal of becoming a net-zero GHG emissions city by 2050.

EXISTING AND PLANNED ACTION SCENARIO

Existing and planned actions include the goals and commitments adopted by Mayor Kate Gallego and the members of the Phoenix City Council, including the 2050 Sustainability Goals and C40 Cities Deadline 2020¹; actions planned by the Arizona Public Service (APS)² and Salt River Project (SRP)³; the Executive Order on Tackling the Climate Crisis at Home and Abroad; and expected market trends. Transportation modeling used information from the city of Phoenix's Comprehensive Bicycle Master Plan; and modeling from the Maricopa Association of Governments' Travel Demand Model and their Active Transportation Plan.

C40 Cities Pathway model results for actions and plans already in motion, the yellow shaded area is the amount of GHG emissions that still needs to be addressed to meet goals.



C40 Pathways model showing 44% reduction in greenhouse gas emissions by 2030 as a result of existing and planned actions described above.

By 2050, the remaining emissions are from the transportation and waste sectors. For transportation, the GHG emissions are from those modes of transportation that are not easily electrified like airplanes, off-road vehicles and railways/trains. The remaining emissions from the waste sector are from landfill gas from already in place material.

AMBITIOUS ACTION SCENARIO

Additional modeling is being done to determine what other climate actions are necessary and feasible to meet the Deadline 2020 commitment. Deadline 2020 provides guidelines to accelerate reductions in GHG to meet the goals of the Paris Agreement. This includes proposals like installing additional residential solar, the White House executive order to reduce GHG emissions from the electric sector to be carbon-free by 2035, among others.

Input from the community, city leaders, city management, and climate liaisons is being sought to determine the best path forward for Phoenix. As the climate plan is revised, the model will be updated, and actions will be re-evaluated.



STATIONARY ENERGY



2050 GOAL

All buildings will be powered with net-zero GHG sources of energy. All new buildings will be “net-positive” in terms of energy and materials. At the community scale, we will enhance 15 compact centers where the services are provided locally. Residents will be able to live, work and play, all within walking or biking distance.

STATIONARY ENERGY (SES) GOALS

Goal SES1: Achieve net-zero GHG emissions for municipal operations electricity use by 2030 through renewable energy projects, energy efficiency upgrades, and utility partnerships.

Goal SES2: Support energy-efficiency upgrades to existing buildings throughout the city by developing three new community-wide conservation and renewable-energy programs by 2025.

Goal SES3: Promote development of community-wide energy projects, including microgrids, that improve the sustainability and resilience of the surrounding community’s electricity grid.

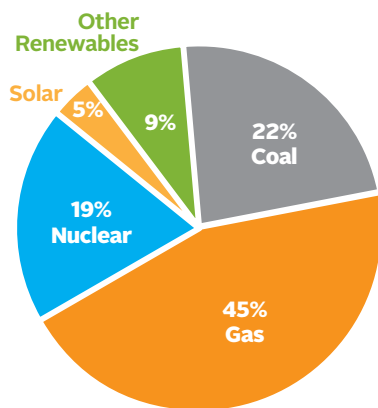
Goal SES4: Design and construct all new buildings within the city to Living Building Challenge, Net-Positive Design, or equivalent design standards by 2050.

Goal SES5: Obtain electricity from an electricity grid that is carbon-free by 2050.

620,799

residents are estimated to be eligible for the Low Income Home Energy Assistance Program (LIHEAP)¹⁵

Source of Energy by Fuel Type (2019)¹⁴



SAVE UP TO \$75/YR

by replacing your home's five most frequently used light fixtures or bulbs with ENERGY STAR® models.¹⁶



STREET LIGHT PROGRAM

100,000

streetlights converted to LED⁸ saving the city

\$3.5 MILLION

in annual energy costs.⁸

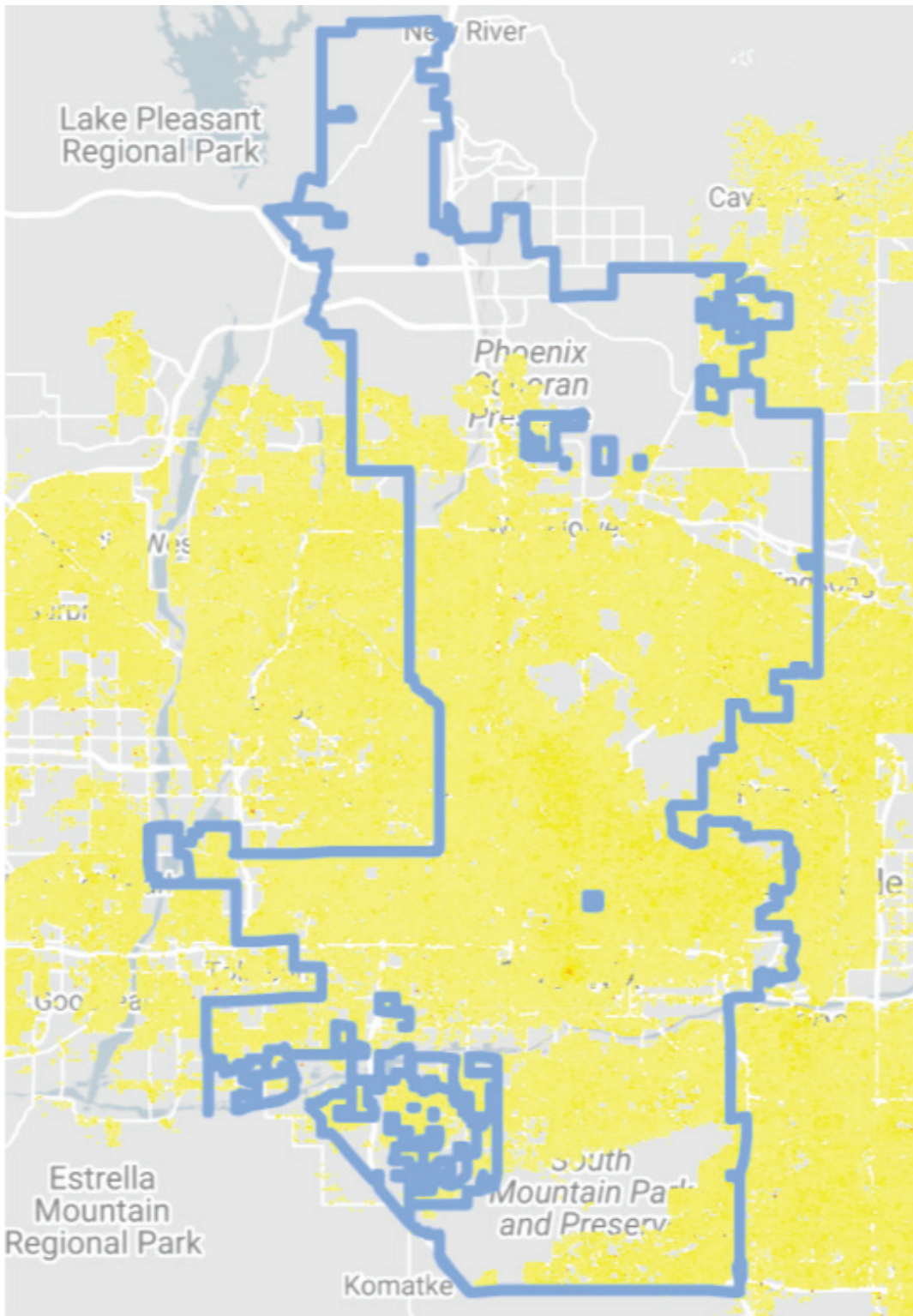


BACKGROUND

According to the 2018 GHG Community Inventory, 51 percent of GHG emissions in Phoenix come from the stationary energy sector. Electricity and natural gas provide the energy that lights buildings, cools our homes and businesses and powers industry. **Currently, most of the electricity that is used in Phoenix comes from the combustion of fossil fuels—natural gas and coal.** Generation of electricity from these fuels releases GHGs that contribute to climate change. Maximizing energy efficiency and using renewable sources of energy will reduce the community's emissions. Solar energy is the most abundant and least expensive form of renewable energy in the Phoenix area and it holds the most promise for reducing GHG emissions from the production of electricity.

Phoenix receives 30-40 percent more solar radiation than most other locations in the United States, and this results in superior cost-efficiency for solar energy projects in the Phoenix area. Google Project Sunroof estimates rooftop solar potential of Phoenix to be over 9,300 MW throughout the city as seen in the map that follows.¹⁹ Arizona has a renewable energy standard and tariff (REST) that requires that regulated utilities provide at least 15 percent of retail sales from renewable energy by 2025, with a requirement that 30 percent be generated from systems located on customer's premises, including residential and commercial rooftops. In May 2021, the Arizona Corporation Commission proposed rules to require utilities to reduce carbon emissions by 50% by the end of 2032, 80% by the end of 2050, and 100% by the end of 2070. The baseline is an average from years 2016-2018. A final vote is expected in Fall 2021. According to the Environment America Research & Policy Center and Frontier Group, **Phoenix is the city with the fourth-most solar photovoltaic (PV) installed, and the eighth-most solar PV installed per capita.**²⁰ Arizona has the second-most solar potential among US states, and is currently fourth in solar generation.²¹

Estimated Rooftop Solar Potential



Estimated rooftop solar potential (in yellow) of Phoenix, AZ from Google Project Sunroof¹⁹

Local Government Leading the Way

The City of Phoenix hosts solar projects from only a few panels to those of megawatt scale. These include solar installations on City of Phoenix property, including rooftops, carports, and ground-mounted arrays, some of which serve facilities where they are installed. In collaboration with Arizona Public Service (APS) and Salt River Project (SRP), large-scale solar energy projects are in progress to produce carbon-free energy for the local power grids. Since these larger projects require a large amount of space, future plans to place solar energy projects will evaluate utilizing city properties like landfills, similar to the Solar Partnership with APS at SR-85. APS has also committed to providing carbon-free electricity by 2050, while SRP has committed to providing carbon-free generation by 2060.




Solar Energy Generation System at Rental Car Center at the Phoenix Sky Harbor International Airport

KEY ACHIEVEMENT

As technologies become more accessible, such as light emitting diodes (LED) to replace fluorescent or incandescent lighting, they are being installed and provide cost savings over the life of the equipment. The city replaced all of its about 100,000 existing streetlight fixtures with energy-efficient, LED fixtures. The new fixtures feature a 2,700-kelvin LED, the city's new color standard for streetlights. LED streetlights also offer maintenance savings and come with a 10-year warranty.¹⁸

PHOENIX LED
STREET LIGHT PROGRAM
BY THE NUMBERS

- \$3.5 MILLION**
Annual Energy Savings
- Nearly **100,000**
Street Lights
Converted to LED
- Reduced Greenhouse Gas
Emissions Equivalent to Removing
3,800 CARS
From the Road Each Year

LET US KNOW! 
Report street light issues, outages
and make repair requests:
phoenix.gov/atyourservice or
602-495-5125

Learn more: [Phoenix.gov/LED](https://phoenix.gov/LED)

GOAL 1

Achieve net-zero GHG emissions for municipal operations electricity use by 2030 through renewable energy projects, energy efficiency upgrades, and utility partnerships.

TARGET 1

100%

BASELINE

3%

SES1.1

Quickstart Actions

Install solar energy generation systems on affordable housing neighborhoods.

City housing developments will include solar power generation as part of the APS Solar Communities Program.

CITY LEAD // Housing

PARTNERSHIPS // APS

TIMEFRAME // Short Term

SES1.2

Quickstart Actions

Replace lighting in municipal operations with light emitting diodes (LEDs) to reduce electricity consumption.

Replacing incandescent and fluorescent lighting in municipal operations with LEDs results in lower electricity consumption and longer lifetime of the device.

CITY LEAD // Public Works, Convention Center, Police, Information Technology Services, Water Services, Aviation

PARTNERSHIPS //

TIMEFRAME // Short Term

Choice Neighborhoods Energy-Efficient Housing– Housing Department

The Choice Neighborhoods redevelopment of the Edison-Eastlake Community will include LEED for Neighborhood Development (LEED ND) certification and architectural guidelines that create “Enterprise Green Communities” (a green building certification program administered through enterprisecommunity.org). The community-driven redevelopment effort will provide new mixed-income, energy-efficient housing that will become a showcase for sustainable development. The Aeroterra Community is a HOPE VI redevelopment project that replaced obsolete public housing units with mixed-income energy efficient, Enterprise Green Communities-certified buildings with solar panels. In addition, the APS Solar Communities Program will see new carports and solar panels installed at Monroe Gardens, Fillmore Gardens, Marcos de Niza Apartments, Summit Apartments, Sunnyslope Manor, and Washington Manor Apartments.



**Plans for Sidney P. Osborn as part of the Choice Neighborhoods Grant (bottom)
and the installed solar panels at Fillmore Gardens (top).**

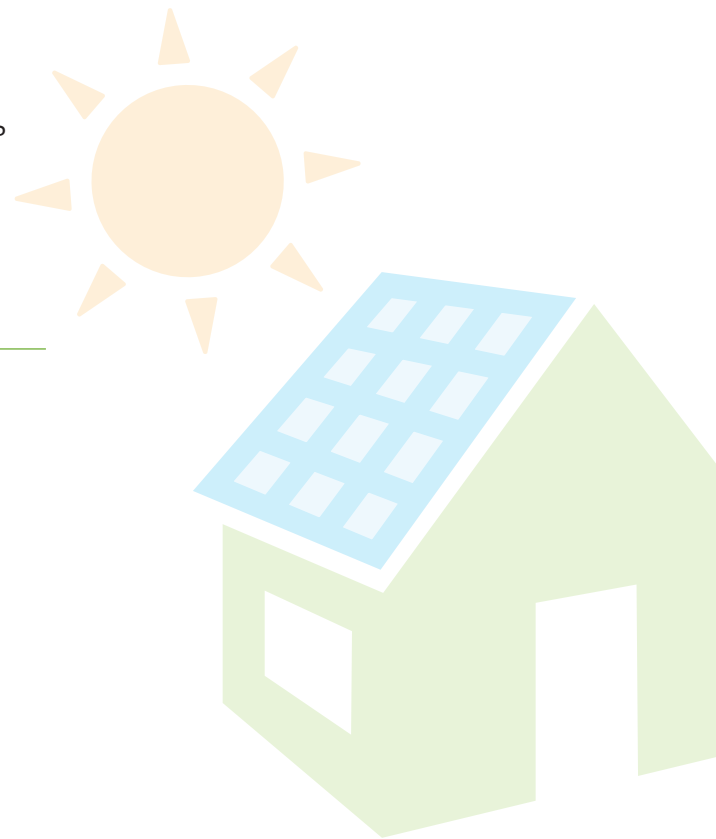
SES1.3*Ongoing Actions***Double the solar energy generation systems installed on city-owned infrastructure adding 30MW of new solar capacity by 2030.**

The cost of solar photovoltaic systems has dropped 80% from 2010 costs, and where site conditions are normal and utilities pay full avoided costs for self-generation, solar rooftop, ground mount and carport arrays now provide electricity at cost parity with utility company power. The city energy team has developed over 40 behind-the-meter solar projects on city properties, ranging from 3 kW to 5 MW.

CITY LEAD // Office of Sustainability Valley

PARTNERSHIPS // Public Works, Public Transit, Valley Metro, APS, SRP

TIMEFRAME // Long Term

**SES1.4***Ongoing Actions***Replace heating, ventilation, and air conditioning (HVAC) equipment units to increase energy efficiency and phase out R-22 refrigerant.**

The Montreal Protocol requires the U.S. to reduce its consumption of HCFCs by 99.5 percent necessitating that equipment utilizing refrigerants be phased out. Approximately 300 of 900 HVAC units using this R-22 refrigerant have been replaced.

CITY LEAD // Public Works

PARTNERSHIPS //

TIMEFRAME // Medium Term

SES1.5*Ongoing Actions***Use Energy Management Plans to identify opportunities to reduce energy use and cost at city-owned facilities.**

As part of the facilities maintenance program, an energy management program (EMP) is used that includes ongoing energy audits to identify opportunities to reduce energy use and cost.

CITY LEAD // All Departments

PARTNERSHIPS //

TIMEFRAME // Short Term

SES1.6*Ongoing Actions***Contract with Partners to secure 250MW of utility-scale renewable energy projects, to offset or displace 100% of utility-provided electricity consumed in city operations by 2030.**

After lowering city operations energy use through energy conservation and efficiency programs, and building on-site solar projects to the extent practical, offset the remaining electricity used in city operations through utility-scale renewable energy projects. These may be developed by a range of procurement tools that assure financial responsibility to our taxpayers, minimal financial and business risks to city budgets and verifiable additionality of carbon reduction to city operations.

CITY LEAD // Office of Sustainability

PARTNERSHIPS // APS, SRP, Renewable Energy Providers

TIMEFRAME // Medium Term

SES1.7*Pending Actions***Install solar energy generation systems at Aviation Department properties, including Phoenix Sky Harbor International Airport.**

There are solar energy generation systems at Sky Harbor International Airport. Possible future solar energy system installations are being considered through a partnership with APS or through solar service agreements (SSA).

CITY LEAD // Aviation

PARTNERSHIPS // APS

TIMEFRAME // Long Term

**SES1.8***Pending Actions***Install solar energy generation systems at landfills.**

Landfills are potential candidates for placing large solar energy generation systems. The SR-85 landfill has an existing 10 MW solar field operated by Arizona Public Services (APS) and other portions of the 2,650-acre landfill site are amendable to additional solar projects.

CITY LEAD // Public Works

PARTNERSHIPS // APS

TIMEFRAME // Long Term

Install solar energy generation systems at water and wastewater treatment plants.

Installation of solar energy generation systems at water and wastewater treatment plants are being considered similar to the Solar Power Facility at the Lake Pleasant WTP solar power facility that was completed in 2013 in partnership with SunPower Corp. through an SSA.

CITY LEAD // Water Services

PARTNERSHIPS // SunPower Corp.

TIMEFRAME // Long Term



Lake Pleasant WWTP that produces 7.5 MW of solar power in partnership with SunPower Corp. The installation is on 30 acres and has 22,936 solar panels saving \$4.2 in cost savings over the 20-year life of the system. ²²

SES1.10

Pending Actions

Emerging Technologies Program research new and innovative ways to save energy for municipal operations.

Investigate new and innovative ways that save energy by evaluating technologies that reduce cooling loads in a facility.

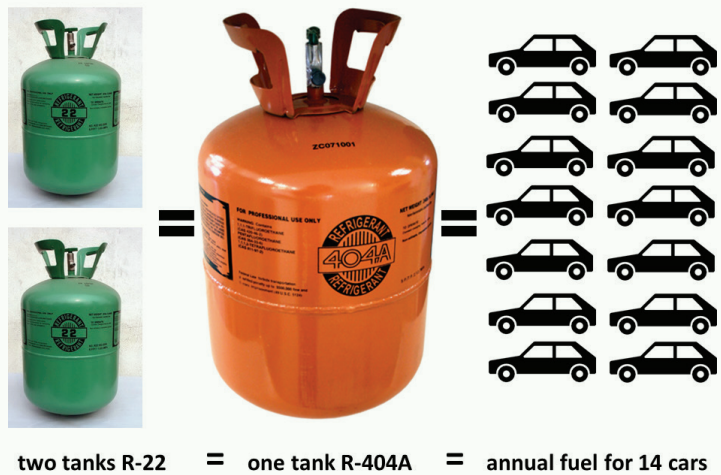
CITY LEAD // Public Works

PARTNERSHIPS // Office of Sustainability

TIMEFRAME // Medium Term

HCFCs and R-22 Refrigerant

As part of Action SES2.2, hydrochlorofluorocarbons (HCFCs), like R-22, are chemicals used as refrigerants in heating, ventilation, and air conditioning systems that have a higher potential to absorb heat than carbon dioxide and need to be replaced as part of the Montreal Protocol.^{23, 24}



SES1.11*Pending Actions***Reduce energy consumption at City facilities by 30% (2012 baseline) by 2030.**

Electricity consumed by municipal operations of the City of Phoenix totaled about 581,000,000 kWh in 2020, or about 5% of all electricity used in the city limits. Services that consume that energy include emergency response; neighborhood services, housing, elderly and other community services; water treatment and delivery, and wastewater treatment; aviation services at three airports; monitoring and environmental services; convention and cultural facilities; and support services. Energy consumption will be reduced by through increased building and process efficiencies.

CITY LEAD // Office of Sustainability

PARTNERSHIPS // All Departments

TIMEFRAME // Medium Term



Local Government Energy Efficiency Examples



Phoenix Convention Center

Phoenix Convention Center (PCC) staff began evaluating potential areas for energy reduction improvements in 2015. Partnering with APS to capture the benefit of its Rebate Program, PCC has completed seventeen projects of which thirteen were eligible for rebates. Over the past 5 years, electrical staff and contractors have replaced or upgraded lamps and lighting equipment, saving approximately \$700,000, reducing usage by 1.84M kWh, and earning rebates totaling \$170,000. Based upon the US Energy Information Administration's annual average for residential electricity usage, the PCC reduced its electricity usage equivalent to that of 170 homes. From stairwells, garages, meeting rooms and food court area over 7,725 lightbulbs and lighting fixtures have been installed, all while planning, ordering materials and completing projects around event activity, other priority facility requests, routine and preventative maintenance tasks. Based upon a recently completed energy audit, the Phoenix Convention Center will continue to implement energy reduction materials and systems over the next 2-5 years.

Aviation Department

The Aviation Department reduced energy use by 17.28 percent between 2009 and 2018 to meet the Better Building Challenge adopted by the city of Phoenix. (Note: PHX Sky Train® is not included, as it was not in service in 2009). The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Level II Energy Audits completed in 2015 were the basis of the Strategic Energy Management Plan and additional Investment Grade Energy Audits have been done. The update to the Aviation Department Design and Construction Services - Design Standards has been completed and is in the process of being implemented. The Standards will focus on procuring more energy efficient equipment during new construction. Recent projects include: New HVAC control system with optimization at 44th St. Sky Train Station® Chiller Plant; Variable Frequency Drive Installation for Condenser Pumps at the Rental Car Center. Conversion to LED: North Runway and high-speed turn-offs, Terminal 4 Departure /Arrival street lighting and High-Profile Parking Lot light, at East Economy Garages A & B, and the Terminal 4 Garage.

GOAL 2

Support energy-efficiency upgrades to existing buildings by developing three new community-wide conservation and renewable-energy programs by 2025.

TARGET 2

3

BASELINE

0

SES2.1 *Ongoing Actions*

Provide services and products to enhance and promote the provision of safe, efficient, sustainable and affordable residences and neighborhoods.

Administer programs citywide that provide low- and moderate-income Phoenix residents access to housing rehabilitation services for homeowners and renters, which address emergency health and safety concerns, stabilize critical systems, remediate lead hazards, and improve energy efficiency; and preserve naturally occurring affordable rental housing.

CITY LEAD // Neighborhood Services

PARTNERSHIPS // Non-profits, Small businesses, Community Partners

TIMEFRAME // Short Term

SES2.2 *Pending Actions*

Attract sustainable and inclusive businesses by developing entrepreneurship and leadership programs to achieve 2050 goals.

Create, launch and lead a new business attraction strategy designed to recruit both national and international low and post-carbon companies to the city of Phoenix. Develop an inclusive entrepreneurship program that addresses the systemic barriers to wealth generation and small business formation, serves communities most impacted by the effects of climate change and supports and promotes the growth of entrepreneurs and innovators developing business models around climate action.

CITY LEAD // Community and Economic Development

PARTNERSHIPS // ASU, Workforce Board, MCCC

TIMEFRAME // Short Term

SES2.3*Pending Actions***Strongly advocate for distributed solar energy systems (rooftop and carport solar) and for a cleaner electric grid, with more utility-scale solar arrays.**

As the largest city in Arizona, Phoenix needs to lead the advocacy for a cleaner grid and increased access to solar. With direction from the Mayor and City Council, the city will speak to utilities, other levels of government and the Arizona Corporation Commission to allow the city to be a leader in renewable energy.

CITY LEAD // Office of Government Relations, Office of Sustainability

PARTNERSHIPS //

TIMEFRAME // Medium Term

Solar Energy and Phoenix

The Arizona Corporation Commission (ACC), an elected commission of five, manages state utility policies, including Arizona Renewable Energy Standard and Tariff (AZ REST). The AZ REST, passed in 2006, requires regulated utilities to provide at least 15% of retail sales from renewable energy by 2025. All annual reporting since 2012 has required at least **30% of the utilities' requirement under the standard come from distributed energy sources, or behind the meter systems that are located on the customer's premises**. The 30% "carveout" for distributed generation is a strong incentive for utilities to encourage residential and small commercial rooftop solar energy generation, and APS has now over 50,000 behind-the-meter solar generators tied to its grid.

Compared to neighboring states, Arizona's current REST is the least ambitious. (New Mexico: 40% by 2025, 80% by 2040; California: 44% by 2024, 52% by 2027, 60% by 2030; Nevada: 50% by 2030; Colorado: 30% by 2020; Arizona: 15% by 2025, 80% by 2050, 100% by 2070)

Environment America Research and Policy Center publishes an annual report, 2020 Shining Cities, which reviews and ranks American cities by their level of adoption of solar energy production within their city limits. Total solar capacity, per capita capacity, and total solar production are reported, along with brief summaries that explain why, for example, Phoenix, L.A., and San Diego host significantly more solar energy than Burlington and Bangor.

With 272.4 MW of installed solar in the city limits, and 164 watts per person, Phoenix ranks 4th nationally by total capacity installed, and 8th per capita. The relative strength among metropolitan areas of solar industries depends on the relative strength of the solar resource, state renewable energy policies, and the policies of electrical utilities about climate and pollution issues. While the first of these factors suggests that Phoenix (and Las Vegas) would lead the nation in solar adoption, state and utility policies pull L.A. and San Diego into 1st and 2nd place rankings in that report. Shining Cities recommends that cities:

- Establish goals for solar energy adoption and programs to meet those goals.
- Implement solar access ordinances to protect residents' right to generate solar energy on their own property.
- Make permitting, zoning and inspection processes easy, quick and affordable. In June 2021, City Council voted to update regulations, including the fire code and fee structure, to make it easier and more cost effective for residents to have solar panels installed. Permits are expected to double as a result of this change.
- Expand access to solar energy to apartment dwellers, low-income residents, small businesses and nonprofits through community solar projects and third-party financing options, such as power purchase agreements.
- Implement policies that support energy storage, electric vehicle smart charging and microgrids.
- Require new homes and buildings to be built with solar panels, or at least be constructed to be "solar-ready," and
- Support and push for strong state-level solar policies.

Affordable Housing Programs

Neighborhood Services Department’s community development programs’ goal is to create homeownership opportunities for Phoenix’s low- and moderate-income residents. The 2021 closeout of the South Phoenix Village Single-Family Infill Redevelopment project completed construction of 126 new build single-family homes is a great example of the city’s commitment. The homes were built with the highest expectation of energy efficiency and sustainability results in mind; and increase the number of affordable housing options throughout the city.

The Housing Rehabilitation program, also administered by the Neighborhood Services Department, has completed repair services to over 1,100 residential structures, most in dire life-threatening situations, to eliminate environmental, health, and safety hazards and provide healthy living environments. Housing repair services address emergency and critical system repairs (e.g. plumbing, electrical, and roofing). Other housing rehabilitation program opportunities exist under the Lead Safe Phoenix and Weatherization Assistance programs. Lead Safe Phoenix focuses on the reduction of lead hazards, to ensure safe areas for children under 6 years of age to grow and develop in healthy and safe households. The Low-Income Weatherization Assistance Program concentrates on decreasing energy consumption and improving indoor air quality for residences within the 200% Federal Poverty Level.

New Roof



New Insulation



New EnergyStar Appliances



A South Phoenix home with electricity bills over \$400/month and lead hazards underwent renovation through NSD Weatherization, Lead Hazard Control and HOME Rehab receiving LED lighting, new roof, all new EnergyStar appliances, and was completely replumbed.

GOAL 3

Promote development of community-energy projects, including microgrids, that improve the sustainability and resilience of the surrounding community's electricity grid.

TARGET 2

To be determined

BASELINE

1

SES3.1

Pending Actions

Install microgrids in city-owned facilities that serve the City's redundancy needs and utilities long-term energy goals.

During the 23rd Ave Wastewater Treatment Plant (WWTP) Power Redundancy study, Phoenix partnered with APS to install a microgrid that would serve both the city's power redundancy needs and APS's long-term goals. Additional power redundancy studies will be conducted at different facilities. Microgrids will be installed at those facilities identified to show a benefit to the power redundancy needs at those locations.

CITY LEAD // Water Services

PARTNERSHIPS // APS

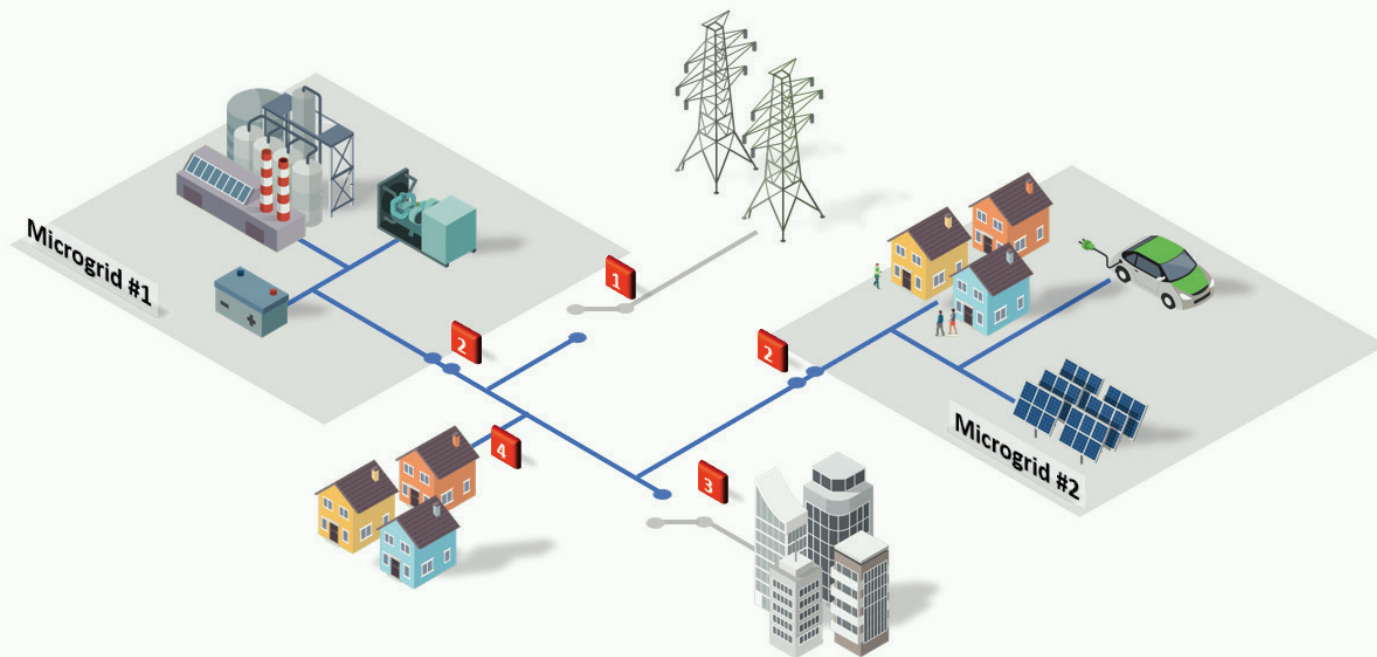
TIMEFRAME // Short Term

Microgrids

As part of **Goal SES5**, microgrids are “mini electricity grids” that can be powered independently from the utilities by on-site generators, renewable energy sources, and energy storage devices to maintain power in highly sensitive areas, like wastewater treatment plants, or in residential neighborhoods.²⁵

23rd Ave WWTP Power Redundancy Study

A **microgrid** was installed at the 23rd Ave WWTP that would benefit the city’s critical infrastructure power redundancy needs and APS’s long term goals. A microgrid is a local energy grid that can disconnect from the traditional grid and function autonomously without disrupting operations. In times of crisis, this capability is important to the continued operation of water and wastewater treatment plants. During these times, the **microgrid** can use its own local energy generation from solar energy generation systems, emergency generators or an on-site battery system. Once the crisis is resolved, the microgrid can then be connected to the traditional grid. This is also useful if energy generation in the surrounding community is disrupted and can provide resiliency and stability to the grid. As part of the installation, Tier 2 generators were replaced with more stringently regulated Tier 4 generators which will significantly reduce emissions.



Industrial and residential microgrid examples.²⁶

GOAL 4

Design and construct all new buildings within the city to Living Building Challenge, Net-Positive Design, or equivalent design standards by 2050.

TARGET 4

All new buildings
in 2050

BASELINE

1

SES4.1

Pending Actions

Update zoning and other codes and streamline permitting processes for green/sustainable construction and renewable energy (solar) projects to reduce barriers for consumers.

Updating zoning and other planning and development codes to promote green/sustainable construction projects to match internationally recognized sustainability codes. Currently, compliance with the 2012 International Green Construction Code is voluntary. A study of options for ordinances for electric vehicle charging stations and associated infrastructure is being conducted. The city continues to explore Photo Voltaic Solar design software solutions that would ensure code compliance, eliminate the need for plan review and reduce solar permit processing time.

CITY LEAD // Planning and Development

PARTNERSHIPS //

TIMEFRAME // Short Term

SES4.2

Pending Actions

Develop embodied carbon calculators applicable to the Phoenix climate and building materials used within the region.

Work with providers of embodied carbon calculators to develop calculators applicable to our climate zone and test those tools on a sample of the building stock. These calculators can then be used to determine which methods of construction can be used to lower GHG impact.

CITY LEAD // Planning and Development

PARTNERSHIPS //

TIMEFRAME // Medium Term

SES4.3*Pending Actions***Design and construct all city of Phoenix municipal operations facilities to Living Building Challenge, Net Positive Design, or equivalent design standards by 2050.**

The Living Building Challenge is an international sustainable building certification program that promotes the most advanced measurement of sustainability in the built environment. On July 6, 2018, the Phoenix City Council adopted the 2018 International Energy Conservation Code (2018 IECC), which is a model code that establishes minimum design and construction requirements for energy efficiency.

CITY LEAD // Planning and Development

PARTNERSHIPS //

TIMEFRAME // Long Term

SES4.4*Pending Actions***Develop incentives and standards to foster private sector developments that meet or exceed the Living Building Challenge, Net Positive Design, or equivalent design standards by 2050.**

New incentives to foster private sector developments that meet or exceed the Living Building Challenge, Net Positive Design, or equivalent design standards, are necessary to spur innovation, create showcase projects, and build capacity in the industry. Planning and Development will work with industry to accelerate high-performance building in the region. Phoenix is currently in the plan review stage for construction of the city's first net-zero building in collaboration with the Sonoran Studio.

CITY LEAD // Planning and Development

PARTNERSHIPS // All Departments

TIMEFRAME // Long Term

Living Building Challenge

As part of **Goal SES4**, all new buildings will be designed and constructed to meet the Living Building Challenge, Net Positive Design, or equivalent by 2050. This means that these buildings will be self-sustaining in energy and water use and over the life of the building will be net-positive contributors to the surrounding community.

Sonoran Studio Building

The Sonoran Studio Building will be Arizona's first Certified Living Building. It is designed by Architectural Resource Team and will be the future home of their architectural offices. This building will be on the leading edge of regenerative design. This is a project that will generate all of its own energy with renewable resources. It will capture and treat its water on-site, meeting the important implementation targets outlined in Phoenix's climate action goals. The Building shall be Net Zero energy and incorporate no toxic materials in its construction. Building design features include solar photovoltaic panels, Zero Mass Water hydrological panels, composting toilets, a rainwater harvesting system and grey water recycling system.

The intent of the design is to meet all water demands within the carrying capacity of the site and mimic natural hydrological conditions, using appropriately sized and climate-specific water management systems that treat, infiltrate or reuse all water resources on site. Project water use and release must work in harmony with the natural water flows of the site and its surroundings. One hundred percent of the project's water needs must be supplied by captured precipitation or other natural closed loop water systems, and/ or by recycling used project water, and must be purified as needed without the use of chemicals.



Sonoran Studio²⁷

GOAL 5

Obtain Electricity from an electricity grid that is carbon-neutral by 2050.

TARGET 5

By 2050, electricity will come from an electricity grid that is net-zero.

BASELINE

33%

SES5.1

Pending Actions

Increase renewable and clean energy resources.

APS and SRP are the utilities that serve Phoenix and the surrounding areas. By 2030, APS set a goal to achieve a resource mix that is 65 percent clean energy, with 45 percent coming from renewable energy by 2030. APS has also announced a goal to deliver 100 percent clean, carbon-free electricity by 2050. SRP set a goal to reduce the amount of carbon dioxide emissions emitted per megawatt-hour by 62 percent from 2005 levels by 2035 and by 90 percent by 2050.

CITY LEAD // Office of Sustainability

PARTNERSHIPS // APS, SRP

TIMEFRAME // Long Term

SES5.2

Pending Actions

Leverage the City's purchasing power to procure 100 percent renewable electricity for City of Phoenix municipal operations.

Municipal operations are responsible for 3.8 percent of Phoenix's total GHG emissions from electricity use as of the 2018 GHG emissions inventory. To demonstrate leadership, the City had committed to procure 100 percent renewable electricity for municipal operations by 2050. An initial project with SRP will provide 10.7 MW of electricity generated from utility-scale solar farms.

CITY LEAD // Office of Sustainability

PARTNERSHIPS // APS, SRP

TIMEFRAME // Short Term

TRANSPORTATION





TRANSPORTATION SECTOR (TS) GOALS

Goal TS1: Implement the city's Complete Streets Policy and Active Transportation Program to encourage multiple modes of transportation.

Goal TS2: Increase the community-wide use of low carbon fuels (i.e., fuels other than gasoline and diesel).

Goal TS3: Promote electric vehicles (EVs) and related charging infrastructure in the community to triple the EV charging capacity on city property by 2025 and support EV adoption resulting in 30% of new car sales being EVs by 2030.

Goal TS4: Reduce the percent of single occupant vehicle trips taken to 60% of all trips, while maintaining a thriving economy.

2050 GOAL

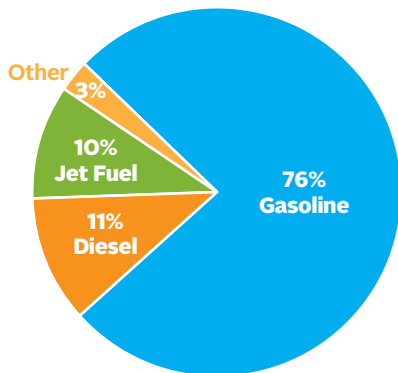
All forms of transportation will be fueled with net-zero GHG sources of energy. Make walking, cycling, and transit commonly used, enjoyed, and accessible for every Phoenix neighborhood, including our disabled community. This goal will result in 90% of the population living within one-half mile of transit, and projects 40% of the population will choose to commute by walking, biking, transit or car share.

 **12.9
BILLION**

miles driven per year.³³
(or 27,000 trips to the
moon and back!)



**Transportation Sector
GHG Emissions by Fuel Type
(2018)²⁸**



\$31.5 BILLION³¹

funding for



 **3.78**

Trips per day per person.²⁹

 **84%**

of travel will still be by
passenger automobile
in 2030.²⁹

 **552**

electric vehicle charging
stations in Phoenix
metro area.³⁰

 **1.7%**

of travel by bus in 2019.³²



BACKGROUND

A well-connected city drives innovation. Cities must provide a transportation system that gets residents to where they want to go without needing to jump into a car alone or to travel long distances to get to their destination. Currently, **GHG emissions from transportation are increasing as the population grows and the city is built out to accommodate this growth.** According to the 2018 GHG community inventory, forty-six percent of all GHG emissions in Phoenix are from transportation, with the majority being from use of gasoline fuel in passenger vehicles. Eighty-four percent of travel likely will continue to be done by passenger vehicle in 2030.²⁹ To become a net-zero GHG-emissions city, significant reductions need to be made in this sector through planning and development of communities and transportation infrastructure that allows for modes of travel other than the single occupancy, fossil-fueled vehicle. This can be achieved by designing Complete Streets to accommodate safe and accessible multimodal travel, like walking and bicycling. The path to decreasing greenhouse gas emissions also includes an increase in consumption of non-conventional fuels or alternative fuels and eventual transition to vehicles powered by electricity or other carbon-free fuel. In addition, efforts must be made to make trips more efficient when possible, without affecting economic growth. By pursuing these goals, Phoenix can reduce its GHG emissions from transportation by 2050.

HIGH CAPACITY TRANSIT



CUMULATIVE PROGRESS JAN. 1, 2016–JUNE 30, 2020



LRT Ongoing Projects

1



CAPITOL/I-10 WEST EXTENSION

- Conducted public meetings for input on options for the downtown route, potential extension to Desert Sky Mall and potential project phasing options
- Continued preparing the federally required Environmental Assessment
- Awarded \$2 million federal transit-oriented development grant

2



NORTHWEST EXTENSION PHASE II

- Completed design and began the engineering phase
- Continued surveying to identify underground utilities

3



SOUTH CENTRAL EXTENSION/ DOWNTOWN HUB

- Completed final design and began the engineering phase
- Began construction in October 2019 and began utility relocation
- Completed street improvements at three intersections to help avoid future traffic impacts
- Opened South Central Extension Community Office (2018)
- Awarded two allocations of \$100 million each from the FTA (2019/2020) and a \$2 million federal business assistance grant (2016)

Light Rail Transit (LRT) Completed Projects

4



50TH STREET STATION

- Opened April 25, 2019
- Received Sustainable Infrastructure Award from Arizona State University's Metis Center

5



NORTHWEST EXTENSION PHASE I

- Service began March 19, 2016

LRT Deferred Projects

6



NORTHEAST EXTENSION

- Deferred to end of T2050 program by Phoenix City Council (2018)

7



WEST PHOENIX TRANSIT CORRIDOR STUDY

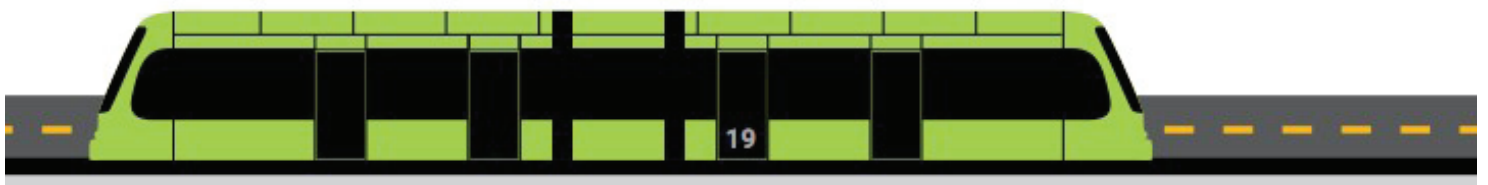
- Deferred to end of T2050 program by Phoenix City Council (2019)

Bus Rapid Transit (BRT) Ongoing Projects



BRT SERVICE

- Began extensive public education and outreach for input on six potential corridors



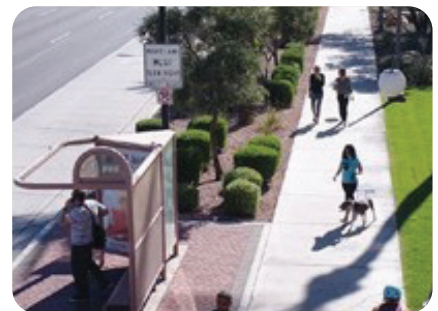
T2050 High Capacity Transit Progress through June 30, 2020.

Local Government Leading the Way

The city of Phoenix has many initiatives and plans that are addressing the transportation needs of its residents. Plans include the Comprehensive Bicycle Master Plan, the Key Corridor Master Plan, and the Active Transportation Plan. Goals of these plans include increasing bi-directional bike lanes from 1,065 miles to 1,995 miles by 2050. Additional work is being done to make the canals multi-use and by 2050, 90 percent of the canals will feature paved paths and have connections with crossings at major streets. Part of that work being done in partnership with SRP has resulted in the Grand Canalscape, a safe and continuous commuter route for bicycle and pedestrian traffic from the city of Tempe to Interstate 10.

Reinvent PHX is an effort to develop walkable, opportunity-rich communities connected to light rail. Part of this work was development of the Walkable Urban Code that regulates development near the light rail with requirements including increased shade to make the walk more comfortable. Most residents in Phoenix prefer to use passenger vehicles for travel with 84 percent of travel being projected to be completed by passenger automobile in 2030, so there is increased focus on the rollout and development of electric vehicles and electric vehicle charging infrastructure. GHG emissions from travel by airplane must also be considered. The Aviation Department (AVN) is implementing an environmental management information system in 2021 and this system will include tools to actively track and notify status of greenhouse gas emissions. AVN is also including an environmental overview and sustainability strategy as a step in the Comprehensive Asset Management Plan (CAMP) implementation plan. Phoenix Sky Harbor International Airport has achieved emissions reduction every year since 2014, primarily through energy conservation projects. In 2020, the airport achieved a Level 3 Certification in the Airport Carbon Accreditation Program. To continue to reduce GHG emissions, the manufacturers of aircraft (Boeing, Airbus, etc.) and their airline customers have been investigating new, more sustainable fuels for commercial scale use. In conversations with our industry partners, AVN is ready to facilitate the adoption of these new fuels once available.

Thanks to all these considerations, Phoenix residents will be available to have a variety of transportation options that suit their needs.



KEY ACHIEVEMENT



T2050

Transportation 2050 (T2050) is a 35-year initiative to improve streets and transit service, including bus service and light-rail construction, throughout the city. The approval of Proposition 104 by voters in 2015 resulted in a 0.7 percent sales tax that replaced a 0.4 percent sales tax and will provide roughly half of the funding. This is supplemented with federal and county funds, passenger fares and other sources for a total of \$31.5 billion. Approximately 86 percent of funds are dedicated to public transit and approximately 14 percent to streets. Through T2050, Phoenix's arterial-street maintenance cycle will be cut nearly in half, from 65 years to 33 years. T2050 will provide an estimated \$2.3 billion for major street-improvement projects, such as new bridges and new roads, to help connect and complete the city's roadway network. Transit improvements entail tripling the number of light rail miles in Phoenix by adding 42 miles of high-capacity corridors to the Valley's current 20-mile light rail line. The bus service network is being expanded to include 75 miles of bus rapid transit and corridors are being evaluated. Engaging with the public is vital to understanding residents' transportation needs. Staff members host open houses and public meetings and attend community events to provide information and gather input.

Public input is sought on a variety of topics such as planning bus routes and extensions, future station locations for light rail, potential bus rapid transit corridors, building and improving roads, and creating and improving bike lanes. Beginning in March 2020, in-person public outreach meetings were temporarily suspended, and staff members were directed not to attend community meetings due to the pandemic; however, many outreach events occurred prior to this time. Staff members also adapted to a new way of conducting business by hosting virtual public meetings accessible by phone or computer — complete with presentations, a variety of speakers and public question-and-answer segments.

The Citizens Transportation Commission (CTC) was established in 2015 by the Mayor and Phoenix City Council for the T2050 program. Fifteen commissioners are appointed by the City Council to address street and transit needs, provide oversight on the expenditure of funds and make recommendations on plan elements. The Phoenix City Council's Transportation, Infrastructure and Innovation subcommittee provides guidance, approvals and recommendations on policies related to infrastructure, transportation, transit, streets, aviation/airport, water, technology, smart cities, innovation and sustainability. Additional oversight is provided through the City Council, and opportunities for public input occur at these meetings as well. For more information, visit phoenix.gov/T2050/



GOAL 1

Implement the city's Complete Streets Policy and Active Transportation Program to encourage multiple modes of transportation.

TARGET 1

60% Single Occupancy Vehicle Travel

BASELINE

85%

TS1.1 *Ongoing Actions*

Increase bike lane mileage in the city of Phoenix and ensure the bicycle network is connected and comfortable for riders of all ages and abilities.

Bicycling promotes a healthy lifestyle and has significantly lower emissions and requires much less infrastructure than a motor vehicle. Phoenix City Council adopted the Comprehensive Bicycle Master Plan in November 2014. This plan will help develop a comprehensive bicycle network that is fully connected with the Phoenix community and other transportation networks. There are 1,065 miles of bi-directional bike lanes with a goal of 1,995 miles by 2050. In addition to the Comprehensive Bicycle Master Plan, the T2050 Mobility Improvements subprogram was established to improve neighborhood mobility through the construction of new sidewalks and multi-modal connectivity through the provision of new bicycle facilities.

CITY LEAD // Street Transportation

PARTNERSHIPS //

TIMEFRAME // Long Term

TS1.2 *Pending Actions*

Create a network of multi-use paths along the existing canal network in Phoenix.

The canal network is used to transport water throughout Phoenix and provides an opportunity to incorporate alternative mobility improvements along its banks. In 2020, Phoenix opened the initial 12 miles of shared use path along the Grand Canal in Central Phoenix from Interstate 17 to the city of Tempe. This shared use path provides safe and convenient walking and biking access between neighborhoods, transit corridors, local employment, shopping, education and recreation centers. The next segments will be under design in late 2020 with implementation by late 2023. 45 percent of canals have paved paths. By 2050, 90 percent of canals will have paved and connected paths, with crossings at major streets or barriers.

CITY LEAD // Street Transportation

PARTNERSHIPS // ADOT, MAG, SRP

TIMEFRAME // Long Term

Little Canyon Trail

31st Avenue Between Camelback Road and Missouri Avenue

For much of its recent history, the portion of lateral 14.4 stretching south along the unpaved 31st Avenue alignment from Missouri Avenue to Camelback Road exemplified the unmet public potential of the Valley's historic canal corridors. Hemmed in by graffiti-marred block walls, the open ditch and dirt trail answered the utilitarian call of providing maintenance access to the lateral, nothing more. The Little Canyon Trail Public Art Project changed that, transforming the unsightly ½-mile corridor into a model for how even the smallest canal segments can become beautiful public spaces and safe multi-modal routes. Designed by artist Laurie Lundquist and landscape architect The Sherman Group through a collaboration with the Office of Arts and Culture Public Art Program, Street Transportation Department and Parks Department, the enhanced trail closed an existing gap in the Phoenix's on-street bicycle trail network and created new canal-side destinations for the surrounding west Phoenix community. New seating areas, fencing, entry portals, durable path and shade trees turned the desolate, fragmented corridor into a source of beauty and community pride. The corridor's formerly exposed terrain now boasts nearly 100 shade trees, a 10-foot-wide path with a sinuous pavement pattern, high-efficiency pedestrian-level LED lighting, ADA ramps, a fence that traces a wavy line – like the flow of water – through the corridor, a landscaped roundabout the Colter Street cul-de-sac, and round, steel entry



portals embellished with cotton-blossom patterns, in recognition of the farms that once defined the area. These enhancements balance the corridor's need to assure ongoing maintenance of the irrigation lateral with providing safe passage for bicyclists connecting to the on-street bicycle trails south of Camelback Road and north of Missouri Avenue. They also expand the trail's function to provide shaded seating and gathering spots for people wanting to sit and view the canal. This expansion of public purpose both acknowledges the history of farming that the canal made possible, and the modern urban desire to make more of the vital canal corridors that traverse our Valley communities.³⁴

Develop a series of corridors with a strong emphasis on active transportation and connections to high-capacity transit corridors.

Two city-wide initiatives, the Key Corridor Master Plan (KCMP) and Active Transportation Plan, currently underway will help develop a more robust bicycle and pedestrian network throughout the 15 villages in Phoenix.

CITY LEAD // Street Transportation

PARTNERSHIPS // MAG

TIMEFRAME // Long Term

Grand Canalscape

In 2020, the city of Phoenix opened the initial 12 miles of shared use path along the Grand Canal in Central Phoenix from Interstate 17 to the city of Tempe. With limited resources and a growing city that requires alternative mobility improvements for a vital transportation network, the city of Phoenix Street Transportation Department partnered with the Salt River Project (SRP) to create a safe and continuous commuter route for bicycle and pedestrian traffic along the Grand Canal bank from the city of Tempe to Interstate 10. The overall goal of the Grand Canalscape is two-fold. The primary intent was to develop a continuous low-stress active transportation route for bicycle and pedestrian traffic along the Grand Canal bank. This shared use path provides safe and convenient walking and biking access between neighborhoods, transit corridors, local employment, shopping, education and recreation centers. The route also includes safe crossing facilities at arterial and collector street/trail intersections. The secondary intent of this project is to reintegrate the canals into the surrounding communities by incorporating public art, landscaping in areas of opportunity, and neighborhood access points to the path which provide better visibility, access, and ultimately appreciation of the extensive canal system in the Phoenix area. These projects will provide a safe route for bicycle and pedestrian traffic away from arterial streets and integrate the canals into the surrounding communities through improved access, public art and landscaping – with the goal of increasing usage and appreciation of one of our unique assets, the canal system in the Phoenix area. The designs, lessons learned, and experience gathered during this project provide a blueprint for further development of the Grand Canal along with other canals in the system such as the Western and Highline canals. The next segments will be implemented by late 2023.³⁶



TS1.4

Pending Actions

Develop communities that are walkable and have access to light rail as part of Reinvent PHX.

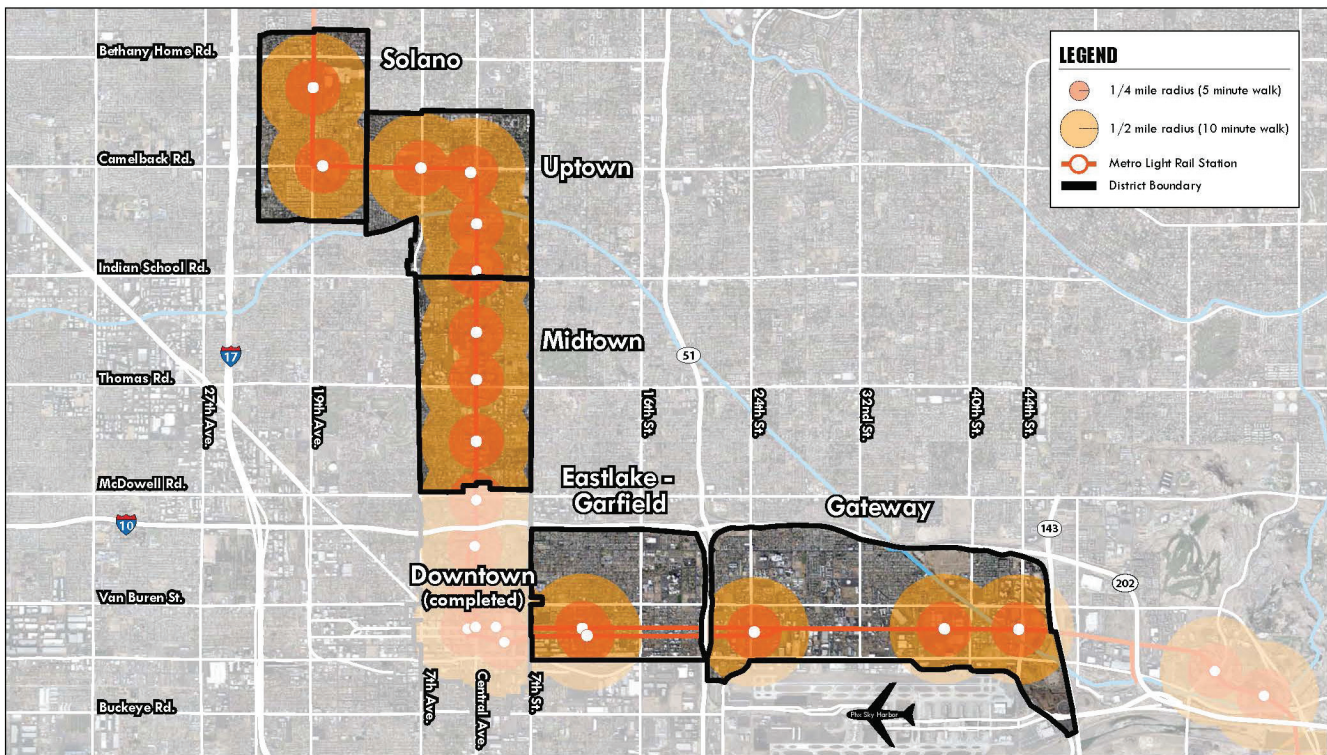
Reinvent PHX is a collaborative partnership committed to developing walkable, opportunity-rich communities connected to light rail. Five Transit oriented development (TOD) districts were identified and sustainability, health impact, and economic assessments were produced to create action plans for each district through district steering committees. The total acreage of expanded infill development within TOD areas is 403 acres. 707 affordable housing units have been developed within the TOD areas. Over seven miles of bike lanes have been added to TOD areas. This process establishes a new, transit-oriented model for urban planning and development along the city’s light rail system.



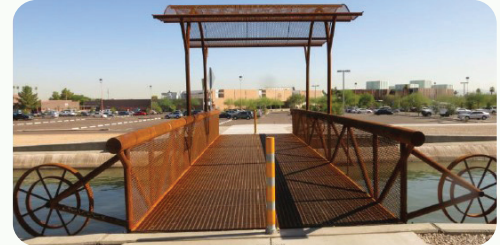
CITY LEAD // Planning and Development

PARTNERSHIPS // Community and Economic Development, U.S. Department of Housing and Urban Development, Arizona State University, Vitalyst Health Foundation

TIMEFRAME // Long Term



ReinventPHX
Project Map



Walkability

Passage is a collaborative, multi-faceted work of public art, by the Office of Arts and Culture and Street Transportation Department, that completes the series of improvements the Street Transportation team began in 2003 to improve pedestrian comfort and trail connectivity in the South Mountain community. The first project in the series was the 2005 Baseline Road Public Art Project (with Ten Eyck Landscape Architects), which improved the multi-use trail system of the area and added shade enhancements for transit riders along the Baseline corridor. The second was the 2009 Zanjero's Line - Highline Canal Public Art Project (also with Ten Eyck Landscape Architects), improving four miles of trail and crossings on the historic irrigation lateral along the base of South Mountain. Passage bolsters South Mountain Community Library's connection to its surroundings by fusing poetry and place with public

art. It combines "acoustic" chairs, plaza enhancements, poetry trellises and a new pedestrian crossing of the Western Canal. The library plaza and trellis enhancements were developed in partnership with the South Mountain Community College District and Phoenix Library Department. The final project component is a new bridge across the Western Canal. It was designed to link the library and South Mountain Community College campus with the Arizona Agribusiness and Equine Center commercial complex to the south. The immovable wheels flanking the bridge entrances are a visual play on the history of movable bridges that once spanned the Salt River Valley canals. The bridge was designed by Harries and Heder with percent-for-art funds administered by the Phoenix Office of Arts and Culture Public Art Program. It was built using Federal transportation enhancement moneys administered by the Phoenix Street Transportation Department. Combined with the public art of plaza and walkway, it strengthens pedestrian pleasures and access in a community of increasingly connected trails.

GOAL 2

Increase the community-wide use of low carbon fuels (i.e., fuels other than gasoline and diesel).

TARGET 2

100% Alternative Fuels or Electric

BASELINE

0.5%⁵

TS2.1

Ongoing Actions

All city of Phoenix fleet will be fueled by alternative fuels, including electricity.

The city fleet will continue to transition to low carbon alternative fuels. Currently, 73 percent of the fuel used by the fleet is alternative fuel.

CITY LEAD // Public Works, Public Transit, Aviation, Police

PARTNERSHIPS //

TIMEFRAME // Long Term

ELECTRIC BUSES

During the summer of 2020, Valley Metro tested battery electric buses from three different manufacturers on multiple urban, high density routes. Previous trials of electric buses, in 1994 and 2016, were unsuccessful because they were unable to provide the operating range necessary in the desert climate. The use of air conditioning causes the battery to deplete more quickly and limits the range of the bus to less than 100 miles. As technology has improved, the three buses tested were found to be able to be piloted on circulator routes without the need for fast charging. Valley Metro is pursuing an initial, small investment in electric buses to gain operational and maintenance experience, and determine the lifecycle costs of the electric buses in the Phoenix metro area. This will help create attainable goals for the acquisition of additional electric bus use in the region.³⁵



TS2.2

Ongoing Actions

The majority of new garbage trucks will be replaced with cleaner burning options such as compressed natural gas (CNG) or electric as they become available.

As part of cleaner air initiatives, diesel-engine solid waste trucks are being replaced with CNG-fueled ones, increasing air quality and reducing GHG emissions. Nearly every new garbage truck is powered by CNG and is slow filled overnight in the yard where they are maintained. CNG fuel reduces emissions and particulates and with overnight fueling saves employee time waiting in line to fuel daily, further reducing emissions. By 2030, the majority of existing garbage trucks will be replaced with cleaner burning CNG-fueled trucks or electric vehicle garbage truck options as they become available. The Solid Waste Field Services division utilizes a fleet of alternative fuel equipment to collect, reuse and recycle green organics, and bulk trash from approximately 400,000 residential customers each week and uses 100% alternative fuel, with 150 units using CNG, and 60 of which use ultra-low NOx CNG engines.

CITY LEAD // Public Works

PARTNERSHIPS //

TIMEFRAME // Medium Term



**Solid Works Garbage Trucks
being slow-filled with
compressed natural gas.**

TS2.3

Pending Actions

Advocate for state and local regulations that promote alternative fuel sales in the Phoenix metropolitan area.

Alternative fuels are fuels that are not gasoline or regular diesel. These fuels are used in place of fossil fuels to decrease GHG emissions. It is important to advocate for further local GHG emissions reductions from state and local regulations that promote alternative fuel sales in the Phoenix metropolitan area as directed by the Mayor and City Council.

CITY LEAD // Office of Government Relations

PARTNERSHIPS // ADEQ

TIMEFRAME // Short Term

GOAL 3

Promote electric vehicles (EVs) and related charging infrastructure in the community to triple the EV charging capacity on City property by 2025 and support EV adoption resulting in 30% of new car sales being EVs by 2030.

TARGET 3

To be determined

BASELINE

8,546 EVs registered in the city of Phoenix

218 Level 2 public electric vehicle charging ports installed throughout the city

Electric Vehicles and Electric Vehicle Supply Equipment

Electric Vehicle (EV) deployment is one of several measures that will greatly reduce emissions from mobile sources, particularly light-duty vehicles and medium-heavy-duty trucks, which account for approximately 66 percent of nitrogen oxides, an ozone precursor, and other hazardous air pollutants. In analyzing pathways for GHG reduction, the city of Phoenix has identified the need to promote and adopt electrification via wide-scale EV deployment to be among the primary solutions for reducing GHG reduction targets by 2050. Phoenix has committed to an ambitious goal of a 100 percent net-zero greenhouse gas emissions city fleet by 2050. Electric vehicle supply equipment (EVSE) deployment should be scaled to reduce range anxiety and encourage higher EV penetration rates as consumers become more confident in charging accessibility.

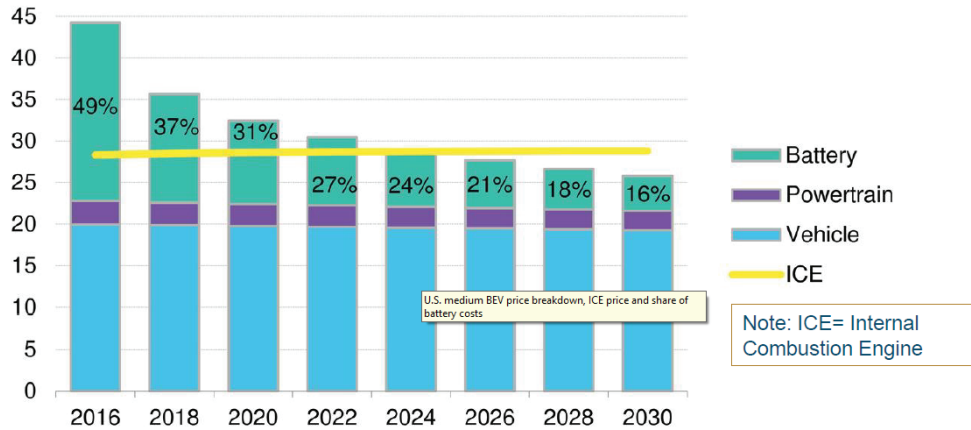
Electric vehicles provide many benefits to consumers, including lower maintenance, lower fuel cost, and zero tailpipe emissions. EV's result in **60 percent fewer GHGs from upstream emissions (electricity generation) as compared to internal combustion gasoline burning engines** and have the potential for significant improvement in local air quality, reducing both particulate matter and ozone. Although estimates vary on the adoption curve of electric vehicles, if ten percent of vehicles were electric by 2025, total transportation emissions would decrease by approximately 5 percent. In addition, EVs have a lower operating cost (with a cost per charge equivalent to \$0.30/gallon for daytime charging on “time-of-use” rates) and have the long-term potential for further emission reductions as the electricity grid decarbonizes over time. This possible action area includes providing increased electric vehicle charging infrastructure at home, work and public locations and on the road, and bulk purchasing of BEVs by the community to reduce upfront costs. Innovation in battery technology combined with extensive public charging availability in the next five years could reduce concern over the current shorter range of EVs.

Annual sales of new light-duty vehicles in Arizona fluctuate each year from roughly 385,000 to 400,000, and EVs account for approximately 2.3 percent of annual sales. This indicates that EVs are still in an early adoption phase. EV batteries are becoming more efficient, with longer range options, and cheaper to manufacture. Estimates show that the price of EVs will reach price parity with the internal combustion engine vehicles by 2024, as shown in the chart below. As of April 2021, the city of Phoenix fleet currently has one PHEV, and ten light duty EVs.

+ PEVs could reach price parity with conventional vehicles by 2024

EV and ICE vehicle upfront cost projection

\$2016 (thousand) and %



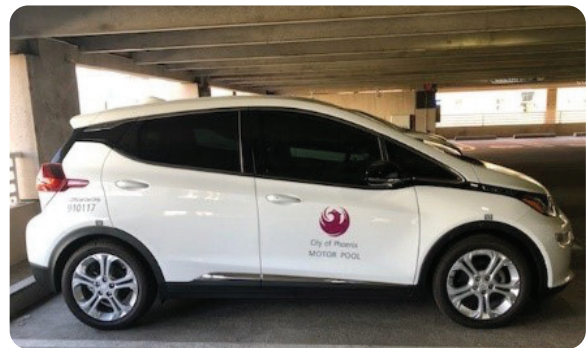
Source: BNEF. "Electric Vehicle Outlook 2019" (2019). Available at: <https://about.bnef.com/electric-vehicle-outlook/>

According to Arizona Department of Transportation, as of FY20, there are over 7.8 million vehicles registered in Arizona, and 34,898 vehicles registered as EVs.³⁷ Based on data collected from the US Department of Energy's Alternative Fuels Data Center, approximately 598 charging stations are located within the Phoenix metro area. Electrify America is a leader in EV charging and offers the most public DC Fast Chargers stations in the US and have deployed over 2,000 DC Fast Chargers at nearly 500 locations across 42 states, including Arizona. The city is currently collaborating with Electrify America on the possibility of locating additional DC Fast Chargers within the city of Phoenix boundaries.

Currently, there are over 100 different EV makes and models on the new and used markets for purchase and the promise of all major manufacturers adding more makes and models in the coming years. EVs made up approximately 2.4 percent of the US auto sales as of 2020. However, the growth in EVs is continuing to climb and by 2030, EVs will account for an estimated 27 percent of all light-duty vehicle sales.¹³

The city of Phoenix's clean air, clean energy, and GHG emission reduction targets require an ever-increasing percentage of EV market penetration. Phoenix will continue to collaborate with local utility companies to provide and promote EV and EVSE purchasing incentives, enact EV building codes, address EV equity concerns, as well as continue to provide community awareness and outreach for the EV programs.

The goal of the City of Phoenix EV Program is to promote the adoption of consumer light-duty EVs and PHEVs by increasing infrastructure availability, increasing community awareness, creating dealership and utility relationships, implementing EV ready building codes, and initiating an aggressive municipal green fleet replacement strategy to reduce GHG emissions from the transportation sector by 2050.



STATEWIDE PLAN FOR ELECTRIFICATION OF TRANSPORTATION

Arizona Public Service (APS), Tucson Electric Power (TEP) and other stakeholders developed the Statewide Transportation Electrification Plan (STEP) in 2020 that projected 1 million EVs will be on Arizona roads by 2030 and nearly 5 million by 2040. The 2020 STEP described the planning efforts by APS and TEP to support transportation electrification in Arizona to create a solid foundation for all subsequent policies, programs, and initiatives across the state. The information provided in this plan will be used to assist in future EV planning efforts and provide additional framework to develop city EV policies, programs and procedures.

TS3.1

Quickstart Actions

Complete construction of the Phoenix Sky Train®.

The automated PHX Sky Train® connects travelers between the METRO Light Rail 44th Street and Washington stop and the airport. 1.9 miles have been completed with 2.5 additional miles scheduled for completion by 2022.

CITY LEAD // Aviation

PARTNERSHIPS //

TIMEFRAME // Short Term

PHX Sky Train®

Providing a vital transit link to the region, the automated PHX Sky Train® connects travelers between the METRO Light Rail 44th Street and Washington stop and the airport. The PHX Sky Train® is an electric people-mover system that allows one of the country's busiest airports to alleviate roadway congestion and enhance customer service. The initial 1.9-mile-long PHX Sky Train® segment transports users to Phoenix Sky Harbor's East Economy Lot and Terminals 3 and 4 in less than 5 minutes. This convenient multi-modal connection improves ridership on the METRO Light Rail by both the traveling public and airport employees, further connecting our community with sustainable transportation options. By 2030, 93,142 passengers will take the PHX Sky Train® daily based upon a 2019 ridership study. Currently under construction, the final phase of the PHX Sky Train® will add 2.5 miles of guideway and connect to the Rental Car Center, completing the circuit and allowing the airport to retire its CNG bus fleet to the Rental Car Center. Completion of the final segment of the PHX Sky Train® in 2022 and construction of the West Ground Transportation Center at PHX will reduce an additional 69,000 metric tons CO₂e per year.



TS3.2**Quickstart Actions****Increase EV Infrastructure development in single-family, multi-family and commercial properties through incentives and building codes.**

PDD staff will collaborate with building organizations and other stakeholders to identify incentives and code considerations and ensure all concerns are addressed and incorporated into the building code adoption process. An EV Ready Building Code Policy will be developed and incentives addressing EV charging parking requirements for new multi-family and commercial construction developments and connection requirements for new single-family construction to include information on conduit, wiring, and electrical capacity. A strategy will be developed to streamline the administrative process and decrease application timelines for simplifying the City permitting process for property owners who wish to install charging infrastructure on existing single-family, multi-family, and commercial properties.

CITY LEAD // Office of Sustainability, Planning and Development

PARTNERSHIPS // APS, SRP, Developers

TIMEFRAME // Short Term

TS3.3**Ongoing Actions****Develop community outreach and EV engagement campaign and EV Roadmap Action Plan.**

Engage regional businesses and EV stakeholder groups to advance EV initiatives. Develop outreach campaigns to underserved communities to develop a targeted program to address mobility needs and access. Create city staff EV team to act as internal EV advocacy and outreach ambassadors to assist in informing Departments and participating in EV events. Engage EVAZ to collaborate on a regional level.

CITY LEAD // Office of Sustainability

PARTNERSHIPS // ASU, APS, SRP, Local Auto Dealers

TIMEFRAME // Short Term

TS3.4*Ongoing Actions***Implement equity principles into EV policies and programs.**

Develop a strategy to expand eMobility access to communities with relatively fewer transportation resources and options. Promote inclusive collaboration to ensure all communities have a voice in helping to shape EV policies and programs. Prioritize initiatives that maximize benefits to vulnerable communities.

CITY LEAD // Office of Sustainability

PARTNERSHIPS // ASU, APS, SRP, Local Auto Dealers

TIMEFRAME // Short Term

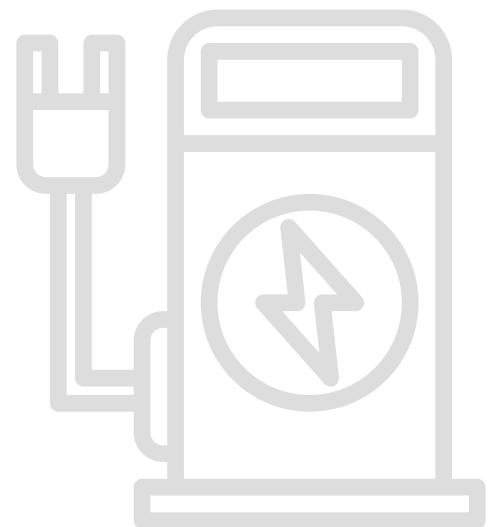
TS3.5*Ongoing Actions***Increase EV charging infrastructure installations on city managed/ owned properties.**

A citywide EV charging infrastructure plan and policy will be developed for Phoenix that will include equity considerations when identifying locations for EV charging accessible by the public, fleet and city employees. Continue to seek out funding opportunities to accelerate vehicle electrification and EV charging infrastructure that may significantly defray the cost of both new fleet vehicles and associated charging infrastructure.

CITY LEAD // All Departments

PARTNERSHIPS // APS, SRP

TIMEFRAME // Medium Term



TS3.6

Ongoing Actions

Replace the light-duty municipal internal combustion engine city fleet with EVs where operationally feasible.

An action team comprised of existing Fleet Managers and maintenance staff will be formed to provide training and awareness raising of vehicle makes and model opportunities that are available and forthcoming. A Green Fleets Program and Procurement Policy will be developed by 2022 that will reflect how decisions will be made about vehicle purchasing and replacement so that at each decision point, consideration and analysis is given to purchasing a vehicle that would reduce or eliminate carbon emissions. Update the centralized procurement policy and/or process to enable the consideration of total cost in FY22. Use vehicle lease-to-own programs, where financially sound, in accordance with the Climate Mayor’s Purchasing Collaborative to procure future EVs. Conduct pilot programs to include medium to heavy duty fleet equipment (ex. transit buses, solid waste trucks, and street sweepers).

CITY LEAD // Public Works, Office of Sustainability, Aviation

PARTNERSHIPS // APS, SRP

TIMEFRAME // Medium Term

TS3.7

Ongoing Actions

Increase EV adoption by the public to achieve 30% of new car sales to be EV by 2030.

Develop city incentive programs and strategies in partnership with utilities and stakeholders to assist the public with equitable access to EVs, EV chargers, and/or other programs such as car share, ride share, and E-bikes. Coordinate with local auto dealers to develop programs and incentive opportunities to include purchase and leasing options. Raise awareness of the used car markets as viable purchasing options.

CITY LEAD // Office of Sustainability

PARTNERSHIPS // APS, SRP

TIMEFRAME // Medium Term

City of Phoenix DRIVE ELECTRIC PHOENIX!

Plug in the Savings

Save Up To **\$13,750** On An Electric Vehicle

WHY BUY AN ELECTRIC VEHICLE NOW?

- ✓ **Great discounts** (see below)
- ✓ **Free access** to the carpool lane
- ✓ Save up to **\$3,000 in annual fuel costs** (1,250 gallons of gas)
- ✓ Be a proud **Zero Emission Vehicle** owner

"Every family's second car could be an electric vehicle and become the primary commuter car."

CHECK OUT THESE DISCOUNTS!

For details contact your Local Phoenix Dealer

	Nissan LEAF 2020 Year End Model	Chevy BOLT 2020 Year End Model
Cash Back	\$6,000*	\$6,225*
Federal Tax Credit	\$7,500	N/A
Employee Discount for Everyone	N/A	\$2,883*
Added Incentives	(EVGO Charging Card) \$250	(Costco Member Discount) \$3,000*
Total Savings	\$13,750	\$12,168

* All offers subject to change.

Install electric vehicle charging stations for nonroad equipment on city of Phoenix Aviation properties.

Using VALE grants, the Aviation Department is developing electric ground support equipment infrastructure at Phoenix Sky Harbor International Airport. Teaming with the airlines, over 100 fuel-driven ground support equipment units have been retired and replaced with electric units. Forty electric charging stations have been installed and additional infrastructure will be installed in future terminal construction projects.

CITY LEAD // Aviation Department

PARTNERSHIPS // Airlines, Maricopa County

TIMEFRAME // Short-term

Voluntary Airport Low Emissions Program (VALE)

More than 100 fossil fuel-driven ground support equipment units - belt loader, bag tugs, aircraft pushbacks - have been retired and replaced with electric units by the airlines at Phoenix Sky Harbor International Airport. Phoenix Sky Harbor International Airport (PHX) through the Aviation Department has requested and received two grants from the Federal Aviation Administration under the Voluntary Airport Low Emissions (VALE) program to develop electric ground support equipment charging infrastructure. Forty charging stations have been installed by the Airport and additional infrastructure will be installed in future terminal construction projects. In support of the Airport's grant request, Southwest, Airlines, American Airlines and United Airlines have retired and replaced 100 fossil fuel-powered units with electric models. Other examples of air quality improvements made by the Aviation Department include the Trip Fee Program, in which drivers of alternate fuel vehicles receive a discount, and Cell Phone Lots where drivers wait for arriving friends and loved ones. Both initiatives reduce airport roadway congestion and air pollution from vehicles circling airport grounds while waiting for passengers. Aircraft ground policies at PHX, such as the use of "one engine taxi" when aircraft move off the airfield after landing, reduces emissions while aircraft are on the ground. The 2019 conversion from turf to desert landscaping decreased emissions from mowing and gas-powered trimming while saving 5 million gallons of water annually in lawn maintenance.



Electric Ground Service Equipment and Charging Stations

TS3.9*Pending Actions*

Advocate for state and local regulations that incentivize that new vehicle sales in the Phoenix metropolitan area be battery-electric or plug-in electric vehicles, including electric vehicle charging infrastructure.

Federal tax credits are available for some all-electric and plug-in hybrids models. Policy support at the state and local levels is needed to increase sales of electric vehicles and will be pursued as directed by the Mayor and City Council. This includes developing ordinances for electric vehicle charging infrastructure to support the adoption of electric vehicles.

CITY LEAD // Office of Government Relations

PARTNERSHIPS // Office of Sustainability,
MAG, Maricopa County, APS, SRP

TIMEFRAME // Short Term



GOAL 4

Reduce the percent of single occupant vehicle trips taken to 60% of all trips, while maintaining a thriving economy.

TARGET 4

60%

BASELINE

85%

TS4.1

Quickstart Actions

Establish a policy that promotes teleworking for city of Phoenix municipal operations.

Maricopa County Ordinance P-7 Travel Reduction Program requires a reduction of the amount of travel performed in a single occupancy vehicle by using alternative forms of travel. Teleworking is an important element of a travel reduction plan and should be established for city of Phoenix employees where possible. It is also important to incentivize and promote teleworking for all employers, regardless of size. During the pandemic, 25 percent of employees participated in the telework program. An Ongoing Telework Program will be established to continue to allow those positions to continue teleworking, when possible.

CITY LEAD // Human Resources Department

PARTNERSHIPS // Office of Environmental Programs

TIMEFRAME // Short Term



TS4.2*Ongoing Actions***Expand bus service network and service hours, and introduce new bus rapid transit corridors as part of T2050.**

The bus service network is being expanded to include 75 miles of bus rapid transit and corridors are being evaluated. Service hours have been increased to match light rail operating hours, with increased frequency on high-demand routes to every 15-minutes.

CITY LEAD // Public Transit

PARTNERSHIPS // Street Transportation, Valley Metro

TIMEFRAME // Long Term

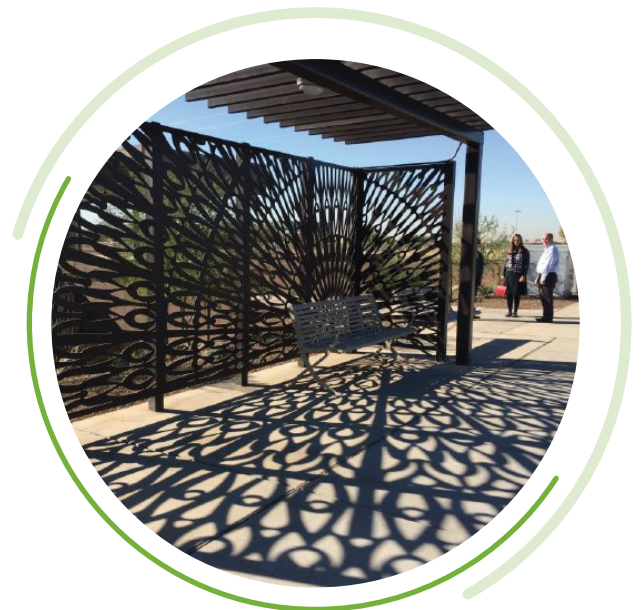
**TS4.3***Ongoing Actions***Increase the number of light rail miles in Phoenix by adding high capacity corridors across the city as part of T2050.**

Light rail corridors are being constructed to connect the city. 42 miles of light rail will be added to the already existing 20 miles of light rail.

CITY LEAD // Public Transit

PARTNERSHIPS // Street Transportation, Valley Metro

TIMEFRAME // Long Term



Desert Rose–Desert Sky Transit Facility

TS4.4*Ongoing Actions***Continuously evaluate routing efficiencies and reciprocal agreements as applicable.**

The Solid Waste division employs routing efficiencies and utilizes reciprocal agreements with private haulers and other municipal entities to reduce trips and distance traveled hauling garbage to transfer stations and landfill. These agreements provide economic value and increased service efficiency for the solid waste operations. In addition, the city is evaluating siting of new transfer stations to reduce emissions and miles driven.

CITY LEAD // Public Works

PARTNERSHIPS //

TIMEFRAME // Short Term

TS4.5*Ongoing Actions***Transition to digital communications with residents, where possible, without a decrease in the level of service provided.**

A transition to digital communications will decrease GHG emissions by eliminating the need for printed materials and their distribution. It is important to consider residents who may not be able to receive communications digitally.

CITY LEAD // Communications Office

PARTNERSHIPS //

TIMEFRAME // Long Term

TS4.6*Pending Actions***Make job training for city of Phoenix employees available in a digital format.**

Providing job training in a digital format reduces GHG emissions. These reductions may come from reduced amount of travel to a training facility, reduction of space dedicated to training, and printing of training materials. Using Coronavirus Aid, Relief, and Economic Security (CARES) Act funds, a learning management system is being developed that will provide virtual learning opportunities with access to a large database of training material that will reduce in-person facilitation of training and reduced hard copy of training materials.

CITY LEAD // Human Resources Department

PARTNERSHIPS // Information Technology Services Department

TIMEFRAME // Short Term

2020 SUCCESS STORY

Phoenix Police E-Learning

The Phoenix Police E-Learning platform has been in place for approximately five years. The initial goal was the delivery of update, best practice or procedural training to more than 4,000 sworn and civilian employees. This platform has made it possible to deliver more in-depth training, more often, and more efficiently. As an example, five mandatory safety courses are available online that traditionally required safety unit personnel to deliver in-person during squad briefings or annual trainings. This method of delivery required many hours of instruction and travel and took months to complete each year. Since the beginning of 2020, four other courses have been made available which normally would have required nearly everyone to attend by travelling to a location and inaccessible for patrol service. By using the E-learning platform, officers are able to view these courses from laptops in their patrol vehicles while on the street and when time permits. This allows for higher officer presence in the community and availability for assistance to the public.

Recently, the current testing process for sergeant was made available through the E-Learning system. This method of testing saved the city approximately \$5,000 which would normally have been paid to an external testing source. Future promotional processes will also be administered through E-Learning, which increase cost savings.

At the beginning of 2020, deployment of E-Learning classes for basic academy classes was initiated. Initially five courses were created which was the equivalent of 12 hours of training. Since that time, six more courses have been developed which added 15 hours of training. Three courses are currently in development which add between 10-14 hours of online training. The future goal is to have more than 100 hours of traditional, in-person training available through the online platform for the basic academy courses. A mirrored E-Learning platform was also created in order to make these same classes available to recruit classes for other law enforcement agencies that use our training academy. To date, approximately 125 recruits have received training through the online platform.

The availability of online courses allows students to progress at their own pace, eliminates the need for instructors to travel to the academy, and ultimately provides more free time to conduct scenario-based training with recruits. Scenario-based training gives recruits more practical experience in situational encounters, teaching them to interact and appropriately deal with people, problem solve and use safe tactics. Each of these skills are valuable when becoming officers and engaging with the community.

By using the E-learning platform, officers are able to view these courses from laptops in their patrol vehicles while on the street and when time permits. **This allows for higher officer presence in the community and availability for assistance to the public.**

WASTE AS A RESOURCE





2050 GOAL

Phoenix will create zero waste through participation in the Circular Economy where recycled materials are repeatedly used in products, instead of using raw materials.

WASTE AS A RESOURCE (WR) GOALS

Goal WR1: Implement programs to reduce waste, increase the reuse, recycling and recovery of waste materials and promote social and economic value.

Goal WR2: Reduce GHG emissions resulting from the degradation of waste by capturing landfill gas and converting 100% of the methane (up to 1500 SCFM) from the SR 85 landfill into renewable natural gas as a substitute for fossil natural gas. Have contract executed and facility constructed and operational by March 2023.

Goal WR3: Increase waste-diversion participation by all residents and businesses.

Goal WR4: Transition to green alternatives from environmentally hazardous materials.

Goal WR5: Expand brownfield redevelopment along the Rio Salado in Phoenix.

Goal WR6: Reduce GHG emissions from water and wastewater treatment by capturing biogas from treatment processes and increasing renewable sources of energy.



**ZERO
WASTE**

by 2050

PHOENIX
GREEN



BUSINESS
LEADER



108

businesses recognized
(2021)



**7,800
ACRES**

Rio Reimagined
project



36%

Residential
Customer Waste Diversion
Rate (2020)



**UP TO
55,000**

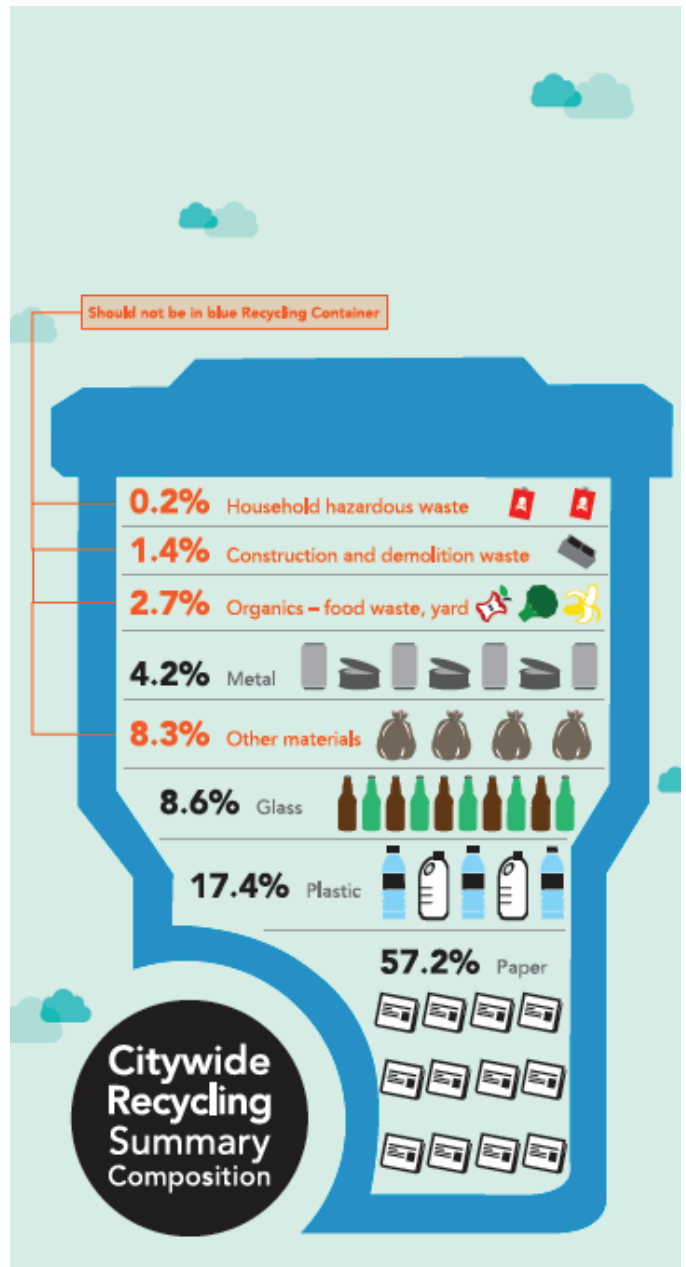
tons compost
annual capacity



BACKGROUND

Most residential and commercial waste ends up in landfills, left to decompose over decades, producing landfill gas that contains carbon dioxide and methane—a GHG 28 times more potent than carbon dioxide. The Phoenix Solid Waste utility processes approximately one million tons of solid waste each year. This waste, along with the waste already in the one open and five closed landfills managed by Phoenix, produced approximately 304,000 metric tons of CO₂e per in 2018—an amount equivalent to emissions from 65,700 cars. Technologies, such as methane gas capture systems, are used to decrease the amount of GHG gases released to the atmosphere, but ultimately, limiting the amount of waste that enters the landfills is the best way to reduce or eliminate GHG emissions from waste.

In 2016, the Phoenix City Council adopted 2050 sustainability goals, including an ambitious goal of zero waste by year 2050. A zero waste city strives to eliminate all discharges to land, water or air that threaten collective society and environmental health. Recycling, while a necessary component of any striving zero waste city, must be matched with other waste diversion methods such as composting, reduction and reuse to achieve zero waste. In addition, supporting development of the local circular economy, where waste is used as a new feedstock for production, is key.



2017-2018 City of Phoenix Residential Waste Characterization Study

Local Government Leading the Way

In 2016, the Phoenix City Council adopted 2050 sustainability goals, including an ambitious goal of zero waste by year 2050. A zero waste city strives to eliminate all discharges to land, or air that threaten collective society and environmental health. Recycling, while a necessary component of any striving zero waste city, must be complimented with other waste diversion methods such as composting, reduction and reuse to achieve zero waste. In addition, supporting development of the local circular economy, where waste is used as a new feedstock for production, is key.



Compost being processed at the 27th Avenue Composting Facility.

Recycling was first implemented in Phoenix in 1989 as a pilot program. By the year 2000, all Phoenix single family residential households, the city's customer base, had access to recycling. Over the program's first 30 years, recycling has evolved as packaging and materials change. For example, the city no longer receives phonebooks, but now receives more cardboard than ever before. To ensure efficiency, recycling facilities must incorporate new technologies to meet the changes in material composition of the recycling stream to maximize the system's ability to recover material. In December 2019, Phoenix upgraded its north recycling facility which both improved the capture of recyclables and decreased contamination of the final commodity. The upgrade was made possible through a partnership with the city of Peoria and the Closed Loop Fund.

Recycling and composting right and finding alternative solutions for material recovery is crucial to mitigate waste-related climate impacts. For example, to provide an alternative recycling option for plastic bags, in 2007, the City collaborated with the Arizona Food Marketing Alliance and local grocery stores to implement Bag Central Station. The program allows residents to recycle plastic bags, dry cleaning bags, produce bags, and more at any grocery store or big retailer across the valley. The program has been widely successful in diverting plastic bags from ending up in household recycling, which is not currently an acceptable material. Phoenix regularly evaluates alternative solutions as many materials are considered a value-added resource if source separated by the appropriate engineering function and delivered to a specific end-market.

Recycling in Arizona is not mandatory. Regardless, Phoenix has achieved exceptional participation with at least 90% of its households voluntarily participating in the recycling program. Although, much can be done to advance education around what is acceptable in this program (contamination reduction).

Since education is critical in preventing contamination in household recycling, in late 2019, the city of Phoenix collaborated with eleven cities in the Phoenix metro area to launch a unified marketing effort for recycling education using the ReCollect Waste Wizard. The Wizard is a web-based search engine that allows residents to look up a material to see how to properly recycle or dispose of it. To date, nine of the eleven cities, including Phoenix, have been added into the Wizard. The goal of the program is to standardize recycling education across the Valley.

While Phoenix can offer recycling to single-family households, per a city ordinance, both businesses and multi-family complexes must receive trash and recycling services from a private hauler. In many cases, businesses and complexes may not have recycling, whether due to added costs or lack of dedicated space or capacity. In response to this, Phoenix worked with the Arizona Multi-Housing Association to create an ordinance requiring that new multi-family housing build in dedicated capacity for recycling to encourage these complexes to add recycling service. In addition, Phoenix distributed numerous Eco-stations, large recycling dumpsters often found in city parks, to offer a recycling option for

residents who do not have access to recycling through their multifamily complex. In 2017, the city implemented the Phoenix Green Business program to recognize businesses that take initiatives on sustainability including their waste diversion practices.

Composting was first piloted in Phoenix in 2013, although the city has been managing a chip and grind operation since 1995. The pilot composting program was possible through a small-scale processing facility, and in 2017, the city opened its first industrial composting facility. **The 27th Avenue Compost Facility is the first solid waste infrastructure project in the United States, and the first in Arizona, to earn an Envision recognition from the Institute for Sustainable Infrastructure.**³⁸ The facility can currently process up to 55,000 tons of organics per year, and with further assessment and funding to support infrastructure, the potential to scale the facility to improve capture is feasible. The city's waste characterization studies have revealed that over 40 percent of what is placed in the trash container is compostable material. When sent to the landfill, compostable material anaerobically breaks down producing methane gas, which is a contributor to greenhouse gas emissions. In addition, studies have shown that the lack of air in a landfill prevents true decomposition, thereby mummifying even organic materials like food. The compost facility is crucial in diverting organic waste from the landfill.

Since methane gas has a higher global warming potential than carbon dioxide, the City's State Route 85 Landfill has implemented a rigorous methane capture system to reduce emissions from the landfill. Methane is currently flared but plans for the future include reusing methane for renewable fuel.

Since 2013, Phoenix has been a pioneer city in the United States in developing a local circular economy, which is crucial in fostering local businesses and decreasing reliance of exporting materials outside of Arizona (local material accountability). To encourage this type of innovative culture, Phoenix has designated 50 acres of city-owned land adjacent to its 27th Avenue Transfer Station as the Resource Innovation Campus (RIC), a home for valuable public-private partnerships through land leases, infrastructure support and access to the city's waste stream and feed stock. The idea behind the RIC is that it serves as a gathering place for collaboration and solutions that can increase the diversion and conversion of waste locally in Phoenix. It is also where waste-to-product projects and other waste reduction ideas can be nurtured and developed. Lastly, the RIC is a hub for innovators building Phoenix's circular economy and generating sustainable economic development. The RIC creates the ability for local feedstock to be transformed into new products without the need for costly transportation and international reliance when it comes to remanufacturing.

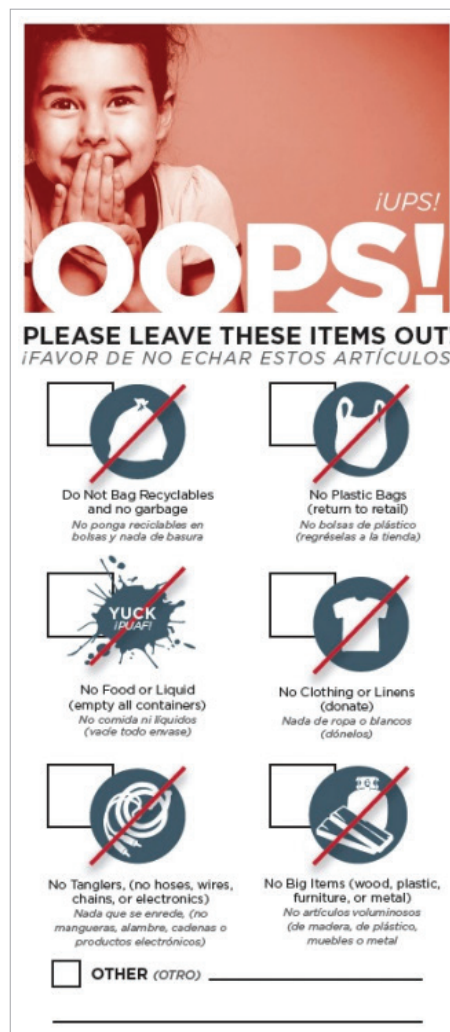
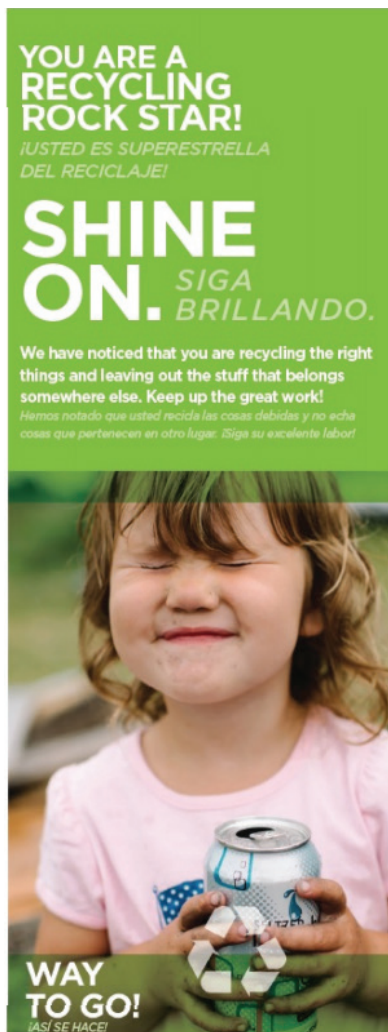


Resource Innovation Center

KEY ACHIEVEMENT

Oops Or Shine On? Recycling Program

The Phoenix Public Works Department implemented a new recycling program that gives residential customers individualized feedback on what can and cannot be recycled. The city launched a pilot program with 1,200 households in southeast Phoenix with historically high contamination. The city monitors data from each recycling route to determine which neighborhoods have the highest contamination rates. At the beginning of the program, about 72 percent of residential customers had recycling contamination and received an “Oops” tag. At the end of the program, five weeks later, 73 percent of residential customers received “Shine on” tags. Recycling contamination significantly impacts the success of a recycling program and contaminated materials end up in the landfill. Phoenix has an average recycling contamination rate of 30 percent. Unclean food containers, lawn clippings, old clothes, wooden items and greasy pizza boxes cannot be recycled, yet people regularly put these items in their recycling bins. Other non-recyclables, such as plastic bags and wrappings, can cause mechanical malfunctions that slow down the sorting process.



GOAL 1

Implement programs to reduce waste, increase the reuse, recycling and recovery of waste materials and promote social and economic value.

TARGET 1

To be determined

BASELINE

To be determined

WR1.1

Quickstart Actions

Reuse recycled asphalt in street pavement pilot program.

The Reclaimed Asphalt Pavement (RAP) Project is assessing the cost effectiveness and performance using different proportions of RAP on Phoenix streets as part of traditional paving materials. Phase II was recently completed, which involved performance tests on a road section within the city. If the pilot is successful, this process will be applied on many city streets.

CITY LEAD // Street Transportation

PARTNERSHIPS // Public Works, Arizona State University

TIMEFRAME // Short Term



Continue to identify and collect waste materials to recycle

Programs are in place to recycle used fluorescent lamps, tires, batteries and steel, which can generate revenue. In fiscal year 2019-2020, 27,343 tires and 10,350 batteries were recycled. Approximately 1,100 tons of steel is recycled annually.

CITY LEAD // Public Works

PARTNERSHIPS //

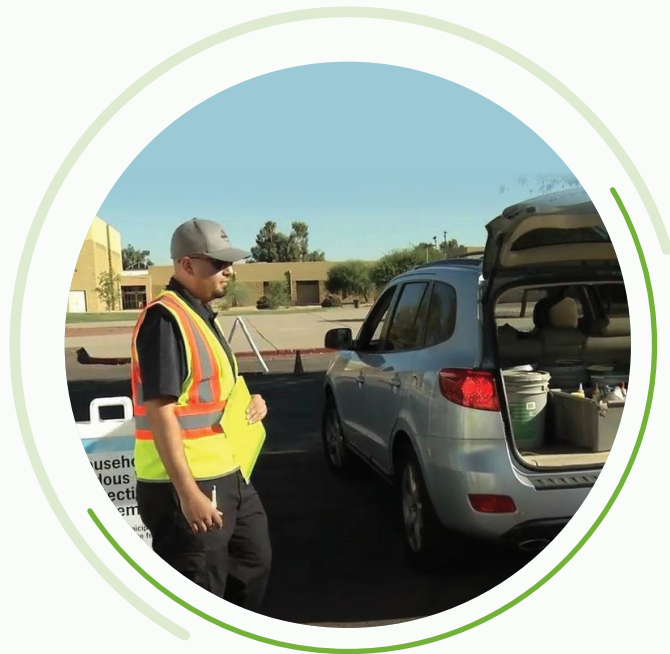
TIMEFRAME // Long Term

Household Hazardous Waste

For over 30 years, the city of Phoenix has offered a program for the recycling and proper disposal of Household Hazardous Waste (HHW) with the goal of; protecting human health and the environment, preventing operational hazards and increasing the diversion of hazardous waste materials from the City's landfill. Historically, the City has offered event-style collection of household hazardous waste items. However, in March 2020, due to the Covid-19 health pandemic and related safety concerns, the Phoenix Public Works Department (PWD) transitioned from its traditional event-style collections to a singular more socially distant HHW option, vendor drop-offs. With City Council approval, in January 2021, the City kicked off its pilot HHW home collection program and within days received over 1,000 service requests from its residents.

For more information, go to

<https://www.phoenix.gov/publicworks/hhw>



**Household Hazardous Waste
Collection Event**

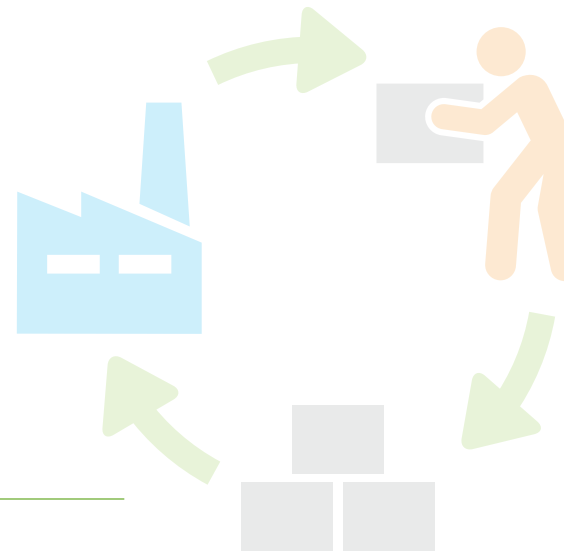
WR1.3*Ongoing Actions***Continue to implement reuse programs to eliminate waste by reusing items previously identified as waste.**

Waste materials are identified and collected for reuse. The Make Ready program reuses auto parts reducing waste sent to the landfill and saving over \$120,000 in fiscal year 2019-2020.

CITY LEAD // Public Works

PARTNERSHIPS //

TIMEFRAME // Long Term

**WR1.4***Ongoing Actions***Continue to implement waste reduction programs at the two material recovery facilities, including a composting facility that recovers organic waste.**

Material recovery facilities (MRFs) are specialized facilities that receive, separate, and prepare recyclable materials for sale. Phoenix has two MRFs, one at the North Gateway Transfer Station and one at the 27th Avenue Transfer Station. The city's composting facility was opened in 2017 and is a key component of Reimagine Phoenix. Phoenix processes roughly 169,000 tons of recyclables and 55,000 tons of organic waste per year at these facilities.

CITY LEAD // Public Works

PARTNERSHIPS //

TIMEFRAME // Long Term

WR1.5*Ongoing Actions***Use the Adaptive Reuse Program to continue to assist with streamlining the process and steps required to repurpose existing buildings for new business uses.**

Repurposing existing buildings for new uses can be challenging. Phoenix's Adaptive Reuse Program encourages the reuse (recycling) of buildings to promote business uses and offers incentives that help bring life to underutilized buildings, supports local businesses, takes advantage of existing infrastructure and supports our neighborhoods. During the past five years, the city of Phoenix has assisted 151 qualified adaptive reuse projects by providing over \$450,000 in Adaptive Reuse Incentives.

CITY LEAD // Planning and Development

PARTNERSHIPS //

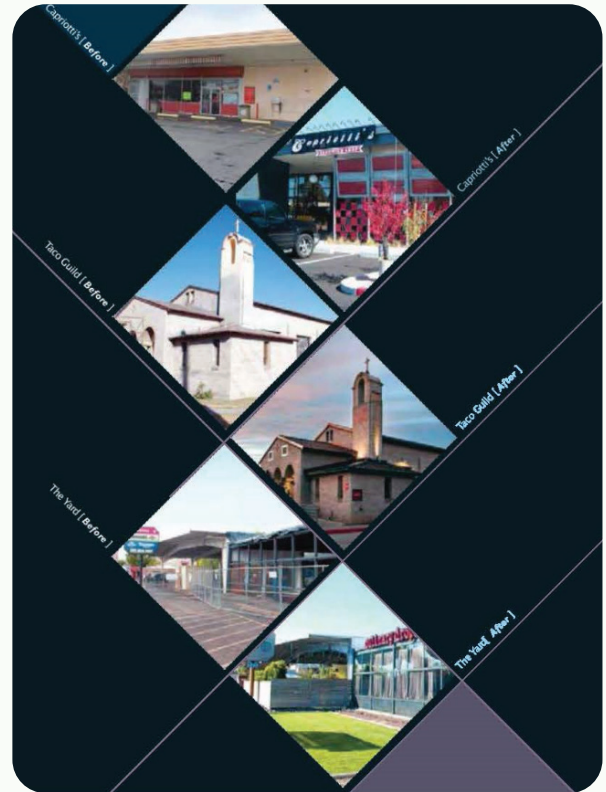
TIMEFRAME // Long Term

Adaptive Reuse

The city of Phoenix works on repurposing and reusing existing buildings citywide through the Adaptive Reuse Program. The city of Phoenix's Adaptive Reuse Program was created in 2008 to assist with streamlining the process and steps required to repurpose existing buildings for new business uses.

Program Creation: A task force consisting of community and business leaders and representatives from various arts organizations helped the city of Phoenix review existing codes and identify ways to streamline processes, relax code requirements for new development, utilize existing infrastructure and provide business opportunities by repurposing and reusing existing buildings without compromising public safety. The task force identified about 30 policy areas to assist and support the Adaptive Reuse Program. Some of the most popular policy areas include providing regulatory relief (not requiring all of the regulations associated with new build projects), providing projects with a designated point-of-contact (a designated staff member from the Office of Customer Advocacy is assigned to each project), focusing on speed-to-market opportunities (streamlining measures are in place to help businesses open their doors sooner) and providing financial incentives (qualifying projects can benefit from up to \$7,000 in incentives to cover expenses such as plan review and inspection fees).

Program Impact: During the past five years, the city of Phoenix has assisted 151 qualified adaptive reuse projects by providing over \$450,000 in Adaptive Reuse Incentives.



Repurposing existing buildings for new uses can be challenging. Phoenix's Adaptive Reuse Program encourages the reuse (recycling) of buildings to promote business uses and offers incentives that help bring life to underutilized buildings, supports local businesses, takes advantage of existing infrastructure and supports our neighborhoods.

Clean Construction

As part of **Goal WR1**, the city of Phoenix has undertaken several actions which include:

- adoption of a goal for requiring net-positive new construction in terms of both energy and materials by 2050
- adoption of the goal to become a carbon neutral city operating on 100% clean energy
- adoption of the most current energy-efficiency standards of the 2018 International Energy Conservation Code
- adoption of the 2018 International Plumbing Code which incorporates water-conserving plumbing fixtures and systems
- voluntary compliance with the 2012 Phoenix Green Construction Code which incorporates standards to reduce embodied carbon emissions
- streamlining of the permitting process for solar photovoltaic systems
- approval of the Sonoran Studio—the City’s first project to meet the Living Building Challenge
- adoption of an Adaptive Reuse Ordinance with financial incentives to promote the repurposing of existing building stock to keep Demolition and Construction materials out of the waste stream
- adoption of an Adaptive Reuse Ordinance with financial incentives to promote the repurposing of existing building stock to keep Demolition and Construction materials out of the waste stream

Additionally, the city of Phoenix is working to expand our commitments to clean construction, energy efficiency and reduced emissions through the following actions:

- work with providers of embodied carbon calculators (such as Athena and EC3) to develop calculators applicable to our climate zone and to test those tools on a sample of the building stock
- establish a working group to discuss incentives for developers to utilize embodied carbon calculators, comply with the green construction code and expand adaptive reuse of existing buildings
- work with stakeholders to develop the following recommendations for Council consideration:
 - to adopt the enhanced energy and water-conservation standards of the 2021 International Energy Conservation Code and the 2021 International Plumbing Code
 - allow voluntary compliance with the 2021 Green Construction Code
 - creation and adoption of an Electric Vehicle Charging Station infrastructure ordinance

GOAL 2

Reduce GHG emissions resulting from the degradation of waste by capturing landfill gas and converting 100% of the methane (up to 1500 SCFM) from the SR 85 landfill into renewable natural gas as a substitute for fossil natural gas. Have contract executed and facility constructed and operational by March 2023.

TARGET 2

To be determined

BASELINE

75% of methane collected and flared

WR2.1

Quickstart Actions

Capture and reuse methane as vehicle fuel as part of the Landfill Gas Recovery Project at SR-85 Landfill.

State Route 85 (SR-85) Landfill is Phoenix's only active landfill and receives over one million tons of waste per year from Phoenix and other sources. The waste decomposes and produces landfill gas that is roughly half methane and half carbon dioxide. A project will be developed in the future to capture the landfill gas and use it as fuel.

CITY LEAD // Public Works

PARTNERSHIPS //

TIMEFRAME // Short Term



WR2.2

Ongoing Actions

Continue to utilize methane capture systems on active and decommissioned landfills to oxidize methane that is produced to reduce GHG emissions potential.

Landfill gas capture systems are utilized at SR-85, the city's only active landfill, and decommissioned landfills, including Skunk Creek, 27th Avenue, Deer Valley, 19th Avenue, and Del Rio landfills. These systems capture methane gas that is produced by decomposing waste and is combusted to produce a less GHG intensive gas.

CITY LEAD // Public Works

PARTNERSHIPS //

TIMEFRAME // Short Term

GOAL 3

Increase waste-diversion participation by all residents and businesses.

TARGET 3

100%

BASELINE

36% in 2020 for residential customers

WR3.1

Ongoing Actions

Provide outreach and feedback to residents what can and cannot be recycled through presentations to schools and communities.

The Zero Waste team provides education on proper recycling, including group tours of the city's North Gateway Transfer Station and MRF, educational presentations to schools, neighborhood and community meetings, and hosting informational booths at community events. In 2019, the Public Works Zero Waste team interacted with approximately 23,500 community members. In 2020, the Zero Waste team extended its reach through digital efforts including the creation of Recycle+, the transition to virtual presentations, and the development of more online resource documents. These digital practices will continue to provide residents additional access to the team.

CITY LEAD // Public Works

PARTNERSHIPS //

TIMEFRAME // Short Term



Zero Waste Outreach: Compost Council Tour at the Resource Innovation Center

Increase organic diversion from the landfill.

Waste diversion efforts include diversion of organic materials. Through the Green Organics Residential Collection program, organic material, like yard trimmings, untreated wood, tree fruit, and cactus, is collected from residential properties. Additional material is collected directly by the transfer stations. Program goals include establishing value in the local compost market by manufacturing a high-quality compost, reducing environmental and climate impacts from landfilling, and creating more community awareness around organic commodities and waste.

CITY LEAD // Public Works

PARTNERSHIPS //

TIMEFRAME // Short Term

Eco Stations

The Public Works Customer Engagement Services (CES) division has strategically placed large roll off dumpsters in city-owned parks and near clusters of multifamily housing complexes. Eco-stations are wrapped with visual aids and literature on what is acceptable in Phoenix's recycling program to further reduce contamination of recyclable materials and provide community education. The goal is to increase recyclables captured, the city's landfill diversion rate and provide convenient access to residents and businesses that do not have other recycling options readily available. Phoenix multifamily residents and businesses are encouraged to use Eco-stations to place their recyclables in at any time at no cost.



Eco Station

Increase number of businesses that participate in the Phoenix Green Business Leader Program that recognizes Phoenix businesses that have sustainable practices, including increased waste diversion.

The Green Business Leader (GBL) program started in 2017 as part of the Reimagine Phoenix initiative to create public-private partnerships to further waste diversion in the city. In 2019, the GBL program expanded to recognize businesses for efforts around water conservation, energy efficiency and sustainable purchasing, in addition to waste diversion. There are more than 100 certified Green Businesses.

CITY LEAD // Public Works

PARTNERSHIPS // Office of Sustainability, Office of Environmental Programs, Water Services

TIMEFRAME // Short Term

Green Business Leader Program



The Phoenix Green Business Leader Program, initiated in 2017 by the Public Works Department, recognizes Phoenix businesses that are passionate about sustainability. The program initially focused on waste diversion-related activities such as recycling or composting. To improve the program and provide additional value to Phoenix businesses, the Public Works Department partnered with the Water Services Department, the Office of Sustainability, and the Office of Environmental Programs in 2019 to expand the GBL program to recognize businesses for efforts around water conservation, energy efficiency and sustainable purchasing, in addition to waste diversion. The expansion also includes a three-tiered certification system of green, gold or platinum level, depending on the number of sustainable actions a business achieves within their business practices.

Number of Certified Green Businesses: 108 (2021)

- 47 Platinum Certifications
- 17 Gold Certifications
- 44 Green Certifications

The city launched the Diversion Tracking Tool in mid-2018 which measures waste diversion related to Green Businesses. The cumulative tonnage from 14 of the 108 that record their tonnage:

- 5,400 tons recycled
- 13 tons composted
- 92 tons donated

WR3.4*Pending Actions***Increase number of businesses that participate in the “green tenant” program at Sky Harbor International Airport.**

As part of the Aviation Department Sustainability Management Plan Update, a voluntary “Green Tenant” program is being developed to encourage greater collaboration between the Aviation Department and airport tenants on airport sustainability goals. Aviation Department met the waste diversion goal of 40 percent in 2019, a year earlier than targeted.

CITY LEAD // Aviation

PARTNERSHIPS // Airport Tenants

TIMEFRAME // Short Term

WR3.5*Pending Actions***Increase the number of existing buildings that are repurposed instead of demolished.**

In addition to reuse of materials, it is important to reuse buildings through the Adaptive Reuse Ordinance where existing buildings are repurposed. There are eleven adaptive reuse projects underway in Eastlake-Garfield, four in Midtown, nine in Uptown, and two in Gateway.

CITY LEAD // Planning and Development

PARTNERSHIPS //

TIMEFRAME // Long Term

GOAL 4

Transition to green alternatives from environmentally hazardous materials.

TARGET 4

To be determined

BASELINE

To be determined

WR4.1

Ongoing Actions

Continue using vegetable-based inks that are formulated to reduce solvents.

Volatile organic compounds are chemicals that evaporate quickly and are precursors to ozone. One way to limit their use is to transition to vegetable-based inks that are formulated to minimize and, in some cases, eliminate the use of volatile organic compounds as much as possible. The City Clerk Department Print Services Section currently uses vegetable-based inks.

CITY LEAD // City Clerk

PARTNERSHIPS // State of Arizona

TIMEFRAME // Short Term

WR4.2

Ongoing Actions

Use digital communication or recycled paper when possible.

To decrease the production of waste from paper-based transactions and communications, digital communications will replace paper-based communications. If paper is still necessary, the paper that is used should contain recycled content.

CITY LEAD // Communications, City Clerk, Human Resources

PARTNERSHIPS //

TIMEFRAME // Short Term

Update Sustainable Purchasing Policy to be applicable city-wide in future city contracts.

The Sustainable Purchasing Policy was created to integrate contract provisions for more sustainable products and services and to consider the best value considering price, performance, and environmental characteristics over the lifecycle of the product or service. Currently, special terms and conditions exist for the Office of Environmental Programs regarding air quality, energy star/energy efficiency, environmentally-preferred products, hazardous materials, recovered materials, etc. These terms and conditions need to be updated to reflect current city environmental policy and then rolled-out citywide to procurement templates, barring conflicts with already existing regulations, so all departments and their respective vendors can more readily select, incorporate, and enforce them when applicable to their solicitations.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // Finance

TIMEFRAME // Short Term

Transition from Primarily Paper-Based to Electronic Delivery

The City Clerk Department has focused on eliminating paper-based workflows wherever possible and implemented methods of engaging and servicing customers more efficiently with environmentally friendly service delivery methods. In December 2012, the City Clerk Department implemented a Campaign Finance e-filing system that allows candidates and Political Action Committees to submit campaign finance reports online. Starting in November 2020, electronic delivery of information and other tools were implemented for City elections. For the candidate nomination petition process, the City Clerk Department offered candidate packet information online. This is more cost effective and provides candidates and other interested parties access to the most up-to-date information daily. Additionally, in May 2020 the City Clerk Department increased resources for candidates and voters through a partnership with the Secretary of State's Office (SOS). The City Clerk Department worked with the SOS to modify the SOS's E-QUAL (electronic candidate nomination petition system) for use by local jurisdictions for the first time. This system allows candidates to collect the required nomination signatures online minimizing the need for distribution of paper nomination petitions in person. More recently, the City Clerk Department in conjunction with ITS implemented a new eComments and Request to Speak system that allows residents to provide comments and submit requests to speak on Council agenda items electronically, giving them an alternative to in-person participation at Council meetings. This system not only minimizes the environmental impact of the need for physical appearance at City Council Meetings, it also offers an additional opportunity to enhance citizen engagement in public meetings. Additionally, and working with ITS, the City Clerk Department implemented the ability to accept contracts and other documents electronically using Adobe Sign or similar software to obtain electronic signatures. Implementation of this electronic process minimizes the strain on natural resources by decreasing the use of paper, ink printers and other resources thereby minimizing the overall environmental impact and making the document routing process more efficient and economical. The City Clerk Department's commitment to offering electronic services allows the Department to provide services to more customers in an efficient manner while continuing to meet and sustain environmental goals.

GOAL 5

Expand brownfield redevelopment along the Rio Salado in Phoenix.

TARGET 5

To be determined

BASELINE

1,189 potential brownfields

WR5.1

Pending Actions

Increase the cleanup and redevelopment of brownfields in the Rio Reimagined Project area.

The Rio Reimagined Project encompasses more than 78,000 acres and 1,189 potential brownfields. Cleaning up and reuse of these properties brings community, economic, and environmental benefits. The Rio Salado, Agua Fria and Gila Rivers will be revitalized by reconnecting the community with the river and be a catalyst for economic growth. Utilize resources obtained through a U.S. EPA grants to conduct environmental assessments and cleanup.

CITY LEAD // Office of Environmental Programs, Community and Economic Development

PARTNERSHIPS // U.S. EPA, ADEQ, ASU, Cities of Avondale, Buckeye, Mesa, and Tempe

TIMEFRAME // Medium Term





Rio Salado Habitat Restoration Area

The Rio Salado Habitat Restoration Project is 40 years in the making and the first of its kind in the desert southwest. Phoenix Rio Salado is a community-inspired plan to restore part of the once-flowing Salt River from a blighted corridor into an environmental and recreational amenity for the community. Phoenix Rio Salado is a 595-acre area located two miles south of downtown Phoenix and north of South Mountain Park near Central Avenue at the Salt River. Thousands of residents and many government agencies, including city of Phoenix's Parks and Recreation Department, Water Services Department, and the Office of Environmental Programs in partnership with the U.S. Army Corps of Engineers, and Maricopa County Flood Control, were involved with shaping and funding this habitat resource that spans five miles in length from 19th Avenue to 24th Street. The landscape incorporates lush marshy wetlands of which 90% of these types of habitats have been lost in Arizona since the 1900's, native cottonwood and varieties of willows, which are among North America's rarest forest type and Mesquite woodlands or bosques as they are referred to, are the fourth rarest plant community of 104 types identified in the United States other native-desert plants. All plant material was contract grown and required seed collection of within a 1/2 mile of the Salt River to ensure a true seed source to restore the environment of Rio Salado. The National Audubon Society's Nina Mason Pulliam Rio Salado Audubon Center makes conservation action accessible to everyone by providing useful information about sustainable living and on-the-ground activities for all to participate. The Rio Reimagined Project will revitalize the Rio Salado (Salt River), Aqua Fria and Gila Rivers, and the region by transforming over 45 miles of the river stretching from the Salt River Pima Maricopa Indian Community at the eastern most boundary to the city of Buckeye to the west and encompassing more than 78,000 acres.

Brownfields Land Recycling Program

Brownfields is a term used to describe real estate that is contaminated or perceived to be contaminated by hazardous substances or petroleum in soil or groundwater. The complexity and cost of cleanup creates an obstacle to redevelopment or reuse of the property. Brownfields examples include closed landfills, abandoned gas stations, old manufacturing facilities, and former dry cleaning facilities. The cleanup and redevelopment of brownfields brings many economic development benefits to a community.



Del Rio Area Brownfields Plan's boundary map.

The Phoenix Brownfields Land Recycling Program provides financial and technical assistance for brownfields cleanup and redevelopment city-wide through the Office of Environmental Programs and the Community and Economic Development Department. To date, more than \$330 million in private investment has restored more than 320 acres of previously contaminated and has created or maintained approximately 3,000 jobs. In 2020, the city of Phoenix received a \$600,000 Brownfields Assessment Coalition grant for the Rio Reimagined Project with the cities of Avondale, Tempe, and ASU. The target area for the grant is within 1.0 mile of the Salt River (Rio Salado), Agua Fria and Gila Rivers within the cities of Tempe, Phoenix and Avondale, Arizona.

GOAL 6

Reduce GHG emissions from water and wastewater treatment by capturing biogas from treatment processes and increasing renewable sources of energy.

TARGET 6

To be determined

BASELINE

10,199 MT CO₂e
(2018)

WR6.1

Pending Actions

Identify water and wastewater facilities where biogas can be treated, transferred and sold as a renewable green energy commodity. Investigate other opportunities for biogas capture.

Renewable energy projects provide biological sources of natural gas, which can displace natural gas from fossil fuel sources. Biogas that is produced as a result of treatment at the wastewater treatment plants contains methane. As part of the city's pledge to be a sustainable and cost-effective utility, a renewable energy project at 91st Avenue Wastewater Treatment Plant treats, transfers and sells biogas as a renewable green energy commodity. The city will investigate other opportunities for biogas capture at other water and wastewater treatment facilities.

CITY LEAD // Water Services

PARTNERSHIPS // Ameresco, Inc.

TIMEFRAME // Short Term





PHOENIX RESILIENCE



Financial Sustainability Initiatives

The city of Phoenix manages nearly \$2.3 billion to cover its financial responsibilities and invests these funds in compliance with all state and federal regulations as well as the city's Investment Policy. The current Investment Policy includes:

- Safeguarding public funds;
- Ensuring liquidity necessary to support city operations and capital programs; and,
- Earning a rate of return.

In accordance with the city's Investment Policy, the city has invested \$27.2 million in green bonds fully backed by the United States government. Currently the city of Phoenix does not have any investments in fossil fuel companies. The city is actively monitoring green bond opportunities that meet the criteria stated in the Investment Policy. In 2019, the city developed one of the nation's first Sustainability Bond Frameworks to attract new investors interested in supporting sustainable infrastructure. The first issuance in 2019 of \$127M in Sustainability Bonds for water infrastructure was four times oversubscribed and a success in the marketplace.



AIR QUALITY





AIR QUALITY (AQ) GOALS

Goal AQ1: Meet U.S. EPA National Ambient Air Quality Standards (NAAQS).

2050 GOAL

Phoenix will achieve a level of air quality that is healthy for humans and the environment. Air quality will meet U.S. EPA National Ambient Air Quality Standards (NAAQS) and World Health Organization (WHO) standards, and will achieve a visibility index of good or excellent on 90 percent of days or more.



C40

CLEAN AIR CITIES DECLARATION

Signatory City



24

Air quality monitors
throughout
Maricopa County



PM10

Dust particulate matter
with a diameter of
10 microns or less



PM2.5

Smoke particulate matter
with a diameter of
2.5 microns or less

6

US EPA

Criteria Pollutants

(Carbon Monoxide, Lead,
ground-level Ozone, Particulate
Matter, Nitrogen Dioxide, and
Sulfur Dioxide.)



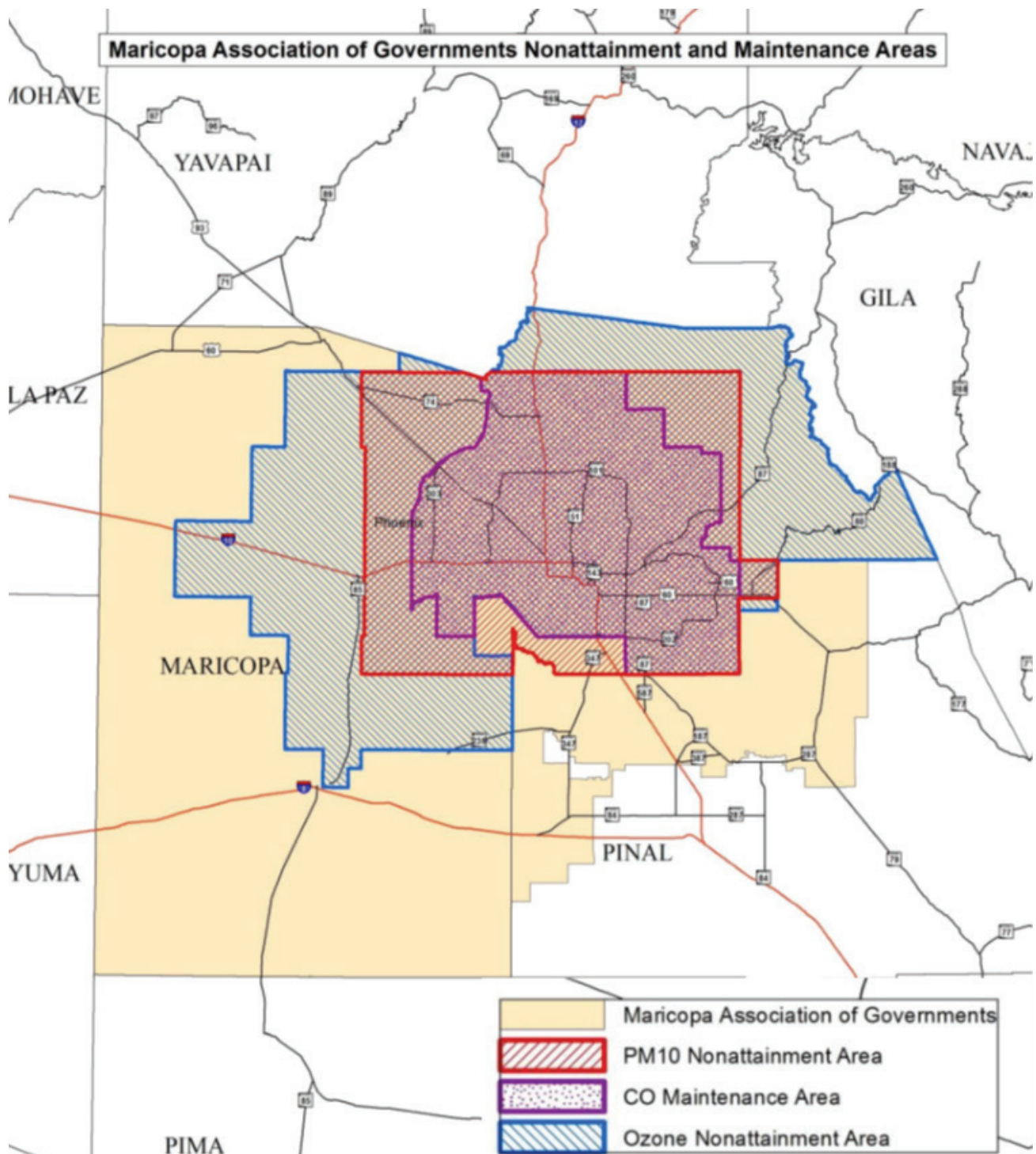
BACKGROUND

Poor air quality impacts every resident in the city of Phoenix. The federal Clean Air Act (CAA) requires Arizona to create a state implementation plan (SIP) aimed at meeting National Ambient Air Quality Standards (NAAQS) that include the following six criteria pollutants: carbon monoxide, ozone, particulate matter with a diameter smaller than 10 micrometers (PM-10) and with a diameter smaller than 2.5 micrometers (PM-2.5), lead, nitrogen dioxide, and sulfur dioxide.

These air quality standards must be met within the Maricopa Nonattainment Area, which includes the city of Phoenix. Of course, air is not contained by city limits so actions directed at improving air quality must be considered at a regional level. Phoenix partners with other governmental entities, including Maricopa County Air Quality Department (MCAQD), Arizona Department of Environmental Quality (ADEQ), and Maricopa Association of Governments (MAG) to work toward meeting these standards.

In 2021, Phoenix became a Signatory City of the C40 Clean Air Cities Declaration. Within two years, Phoenix will establish baseline levels and set ambitious reduction targets for air pollutants that meet or exceed national commitments. As a C40 City, Phoenix meets the World Health Organization (WHO) air quality standards for nitrogen dioxide and sulfur dioxide, and will work toward meeting the standards for particulate matter and ozone. This will be done by including relevant top pollution-reducing actions into the plan, which includes expanding public transit, increasing active transport options, modeling air pollution reduction as a result of actions, and monitoring air quality. As part of the Declaration, new substantive policies and programs will be implemented by 2025 to address the top causes of air pollution (particulate matter and ozone) emissions within Phoenix and under Phoenix's control. Progress will be reported annually on improvements in air quality relative to the targets that are set.

The greater Phoenix area is currently designated as Moderate Non-attainment for ozone, and likely to be redesignated to Serious Non-attainment in 2024. Despite reduced traffic due to the pandemic in 2020, ozone still exceeded regulatory levels. The area also is designated as Serious Non-attainment for PM10 (dust) and is experiencing increasing levels for PM2.5 (soot) that could potentially result in the region's status changed to Non-attainment for PM2.5. As the classification becomes more severe, the Clean Air Act requirements become more stringent and costly. Failure to meet the standard by established deadlines has economic repercussions.



Maricopa County Nonattainment Map

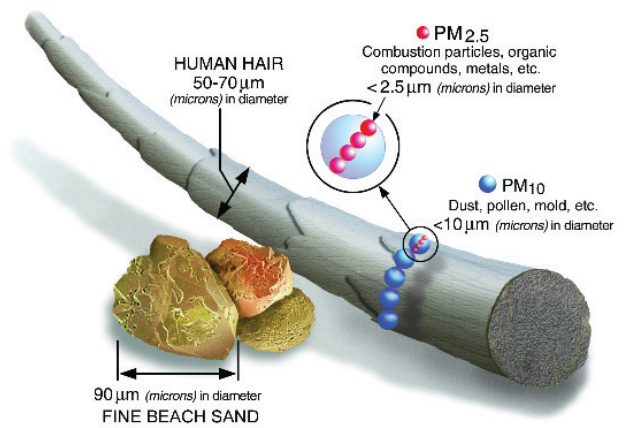
Local Government Leading the Way

Ozone is a harmful air pollutant to both humans and the environment. Ozone is formed when nitrogen oxides and volatile organic compounds react with each other in sunlight. According to the Maricopa County Air Quality Department, the majority of nitrogen dioxide emissions comes from mobile sources, like cars and airplanes. Controlling and understanding the sources of these emissions is needed so that Phoenix can meet air quality standards. One of the programs Phoenix participates in is the U.S. Environmental Protection Agency's (EPA) national Cleaner Trucks Initiative, a program that aims to establish more stringent emissions standards to reduce nitrogen oxides and other pollutants from heavy-duty truck engines. Phoenix has been at the forefront of cleaner air initiatives, demonstrated by Public Works' commitment to replacing its fleet of diesel-engine solid waste trucks with CNG-fueled ones. In 2020, the Public Works Department was awarded \$1 million in Diesel Emissions Reduction Act grants by EPA to replace some of the department's diesel-fueled trucks. The grant money will be combined with matching funds of \$2.1 million from Public Works and its private partner to purchase nine new solid waste collection trucks and one long-haul truck fueled by compressed natural gas to replace old, diesel-fueled vehicles.

Another harmful air pollutant is particulate matter that can be pollution from human activities or a result of a dust storm or wildfire. Particulate matter with a diameter of 10 micrometers or smaller (PM-10) is primarily composed of dust in Phoenix. Particulate matter with a diameter of 2.5 micrometers or smaller (PM-2.5) is primarily soot from burning activities, but also comes from vehicle exhaust. Both PM-10 and PM-2.5 are inhalable and can damage the respiratory system, with PM-2.5 posing a greater risk to health due to its small size. Efforts throughout the region continue to reduce formation of particulate matter. The largest sources of PM-10 are from roads, paved and unpaved. Much of the efforts to decrease PM-10 have been focused on stabilizing these surfaces and maintaining them with the use of street sweepers. In 2011, as part of MAG Five Percent Plan for PM-10, the City established a Dust Reduction Task Force that was specifically created to address particulate matter emissions throughout the city. Since then, the City has stabilized streets, lots and alleys, and conducted outreach activities to ensure that residents would become of methods to prevent the formation of dust. The city of Phoenix has paved over 7 miles of unpaved roads and paved or stabilized over 500 miles of alleys since 2012 as part of the Five Percent Plan.

City employees participate in Maricopa County's Travel Reduction Program with the goal to decrease travel taken in a single occupancy vehicle. In 2019, 25 million miles of commuting were reduced, preventing 143 tons of pollution, solely by city of Phoenix employees.

Continuing to address air quality concerns on a regional level is paramount. The City collaborates with various regional entities to focus on how best to reduce air pollutants throughout the metropolitan area, including the Maricopa Association of Governments, Maricopa County Air Quality Department, Arizona Department of Environmental Quality, and other valley municipalities.



PM-10 and PM-2.5



Phoenix received a DERA grant to replace garbage trucks with cleaner burning engines.

KEY ACHIEVEMENT

City of Phoenix Dust Reduction Task Force

In 2011, the city of Phoenix was experiencing high levels of particulate air pollution. This dust contributed to the infamous “brown cloud,” increased risk for individuals with respiratory diseases, and continued high levels would have led to a loss of billions of dollars in Federal funding for streets and highway projects needed throughout the region. To address this class of pollutants, the city manager established the Dust Reduction Task Force, which consisted of various city departments. The Task Force produced detailed maps of targeted areas, changes to city code for dust reduction, an enforcement strategy for the Code focused on education, dust awareness, response training for staff, and various multimedia items for outreach. An example of the work being conducted to reduce dust creation is seen in the before and after photographs of the surface stabilization on the shoulders of Broadway Avenue. Many residents use the shoulders of this street and the surface was stabilized to allow continued use by residents and limit the formation of dust. Due to the success of the Task Force, Maricopa Association of Governments has recognized Phoenix as a regional leader and the Task Force as a model for other cities in the region.



Before and after of surface stabilization on the shoulders of Broadway Avenue.

GOAL 1

Exceed U.S. EPA
National Ambient Air
Quality Standards
(NAAQS).

TARGET 1

U.S. NAAQS

BASELINE

To be determined

AQ1.1

Quickstart Actions

Establish air pollutant baseline levels and set reduction targets that meet NAAQS.

These targets will put us on a path towards meeting World Health Organization Air Quality Guidelines for particulate matter, nitrogen dioxide, ozone, and sulfur dioxide. Phoenix already meets the Guidelines for nitrogen dioxide and sulfur dioxide.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // Maricopa County Air Quality Department, Maricopa Association of Governments

TIMEFRAME // Short Term

AQ1.2

Quickstart Actions

Implement new substantive policies and programs to address top causes of air pollution emissions within Phoenix and under Phoenix's control by 2025.

Within five years, Phoenix will implement new substantive policies and programs to complement those policies and programs already in place. Some of these already exist and only need to be fully implemented, like the expansion of the public transit system, including light rail, and the creation of safe and accessible walkways and bike paths to commute. Many of the actions within the climate action plan will contribute to decreasing air pollution emissions throughout the city and region. New policies and programs may include increased air quality monitoring, financial incentives, and increased education and outreach.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // Maricopa County Air Quality Department

TIMEFRAME // Short Term

AQ1.3

Quickstart Actions

Publicly report annually on progress in reducing pollution levels relative to targets and achieving the commitments in the Clean Air Cities Declaration.

Progress will be reported annually to C40 Clean Air Cities and be made available publicly.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // Communications Office

TIMEFRAME // Short Term



LOCAL FOOD SYSTEMS





LOCAL FOOD SYSTEMS (LFS) GOALS

Goal LFS1: All people living in Phoenix will have enough to eat and have access to affordable, healthy, local, and culturally appropriate food.

Goal LFS2: Businesses that produce, process, distribute, and sell local and healthy food will be recognized as integral to the economy and encouraged to grow and thrive in Phoenix.

Goal LFS3: Growing food in Phoenix and the region will be easy and valued, for personal or business use.

Goal LFS4: Food-related waste will be prevented, reused, or recycled via sustainable food production practices that maintain a healthy environment.

Goal LFS5: Develop food policies and actions that address local and global challenges posed by climate change, urbanization, political and economic crises, population growth and other factors.

2050 
GOAL

Maintain a healthy, sustainable, equitable, and thriving local food system.

Food Access in Maricopa County



14%
Population that
is food insecure
(Maricopa County)



29%
Obesity rate
(Maricopa County)



12%
Households that
receive SNAP
(Maricopa County)



21%
Children who are
food insecure
(Maricopa County)



10%
Diabetes rate
(Maricopa County)



\$1.80
In total economic
activity for every dollar
in new SNAP benefits

Source: A Comprehensive Food Assessment for Maricopa County Summary Report, September 2019, by Maricopa County Food System Coalition

On-Farm Agriculture in Maricopa County



#1
In Arizona for total value of
Ag products sold, as well as for
milk, poultry and egg sales



#11
In the nation for
value of milk sales



TOP 1%
nationally among countries for
vegetable, melon and potato
crop production



2,293 farms share
5% of all sales



\$1.95B
contributed to Maricopa County
including direct, indirect and
induced multiplier effects



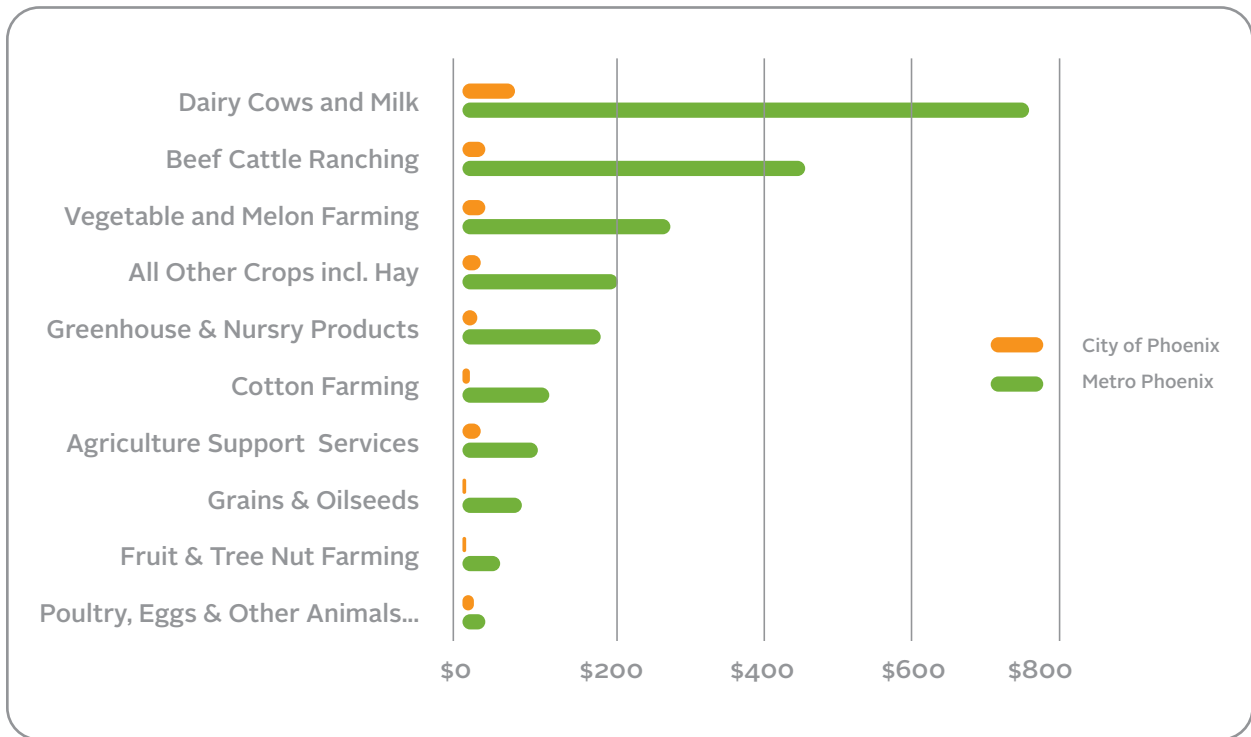
1,495 or about 60% of farms
are small (1 to 9 acres)

186 farms share
95% of all sales

868 or about 30% of farms
reported less than
\$1,000 in annual sales

Direct Output by Industry - 2019

(million of dollars)



Source: USDA, Arizona 2019 Annual Bulletin; IMPLAN Group LLC; Applied Economics LLC.





BACKGROUND

Phoenix residents approved a Healthy Food System goal in the city's general plan, PlanPHX, and was adopted in 2015 to promote the growth of a healthy, affordable, secure and sustainable food system that makes healthy food available to all Phoenix residents. In 2016, Phoenix City Council adopted the 2050 Environmental Sustainability Goals, including a Local Food System Goal to maintain a healthy, sustainable, equitable, and thriving local food system.

Healthy food is defined as food that is fresh, nutritious and grown without harming its producers or our environment.

The food system comprises of food from farm or producer to table or consumer. A healthy food system increases Phoenix resident's ability to access healthy, affordable food. A healthy food system contributes to economic growth, health, and community by:

- Encouraging consumers to grow their own food and providing opportunities for urban farmers to sell their food locally, blurring the lines among growers.
- Supporting all options for furthering access to healthy food including community gardens, urban farms, farmers markets, community supported agriculture, healthy food retailers, and new innovative means.
- Creating a strong community network of successful and culturally appropriate businesses that produce, process, cook, transport, and sell food with prevention of food loss and waste.

Status of Local Food System

A common thread heard about food was that it is very important in terms of connection. Sharing food was a way to show love, and people also feel that food connects them to their community. Achievement of local food system goals results in reduced rates of hunger, obesity, and diet-related diseases through elimination of food deserts, increasing urban agriculture, and adopting zoning, land use guidelines, and other policies to improve the food system. A food desert as defined by the U.S. Department of Agriculture is an area without ready access to fresh, healthy and affordable food. Of the 55 food deserts in Maricopa County, there are 43 in Phoenix that encompass nearly half the Phoenix population.

The term food system is used to denote all processes and infrastructure involved in growing, harvesting, processing, packaging, distributing, marketing, consuming, and disposing of food and food-related items. It also includes all the needed inputs and all generated outputs, e.g. water, technology, and food waste. Local food systems are networks of food production and consumption operating wholly within a limited geographic area. They reduce food transportation and increase trust and social connectedness between producers and consumers. The more direct sales structure allows for farmers and producers to make more off their produce while consumers pay similar prices as with traditional food sales. Meanwhile, reduced transportation distances means less pollution and fossil fuel dependence. The city of Phoenix defines the geographic area of its local food system to be Maricopa County.

The City's Office of Environmental Programs (OEP), in partnership with the Maricopa County Food System Coalition (MarCo), received a grant from the Gila River Indian Community to complete a regional Community Food Assessment to understand the current state of the food system in Maricopa County. Major findings from the assessment:

- Agriculture and food influence major social, health and economic problems, as well as opportunities.
- Despite our agricultural capacity and national leadership, our food system is not working for many people in Maricopa County, especially low-income, ethnic minorities, seniors, and children.
- We face serious challenges in sustaining regional agriculture and community food, especially with regards to land, water and relationships.



Development of 2025 Phoenix Food Action Plan

Phoenix has made a healthy food system a priority. In March 2020, Phoenix City Council supported this effort, and approved the 2025 Phoenix Food Action Plan (2025 FAP) that outlines short term goals, strategies and actions to achieve access to healthy food for everyone in Phoenix by 2050. As the actions outlined are implemented along with the collection of new data, technology improvements and continued collaboration with stakeholders, OEP expects to develop an updated plan in 2025-2026 that continues movement toward the 2050 goal.

PLAN DEVELOPMENT

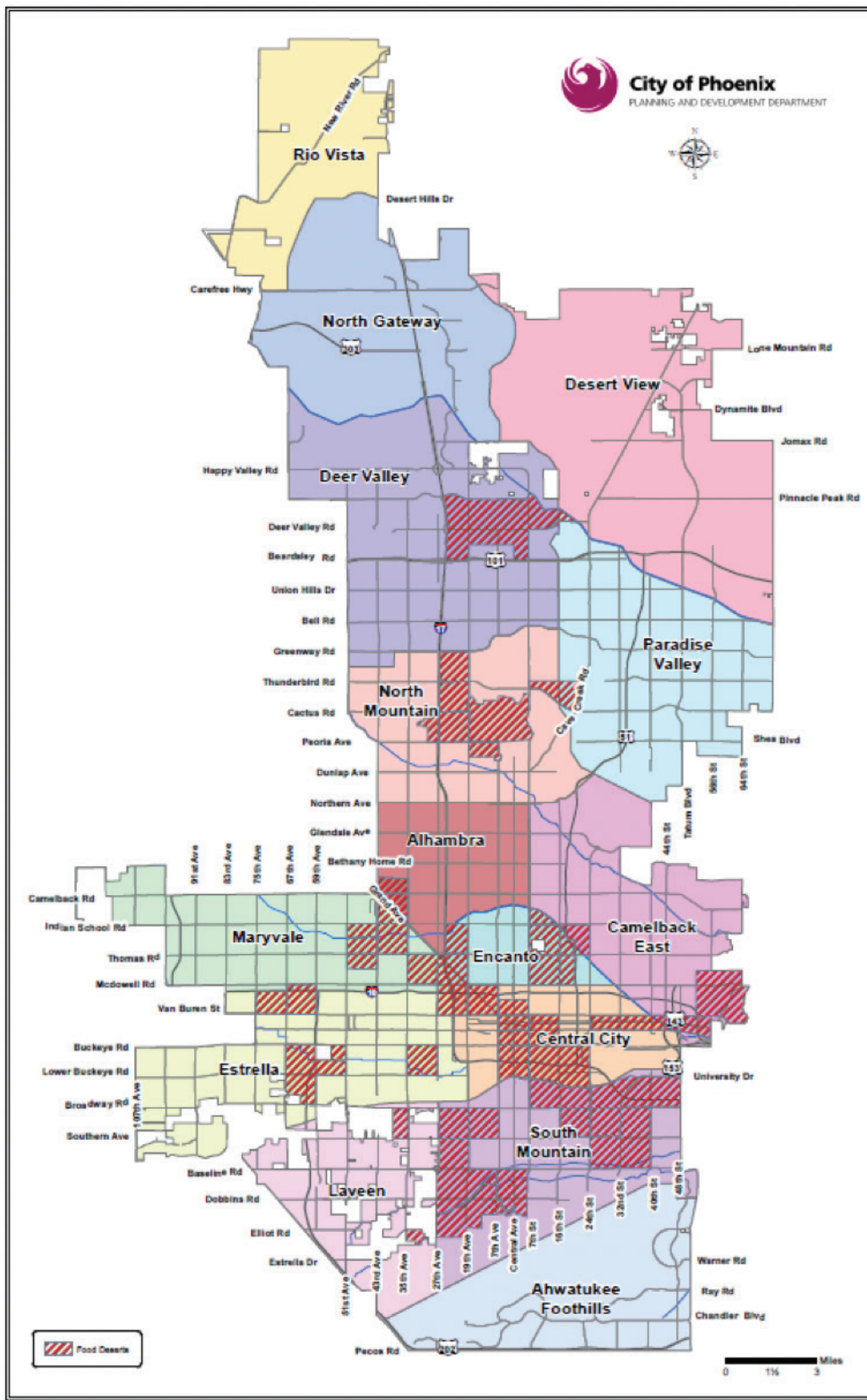
OEP convened an interdepartmental food action team to understand existing food system work across departments, to learn from external food system stakeholders, and to coordinate the development of a food action plan. OEP prepared the plan with input from numerous organizations currently working on food system issues and with community members. OEP staff also participated in various workshops and meetings hosted by others. Additionally, a food survey was conducted through the website and at public events to gather input from residents. The resulting data was used to establish priorities for goals, strategies, and recommended actions to be achieved by 2025.

SOUTH PHOENIX FOOD ACTION PLAN DEVELOPMENT

The importance of understanding the food system at a neighborhood level, particularly areas that faced high rates of food insecurity was important, which includes the South Phoenix and Maryvale areas. Through a grant received the U.S. Environmental Protection Agency (EPA) Local Foods, Local Places program, OEP was able to conduct a two-day workshop in South Phoenix to identify challenges and opportunities for improving the food system in the South Mountain Village Planning Area. Community outreach for this work was focused on engaging residents that were most impacted by food insecurity and hunger, including low income populations and people of color. A food-focused Community of Practice made up of women of color was initiated to develop a greater understanding of food challenges and to establish collaborative relationships for making improvements. The results of the Local Foods, Local Places workshop and community was a South Phoenix-specific Food Action Plan that details recommended actions targeted for the unique and rich history of this geographic area. This place-based plan was included in the city-wide plan and was approved by Phoenix City Council for implementation as well.

CONTINUING COMMUNITY ENGAGEMENT

Putting the goals and strategies into action is being done in partnership with stakeholders that contributed to the plan with a deliberate focus on continuing the work with the South Phoenix and Maryvale Community of Practice. Virtual workshops have taken place and are planned that focus on the continued understanding of challenges and opportunities faced by those most impacted by food insecurity, trust-building, and collaboration on actions desired by the community.



**Food Deserts in Phoenix
(2016)**

Local Government Leading the Way

FEEDING THE HUNGRY & BUILDING A RESILIENT LOCAL FOOD SYSTEM DURING THE CORONAVIRUS PANDEMIC

The impact of the Coronavirus pandemic from 2020 through 2021 was felt strongly in the local food system. People already experiencing food insecurity were now more at risk. Local farmers lost their usual markets, particularly from the closure of restaurants. The fragility of the local food system became evident with an urgency to develop a resilient food system. Phoenix, through the CARES Act Emergency Food Assistance funding that was made available to the city, an allocation of \$2.6 million was made available for the preparation and delivery of meals and Community-Supported Agriculture-style food boxes to COVID19-impacted individuals and families through two unique and innovative programs. In partnership with trusted stakeholders, OEP developed the following programs:

FUNDS TO FEED PROGRAM

The program provided funding for community and grassroots organizations, nonprofits, and health centers to recognize and enhance food delivery occurring in the community by the community. Using a hyperlocal approach, 10 organizations were able to continue and expand their work, create new partnerships, and even obtain additional funding from other sources for their work. Equity was embedded in this program through the inclusion of residents impacted by food insecurity and by grassroots organization members to provide input and ideas on how to effectively promote the program and how to design the grant application and reporting requirements in a way that encouraged participation by Black, Indigenous, and People of Color. This program was administered by LISC Phoenix, a community development financial organization.

FEED PHOENIX PROGRAM

The program provided funding to local farmers, Community Supported Agriculture (CSA), mobile markets, restaurants, caterers, and event venues. Local produce was purchased from 12 farmers for use in meals prepared by 45 local Phoenix restaurants, caterers, and event venues, which are in turn delivered to 29 social service organizations serving COVID-19 impacted individuals and families. The connections made between locally produced food and restaurants and caterers continues with many of the participating restaurants continuing to purchase locally. Fostering further distribution channels happened with the use of a food hub to serve as the distribution point between the farmer and the purchaser. Healthy food was delivered to those in need and the food system was made more resilient by establishing a connected, community food network.

Additional funding is expected to be allocated from the American Rescue Plan Act to continue and expand these programs.



KEY ACHIEVEMENT

Phoenix Brownfields to Healthfields Initiative



Urban farmer and community gardeners at the Spaces of Opportunity Project, Phoenix, AZ – A Brownfields to Healthfields Project

Cleanup and reuse of 10 properties in food desert areas for healthy food.

Phoenix has recognized there is an opportunity to cleanup and redevelop brownfields that directly impact public health through the reuse of these sites for food and healthcare assets. To date, 10 properties have been cleaned up and redeveloped as urban farms, community gardens, school gardens, farmer's market, and a food hub. The work was initiated as a result of award of a \$400,000 community-wide brownfields assessment grant from the U.S. Environmental Protection Agency in 2015. The Brownfields to Healthfields (B2H) project targets areas with inadequate health care, food deserts, and designated infill incentive, neighborhood initiative, and redevelopment areas. Focusing on these areas within Phoenix addresses sustainable and equitable development, in addition to building upon existing brownfields efforts.

Additional project opportunities include:

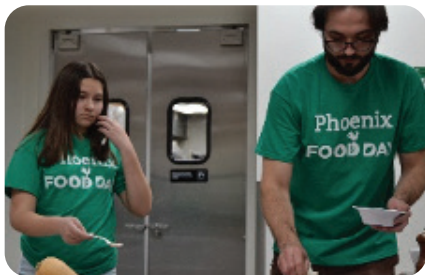
- healthcare facilities, clinics (permanent and mobile),
- healthy food outlets: supermarkets, temporary food retailers, mobile markets, food hubs, farmers markets,
- urban agriculture: aquaponics, hydroponics, controlled environment agriculture, community supported agriculture, community and school gardens.

The impact of this project results in improved community health due to the elimination of exposure to hazardous substances and creation of opportunities for improved access to healthcare and healthy foods, which positively impacts environmental and health equity.

Education to more than 14,000 people living in communities facing food insecurity, hunger, and lack of resources.

Phoenix Food Day and Healthfest is celebrated to inspire people to change the way we look at food. The “Get Growing, Get Healthy, Get Real” themed event brings education and entertainment together to help people in Phoenix and the region move towards a healthier future. The primary goal of the event is to bring education, awareness, resources, and fun to those vulnerable to food insecurity and hunger by hosting the event within the most-impacted communities that experience high rates of food insecurity, hunger, lack of healthy food outlets, transportation challenges, and scarce resources.

Since 2013, Phoenix Food Day has educated more than 14,000 people, engaged 160+ partners, empowered residents, and helped small businesses. The city initiated the event as a simple recognition of healthy eating for city employees. Since that first event, it has evolved into a place for everyone to enjoy learning about growing your own food, cooking healthier and with local, seasonal foods, and becoming aware of the benefits of good nutrition, physical activity, and well-being in a family-friendly atmosphere.



Establishment of the Maricopa County Food System Coalition

The city is a founding member of the Maricopa County Food System Coalition (MarCo) established in 2015. Several organizations focused on improving the local food system gathered to explore the viability of creating a food policy council/coalition for the region. The city's Office of Environmental Programs was eager to learn and listen to stakeholders to better understand the challenges faced in providing access to health food for everyone living in Phoenix. Coincidentally, the two groups of stakeholders came together, and the city committed to help create the coalition. The city continues to have a strong relationship with MarCo and has successfully won a grant award to complete a Community Food Assessment for Maricopa County, the first of its kind. The data collected was integral to the city's own Food Action Plan and continues to provide valuable information to educate others on the importance of an equitable, healthy, thriving, and sustainable local food system.



GOAL 1

All people living in Phoenix will have enough to eat and have access to affordable, healthy, local, and culturally appropriate food.

TARGET 1

100%

BASELINE

57.5%

LFS1.1

Pending Actions

Incorporate agriculture, food processing, and distribution into existing and future land use plans. Collaborate with key partners to facilitate new opportunities for urban-scale gardens, farms, gleaning, and distribution systems.

PlanPHX emphasizes the importance of residents having access to healthy food and sets measures for access within a ¼-mile. Policies that are supportive of food access should be integrated into future redevelopment, transit-oriented, and other land use plans. Explore criteria for various transportation, tree and shade, urban heat island and similar projects that create safe and convenient connections between residential neighborhoods and healthy food assets. Study the impacts of local food production on food equity and social justice for low income communities.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // Planning and Development

TIMEFRAME // Short Term

LFS1.2

Pending Actions

Use existing financial resources for food production and infrastructure. Pursue grants and other funding opportunities that will enhance the community's access to healthy foods.

Identify funding resources available through private sector, government, and philanthropic sources. It is important to determine the viability of using current funding mechanisms available from the City that can be used for food system improvements. Collaborate with key partners to facilitate new opportunities for urban-scale gardens, farms, gleaning, and distribution systems.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // Governmental, philanthropic and place-based funders

TIMEFRAME // Short Term

LFS1.3*Ongoing Actions***Partner with schools and others to support and promote education for youth and adults.**

Support education and awareness on all aspects of the food system and create opportunities to create or enhance urban agriculture, health and nutrition education for youth, adults, and seniors. Collaborate with state and county agencies working with school districts in Phoenix and support Farm to Table programs in schools.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // City of Phoenix Youth & Education Office, Phoenix School Districts, Nonprofits, community & grassroots organizations

TIMEFRAME // Short Term

**LFS1.4***Ongoing Actions***Promote existing healthy food assets, such as farmers markets, grocery stores, retail, community gardens, farms, etc.**

Focus on efforts to address challenges within communities with limited access to fresh healthy food, followed by a city-wide approach to planning for food access for all communities. identify existing food and farm assets within food desert areas, such as the South Phoenix and Maryvale communities. Develop asset maps that are accessible by residents through a variety of communication tools, including online mapping, apps, social media with written resources available at city libraries, community centers, and recreations centers.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // Community and Economic Development

TIMEFRAME // Short Term



GOAL 2

Businesses that produce, process, distribute, and sell local and healthy food will be recognized as integral to the economy and encouraged to grow and thrive in Phoenix.

TARGET 2

To be determined

BASELINE

To be determined

LFS2.1

Pending Actions

Recognize food production as a highest and best use of land.

Phoenix has the potential to be an agricultural technology innovation hub, with a focus on farming that is water efficient, restorative and adaptable to the arid climate and high temperatures. Coordination with internal and external economic development professionals will be done to evaluate the economic development potential of the food system as a local industry cluster. Create opportunities to connect food production businesses with available land. Continue to collaborate with academic partners to establish an agriculture technology initiative.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // Community and Economic Development, University of Arizona, Arizona State University

TIMEFRAME // Short Term

LFS2.2

Pending Actions

Incorporate agriculture, food processing, and distribution into existing and future economic development plans.

Assist agricultural entrepreneurs and existing food-related businesses and identify financial and technical resources and the most effective means to make those resources available. Develop comprehensive, user-friendly information on the requirements of food production, processing, and distribution businesses that is available from the city and through partners.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // Municipal/Regional/State Economic Development Organizations (EDOs)

TIMEFRAME // Short Term

LFS2.3

Pending Actions

Establish a local food buying preference in future City contracts and include in current Sustainable Purchasing Policy.

Develop appropriate contract language that can be incorporated into city contracts for the purchase of local food. Coordination with internal departments to develop guidelines and language, and potentially set procurement goals. Provide healthy, local produce to city employees through a Community Supported Agriculture (CSA) program and pilot in downtown city facilities initiated. Explore the development of healthy procurement guidelines for city events and facilities.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // Finance

TIMEFRAME // Short Term



LFS2.4

Pending Actions

Partner with stakeholders to support and promote a Buy Local Food campaign.

Educate and engage residents on the benefits of purchasing locally-produced food. Develop a Buy Local Food Campaign in collaboration with partners, such as Local First Arizona Foundation and others. Partnership opportunities with grocers to further promote Buy Local will be established or enhanced.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // Local First Arizona Foundation, MarCo, Local Food Producers, Grocers

TIMEFRAME // Short Term



GOAL 3

Growing food in Phoenix and the region will be easy and valued, for personal or business use.

TARGET 3

To be determined

BASELINE

To be determined

LFS3.1

Pending Actions

Update codes and ordinances where appropriate to eliminate barriers and encourage developing a healthy food infrastructure.

Existing zoning codes will be further clarified to clearly identify which zoning classifications and requirements are needed for various agricultural and food production uses, commercial and residential, including, hydroponic, aquaponics, growing inside structures, and for burgeoning uses, such as rooftop and building-integrated agriculture. Identify and update/amend appropriate sections of the zoning code to clearly identify zoning districts in which agricultural land uses are permitted. Develop definitions for agricultural land uses. Develop streamlined processes for agricultural zoning. Explore the development of an “Agritainment” zoning districts, and zoning incentive models (density, PAD district, similar zoning options) that encourages set asides of land for food production.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // Planning and Development, local food producers, and businesses

TIMEFRAME // Short Term

LFS3.2

Pending Actions

Explore development of agriculture community land trusts and/or preservation mechanisms.

Various mechanisms that could be used in concert with nonprofit and private partnerships to preserve land for food production will be identified, as well as best practices of other cities. Existing city policies impacting agricultural land uses will be reviewed. Recommendations will be made for new or modifications to existing policies.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // Community and Economic, Real Estate, Water Services, Planning and Development, MarCo, Arizona Community Land Trust

TIMEFRAME // Short Term

LFS3.3

Pending Actions

Explore the use of city-owned parcels as opportunities for urban agriculture, focused on food deserts within irrigation districts.

Develop, with city departments, guidelines on how to lease/buy city owned land for food production, including establishing appropriate minimum length of lease terms feasible for agriculture. Adopt policies allowing the use of park land and other city-owned land, where feasible and appropriate, for food production. An inventory of land potentially available for agricultural use will be created, including Brownfields. Upon identification of available city-owned land located in food desert and irrigation district areas, a Request for Proposal for agricultural development may be issued.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // Parks and Recreation, Public Works, Water Services, Real Estate

TIMEFRAME // Short Term



LFS3.4

Pending Actions

Support the growth of land uses that contribute to a healthy and sustainable food system (i.e. grocery stores, community gardens, urban farms and other urban agriculture elements).

In addition to city-owned land, there is the opportunity to support efforts to expand urban food production on residential, commercial and institutional properties. Support and encourage collaboration between public and private sectors and small/medium sized farms, food-hubs, mobile markets, co-ops, community and back-yard gardens. Establish community commercial kitchens and/or use existing commercial kitchens. Explore opportunities to work with vacant schools with kitchens to use as a training and economic development resource will be performed.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // Planning and Development, Community and Economic Development, Greater Phoenix Economic Council, school districts

TIMEFRAME // Short Term



LFS3.5*Pending Actions***Use existing and explore new job training resources, where feasible, and partner with others to provide training opportunities.**

A cornerstone in a sustainable local food system is the development of career pathways in farming. Support programs focused on training future farmers and collaborate with partners and institutions, such as the University of Arizona Cooperative Extension of Maricopa County. Identify other potential partners with a focus on providing training for new farmers. Facilitate business training programs for farmers to gain more marketing knowledge and expertise. Explore city policies that support the creation of agricultural employment training opportunities to further promote job creation in the agriculture sector.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // City of Phoenix Workforce Development, Maricopa Community Colleges, University of Arizona

TIMEFRAME // Short Term



GOAL 4

Food-related waste will be prevented, reused, or recycled via sustainable food production practices that maintain a healthy environment.

TARGET 4

80%

BASELINE

To be determined

LFS4.1

Pending Actions

Update codes and ordinances to clarify food waste diversion, i.e., composting opportunities.

Providing clear and understandable codes and ordinances to clarify food waste diversion, such as composting, is essential to a thriving local food system. This includes identifying and updating/amending appropriate sections of the zoning code to clearly identify zoning requirements for composting opportunities.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // Planning and Development, Public Works, MarCo, Business

TIMEFRAME // Short Term

LFS4.2

Pending Actions

Support and promote methods to prevent edible food from entering the waste stream.

A key factor in preventing food waste is to provide means for edible food to be consumed. In the United States an estimated 30-40% of food goes uneaten and ends up in landfills, further contributing to GHG emissions. Creating opportunities to provide edible food to those that don't have enough to eat involves collaborating with stakeholders to identify solutions. Opportunities for collaboration with other stakeholders involved in the prevention of food waste and food rescue will be evaluated.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // Public Works, MarCo, Waste Not, restaurants, institutions

TIMEFRAME // Short Term

LFS4.3*Pending Actions***Promote and support sustainable practices in all areas of the food system.**

The food economy is an integral contributor to the overall economic vitality of the city. Business opportunities are varied, from agricultural entrepreneurs, catering, restaurants, food trucks, mobile markets, retail, such as neighborhood bodegas or convenience stores, and for backyard gardeners to sell their produce. Identifying and providing business resources, including water and energy efficiency, regenerative agricultural practices, and safe food handling are keys to creating a sustainable food economy. Continue working toward development of a Sustainable Food Economy Accelerator for entrepreneurs. Identify mechanisms to assist food-related businesses, including technical assistance and financial resources.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // Community and Economic Development, ASU, cities within Maricopa County

TIMEFRAME // Short Term



GOAL 5

Develop food policies and actions that address local and global challenges posed by climate change, urbanization, political and economic crises, population growth and other factors.

TARGET 5

To be determined

BASELINE

To be determined

LFS5.1

Pending Actions

Research policies and actions that plan for future shocks related to changing population growth, hazards, economic conditions and climate.

Conduct research on best practices and explore ways to integrate food system resiliency within existing and future hazard mitigation, emergency response, and or resilience planning efforts. OEP would serve as the lead for food systems in future resilience planning. Coordination with city departments and external stakeholders will identify opportunities for food system integration.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // Stakeholders from within all aspects of the local food system.

TIMEFRAME // Short Term

LFS5.2

Pending Actions

Convene local food producers with city staff, leaders, and elected officials to build trust and understanding.

Create opportunities and collaborate with stakeholders to identify solutions for providing edible food to those that don't have enough to eat.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // Phoenix elected officials and city departments, Local First Arizona Foundation, local food producers

TIMEFRAME // Short Term

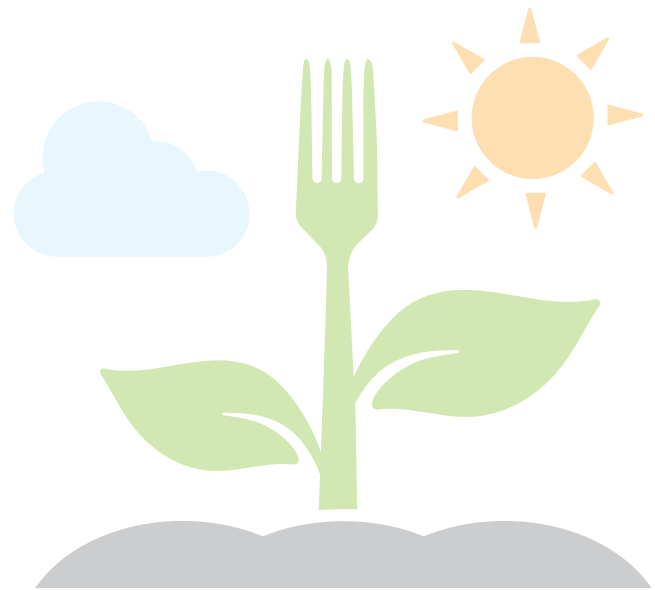
LFS5.3*Pending Actions***Explore funding opportunities from federal, state, and philanthropic organizations for food system activities and staff.**

Identify and submit for funding opportunities from federal, state, and philanthropic organizations for food system activities and staff. Resources to conduct recommended actions will be needed. Obtaining funding from all feasible and available resources will be paramount to the success of achieving the goals, strategies and actions identified.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // Potential funders

TIMEFRAME // Short Term

**LFS5.4***Pending Actions***Complete a GHG Emissions Inventory for the local food system, defined as Maricopa County.**

Complete a GHG emissions inventory of the local food system, that is Maricopa County, to determine which reduction actions will be necessary to reduce the GHG emissions from the production, processing and delivery of food across Phoenix and the region.

CITY LEAD // Office of Environmental Programs

PARTNERSHIPS // MarCo, University of Arizona, NRDC, ICLEI, ASU

TIMEFRAME // Short Term

HEAT





2050 GOAL

Reduce urban heat-island effect through green infrastructure as well as doubling the current tree and shade canopy to 25 percent. Have all residents within a five-minute walk from a park or open space by adding new parks or open space in underserved areas, adding 150 miles of paths, greenways, and bikeways throughout the city, and transforming an additional 150 miles of canals into vibrant public space.

HEAT (H) GOALS

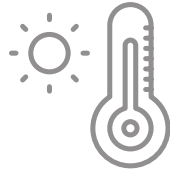
Goal H1: Create a network of 30 cool corridors in vulnerable communities by 2030 to facilitate movement from residents' homes to their places of employment, education and play.

Goal H2: Increase shade provided by trees or constructed shade in 'flatland' parks, not the preserves, streets and rights-of-way to achieve a 25% tree & shade canopy in pedestrian areas by 2030 prioritizing communities most vulnerable to heat.

Goal H3: Provide resources and services to residents to manage heat.

Goal H4: Increase the use of high albedo, or reflective, materials in infrastructure projects.

Goal H5: Develop HeatReady certification for cities in partnership with ASU by 2025.



145

days over 100° F
(38° C) in 2020



25%

tree and shade canopy
across the city by 2030



41,000+

acres of desert parks
and mountain preserves



2,414

heat-related Emergency
Room Visits in 2020 in
Maricopa County⁴⁰

300+

heat-related deaths
in 2020 in
Maricopa County⁴¹



185

Parks



200

miles of trails and
40 trailheads



BACKGROUND

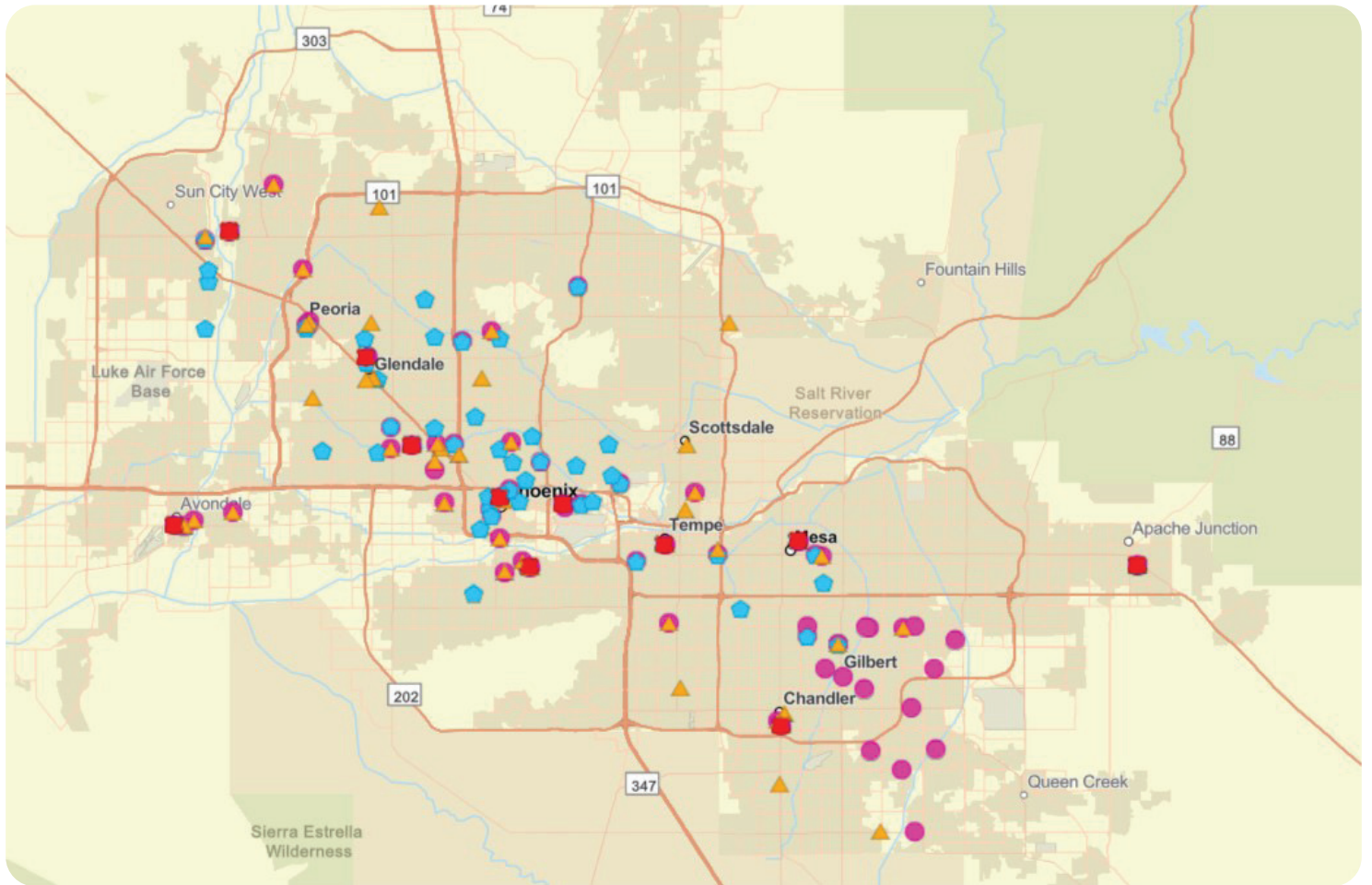
Climate change is leading to increases in average temperatures and increased possibilities of severe prolonged heat waves. Extreme heat can have dangerous and deadly health consequences, including heat stress, illness, and heatstroke.

Phoenix, situated in the northeastern Sonoran Desert, has developed with heat as its signature and desert life as its core identity. On average, Phoenix has 110 days each year with a high temperature over 100 degrees F and 19 days with high temperatures exceeding 110 degrees F. July and August of 2020 were the hottest on record, and 2020 saw 53 days with temperatures over 110 degrees F and 145 days over 100 degrees F. Unlike many other U.S. cities that only have a small percentage of homes with air conditioning, almost all dwellings in Phoenix have some form of mechanical cooling making it, in some ways, better prepared for heat waves and extreme heat events than many other cities. However, in Phoenix, heat does not affect all residents equally--outdoor workers, those experiencing homelessness, and other vulnerable populations such as low-income residents living in poorly insulated homes, face the brunt of the impacts related to heat. Heat is responsible for more fatalities in the U.S. each year than all other weather-related disasters combined. 2,414 heat-related emergency room visits and over 300 heat-related deaths occurred in Maricopa County in 2020. If all the annual heat-related deaths in Phoenix happened at once, it would qualify as a natural disaster.

And daytime extreme heat is not the only concern. Over the last 20 years, the average night-time temperature in Phoenix has risen by nine degrees as a result of the urban heat island effect—a phenomena caused by adding increasing amounts of hardscape and concrete surfaces that capture and store heat during the day and then release

it more slowly in the evening hours than the surrounding desert. If cooler materials were used in infrastructure, while trees, shade and other forms of green infrastructure were added, the urban heat island effect could be significantly mitigated. As an example, ASU tested two neighborhoods in Phoenix just 2 miles apart, but one with significantly more green infrastructure, that experienced a 13 degree F (7 degree C) average surface temperature difference during peak summer hours. The type of infrastructure influences the temperatures communities experience.

Given its reputation as the hottest city in the nation, and its proximity to ASU, Phoenix is without question the epicenter of research related to heat. Hundreds of research projects conducted by ASU over the last decade form a library of resources which could be used to inform future action. In addition, the city of Phoenix and many other organizations have been active in implementing programs and policies related to heat. The MAG Heat Relief Network partners with 137 organizations that provides water, respite, and wellness checks in communities alongside an education and awareness campaign each summer focusing on vulnerable communities. The Network is heralded as one of the best heat-mitigating programs in the nation. The Neighborhood Services Department works with utilities and others to invest millions of dollars each year in weatherizing homes of low-income residents to reduce cooling costs and protect residents from the effects of heat. A recent inventory of actions by city departments found over 50 innovation pilot programs and initiatives recently implemented by city Departments.



Maricopa Association of Governments Heat Relief Network showing resources to manage heat, like the locations of cooling centers, hydration stations, and collection sites.

Local Government Leading the Way

OFFICE OF HEAT RESPONSE AND MITIGATION (OHRM)

In 2021, City Council approved the established of a new office to coordinate efforts city-wide to address heat response, heat mitigation and oversee the implementation of the Tree and Shade Masterplan. The new office includes a Heat Officer, a Shade Administrator and Tree Administrator along with administrative support to track and report on heat actions and coordinate the many actions already underway across city departments and in the community. The office will work closely with ASU for development of heat tracking tools and the city/ASU partnership on developing a Heat Ready City Certification program.

The OHRM will track, coordinate and report on the following city programs:

TREE AND MASTER PLAN IMPLEMENTATION

The Tree and Shade Master Plan was approved by City Council in 2010 and had a vision to double the tree and shade canopy by 2030 to 25%.⁴² Although many actions were taken related to education and awareness campaigns and development of resources, the number of trees planted in the early years was limited given the context of the great economic recession. However, after a groundswell of community support, City Council dedicated \$450,000 in additional to tree funding leading to 4,000 trees now being planted annually on city streets, parks and rights of way.

The Tree and Shade Master Plan implementation is supported by over \$5 million in annual funding to city departments as part of a city-wide program that includes the following initiatives:

- **The Urban Forestry Roundtable** established in 2019 by the city of Phoenix, American Forests and Arizona Sustainability Alliance, is represented by over 30 entities including non-profits, community groups, and other city and county representatives united under the following vision: “Over the next five years, we will work collaboratively to improve tree care and planting in Metro Phoenix in ways that will measurably mitigate urban heat island, improve local air quality and prioritize environmental and social justice outcomes through municipal and private investment in trees — particularly in vulnerable neighborhoods currently lacking tree canopy.”
- **The Urban Forest Implementation Team (UFIT)**) is a working group of city staff from all departments to coordinate tree plantings efforts city wide and monitor progress toward the goal to double the tree and shade canopy. Departments include Streets Transportation, Parks, Neighborhood Services, Planning & Development, the Office of Sustainability, and the Office of Environmental Programs. The programs represented by them include:
 - The **Citizen Forester Program** provides training and education to volunteers to help in the planting and care of trees in the community.
 - **Love Your Block** is managed by the Neighborhood Services Department organizes community planting events in neighborhoods and provides mini grants for neighborhood beautification.
 - The **Tree Donation Program**, newly launched in 2021, will work with the residents and businesses to fund specific tree planting projects in the community—particularly streets and parks to create cool corridors in vulnerable communities.

In a 2017 survey of residents, **92%** thought the goal to double the tree and shade canopy was a good idea, **75%** said they would be willing to participate in community planting projects and over **50%** said they will be willing to donate to a tree campaign.

- **The Planning and Development Department’s Landscape Ordinance Text Amendment** will enhance the care and protection of trees and add enforcement of the ordinance to ensure trees planted as part of new developments will be maintained and retained in perpetuity.
- The **Parks and Recreation Department’s Tree planting program** which is seeking to ensure all city parks have a minimum 25% shade canopy. The Parks department seeks partnerships to plant 1,500 trees each year in city parks.
- The **Streets Transportation Department’s Tree Planting Program** has dedicated funding to plant an average of 1000 trees per year in City streets supplemented by additional plantings as part of Major Capital improvements. It also is launching a new “Cool Corridor Program” in 2021 to plant 9 miles of cool corridors including a cool corridor in each council district.

The Cool Corridor Program will plant nine miles of cool corridors each year—with a least one cool corridor in each council district. Each corridor, approximately one mile long will include up to 200 trees and other cooling assets such as structured shade, to provide up to 60% shading for pedestrians along each corridor. The program will prioritize vulnerable neighborhoods, leverage GIS tools to identify streets with the high pedestrian traffic, and utilize the American Forests Tree Equity Score Analyzer to ensure vulnerable neighborhoods achieve a minimum “tree equity score” by 2030.



- The **Environmental Quality & Sustainability Commission (EQSC)** was appointed by City Council to provide input on a wide range of environmental issues and has been highly engaged in providing recommendations to Council, along with creating the **Urban Heat Island and Tree and Shade Sub-Committee (UHITS)**. UHITS focuses on addressing heat in Phoenix, by increasing tree planting and developing metrics to track the progress towards the 2030 goal to double the tree and shade canopy.
- The **MOU with American Forests** hopes to achieve “Tree Equity” where all of Phoenix’s neighborhoods will reach a minimal standard of tree canopy cover that is feasible and appropriate for the city’s desert climate and conditions by 2030. Tree Equity is the term American Forests trademarked to raise awareness about the need to address historic disparities in tree canopy in cities throughout the United States.

Kuban Park

This project more than doubled the size of a neighborhood park. The work done in partnership between the Office of Arts and Culture and Parks and Recreation Department enhanced it with artist-designed sidewalks, fences, benches, gates, earth forms and other park essentials. The earth forms feature an elevated grassy-berm and large, oval playing area. Key park areas are shaded with such heritage trees as oak, elm, pistache and mulgas.



KEY ACHIEVEMENT

Heat Relief Network

In 2005, after a weeklong heat wave that resulted in about 30 deaths in the homeless population, the Maricopa Association of Governments (MAG) created the Heat Relief Network. The Heat Relief Network is a regional partnership between MAG, local municipalities, nonprofit organizations, the faith-based community, and businesses. Each year, MAG coordinates mapping of the Heat Relief Network, a network of 137 partner organizations that provides water, respite, and wellness checks in communities alongside an education and awareness campaign each summer focusing on vulnerable communities.

During the summer of 2020, as the COVID-19 pandemic took hold, the Phoenix Convention Center was used as a heat respite center following public health guidelines. The Human Services Department coordinated with multiple city departments to provide individuals experiencing homelessness with daily lunch and dinner, on-site case management, medical evaluations, and computer stations with access to the internet. From May 29 through September 30, over 27,000 guests used the cooling center.



Mayor Kate Gallego speaking to a resident taking respite at the Phoenix Convention Center in Summer 2020.

GOAL 1

Create a network of 30 cool corridors in vulnerable communities by 2030 to facilitate movement from residents' homes to their places of employment, education and play.

TARGET 1

30 miles by
2030

BASELINE

0

H1.1

Quickstart Actions

Develop walkshed mapping tool to identify key pedestrian corridors and priority routes for adding shade in vulnerable neighborhoods and increase shade provided by trees or constructed shade.

A next generation Walkshed mapping tool, based on the principles of a model developed by Harvard students studying in Phoenix, is being developed in partnership with ASU to identify key pedestrian corridors and priority routes for adding shade in vulnerable neighborhoods. The tool considers zero car households, proximity to schools, shopping and transit, and identified the most likely routes or “walkshed” that pedestrians would likely take in a given neighborhood. The tool is being piloted in 2021 and will be used to select corridors for implementing priority tree and shade elements.

CITY LEAD // Office of Sustainability

PARTNERSHIPS // ASU

TIMEFRAME // Short Term

Heat-Ready City

Over the past two years, a significant effort has been undertaken by ASU, Harvard, city staff and other stakeholders to better understand the potential for heat mitigation in Phoenix over the long term. Accelerated by a \$100,000 grant from Bloomberg Philanthropies, a “Heat-Ready” team was formed to pilot actions in the community, seek input from residents and businesses on what it means to be heat ready, and explore a framework by which cities could evaluate their heat preparedness using a soon-to-to-be-developed “Heat-Ready certification” system.

The efforts resulted in some remarkable findings. Staff worked with Harvard Students to research the effect of heat on transit ridership including making recommendations for an updated transit ridership propensity model. They prototyped a “walkshed” tool that considers zero car households, proximity to schools, shopping and transit, and identified the most likely routes or “walkshed” that that pedestrians would take in a given neighborhood. When used citywide, this methodology is able to identify priority areas of investment for creating “cool corridors.”

As a next step for climate action related to heat, the city will undertake the development of an Urban Heat Mitigation and Adaptation Plan along with a corresponding Action Plan that incorporates many of the projects already underway. Below are the top actions to be undertaken in 2021 and 2022:

- A **Heat-Ready Certification Model** is being developed by ASU and currently being testing by the city of Phoenix. It will evaluate the policies, programs and governance structures related to heat mitigation and adaption and inform the core components needed in the overarching mitigation and adaptation plan.
- **Cool Pavement Testing** is currently underway in eight Phoenix neighborhoods throughout the city and one city park to receive cool pavement treatment as part of a pilot project. Cool pavement is lighter in color than traditional asphalt or other seal coatings—reflecting rather than retaining heat, and reducing nighttime temperatures in Phoenix. Details on the program can be found at www.Phoenix.gov/streets/coolpavement



- A next generation **Walkshed mapping tool**, based on the principle of the Harvard model, is being developed in partnership with ASU to identify key pedestrian corridors and priority routes for adding shade in vulnerable neighborhoods. The tool is being piloted in 2021 and will be used to select corridors for implementing priority tree and shade elements.
- Expand the current **Summer Safety** program, which includes education and outreach to the community. Continue to collaborate with regional partners on weekly calls (AZ Heat Preparedness & Resilience Workgroup) and associated action teams (the Cooling Center Sub-Working Group and the Cooling Center Response Network).
- Formation and mandate of the new **Office of Heat Response & Mitigation** as approved in the 2021-2022 budget. The office will be central to coordinated heat action across all departments.

H1.2

Pending Actions

Update Phoenix’s Walkable Urban Code to include additional heat mitigation actions.

The Walkable Urban Code regulates development in proximity to light rail stations. Additional heat mitigation actions are being considered to be included in the code, along with the current shade requirements.

CITY LEAD // Planning and Development

PARTNERSHIPS //

TIMEFRAME // Short Term

H1.3

Pending Actions

Achieve “Tree Equity” where all of Phoenix’s neighborhoods will reach a minimal standard of tree canopy cover that is feasible and appropriate for the city’s desert climate and conditions by 2030.

A new MOU with American Forests signed in 2021 hopes to achieve “Tree Equity” where all of Phoenix’s neighborhoods will reach a minimal standard of tree canopy cover that is feasible and appropriate for the city’s desert climate and conditions by 2030. Tree Equity is the term American Forests trademarked to raise awareness about the need to address historic disparities in tree canopy in cities throughout the United States.

CITY LEAD // Office of Sustainability

PARTNERSHIPS // Street Transportation

TIMEFRAME // Medium Term

GOAL 2

Increase shade provided by trees or constructed shade in 'flatland' parks, not the preserves, streets and rights-of-way to achieve a 25% tree & shade canopy in pedestrian areas by 2030 prioritizing communities most vulnerable to heat.

TARGET 2

25%

BASELINE

11-13%³

H2.1

Ongoing Actions

Educate city staff on proper tree care, including Right Tree, Right Place training, and the use of tall pots to help establish plants.

Increasing the tree canopy of the urban forest requires that the right trees are planted in the right place for long-term growth. Recently, in order to increase the success rate of planting, a method was piloted to use tall pots to increase the number of plants that survive.

CITY LEAD // Parks and Recreation

PARTNERSHIPS // Street Transportation, Office of Sustainability, AmeriCorps VISTA

TIMEFRAME // Short Term

H2.2

Ongoing Actions

Update city's tree inventory by 2023.

The 2021 Budget approved funding for updating the city's tree inventory—where every tree in parks, streets and rights of way will be inventoried. A contract will be issued to measure and report on tree information including the identification of lost and unhealthy trees. Using TreeKeeper software, trees will be tracked as they are planted and removed, along with the estimated value of the trees and their associated environmental benefits.

CITY LEAD // Parks and Recreation

PARTNERSHIPS // TreeKeeper

TIMEFRAME // Short Term

River of Shade

The outdoor public art project was designed to enhance the connection between Harmon Library and the surrounding community by creating a new park with artist-designed paths embedded with colorful glass; new bright blue, leaf-shaped benches; artist designed garden fence; and shade trees. Paths lead to a community garden and a grassy amphitheater that will be used by the Harmon Library as an outdoor classroom. The paths and the new ballpark are designed with dusk-to-dawn lighting.



H2.3

Ongoing Actions

Implement Project sunBLOCK, which includes permanent and temporary public art microclimates.

Project sunBLOCK is composed of permanent and temporary public art microclimates that lower the intense heat confronting pedestrians along key corridors in two of Central Phoenix's hottest neighborhoods by 2023. The project brings community, artists, designers and environmental specialists together to create designs that both visually and physically cool transit stops and surrounding streetscapes.

CITY LEAD // Arts and Culture

PARTNERSHIPS // National Endowment for the Arts, Public Transit, Street Transportation

TIMEFRAME // Short Term

H2.4

Pending Actions

Continue to implement the Tree and Shade Master Plan to establish 25% tree and shade canopy in streets and pedestrian areas by 2030.

The Tree and Shade Master Plan launched in 2010 with a vision to double the tree and shade canopy by 2030. The Tree and Shade Master Plan implementation is supported by over \$5 million in annual funding to city departments as part of a city-wide program with over 4,000 trees now being planted annually on city streets, parks and rights of way. This goal is further supported by the tree planting as part of the cool corridors with an additional 1,800 trees per year and an additional 1,000 trees per year through public donations for a total anticipated tree planting of 6800 trees annually.

CITY LEAD // Street Transportation, Parks and Recreation

PARTNERSHIPS // Office of Sustainability, Planning and Development

TIMEFRAME // Medium Term



H2.5

Pending Actions

Increase tree and shade canopy of flatland parks, not the preserves, to 25% by 2030.

The Parks and Recreation Department has set a goal to plant 1,500 trees annually. As of summer 2020, 131 out of 160 flatland parks currently meet the 25% canopy coverage.

CITY LEAD // Parks and Recreation

PARTNERSHIPS //

TIMEFRAME // Medium Term

Increase shade at public transit stops in the City.

An overarching goal of the T2050 plan was to provide all residents in the city with accessible transit and build ridership. Within that goal is the element to provide shade at all 4,050 bus stops in the city. Currently, 2,680 of those bus stops have constructed shade structures.

CITY LEAD // Public Transit

PARTNERSHIPS //

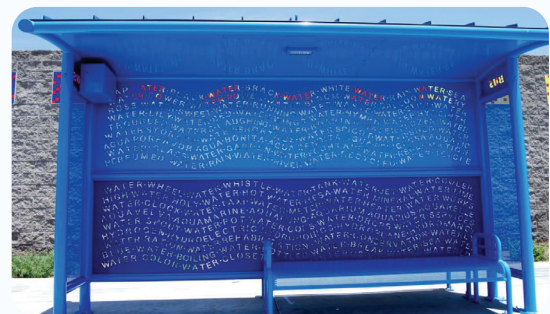
TIMEFRAME // Medium term

Bus Shade Shelters

Shade at all 4,050 public transit bus stops by 2025. 2,680 of the stops already have constructed shade structures.



Bus Shade Shelter co-designed by city of Phoenix and Arizona State University to provide more effective shade throughout the day.



Bus Shade Shelters designed in collaboration with the Office of Arts and Culture.

H2.7

Pending Actions

Coordinate and track the planting of trees to achieve the 25% tree and shade canopy goal.

At the direction of the Phoenix City Council, the Environmental Quality and Sustainability Commission (EQSC) created the Urban Heat Island/Tree and Shade Subcommittee (UHITS) with the purpose to evaluate, analyze and recommend policies to address the issues surrounding Urban Heat and to advance implementation of the Phoenix Tree and Shade Master Plan. Input and recommendations from the subcommittee will be provided to the EQSC for approval and then passed on to City Council.

CITY LEAD // Office of Environmental Programs, Office of Sustainability

PARTNERSHIPS // Environmental Quality and Sustainability Commission

TIMEFRAME // Short Term



GOAL 3

Provide resources and services to residents to manage heat.

TARGET 3

To be determined

BASELINE

50+

H3.1

Ongoing Actions

Educate the community on proper planting and care for trees through the Citizen Forester Program.

Increasing the tree canopy throughout the city will require community participation. Education on how to properly plant and care for trees is provided through the Citizen Forester program. Citizen Foresters advocate for trees by promoting best practices regarding proper tree planting and maintenance techniques, while supporting community efforts to achieve tree and shade canopy goals. Residents can become certified as Citizen Foresters and assist in the planting and care of the urban forest.

CITY LEAD // Parks and Recreation

PARTNERSHIPS // Street Transportation, Office of Sustainability, AmeriCorps VISTA

TIMEFRAME // Short Term

H3.2

Ongoing Actions

Continue to participate in the Heat Relief Regional Network.

The Heat Relief Regional Network is a regional partnership of the Maricopa Association of Governments (MAG), municipalities, nonprofit organizations, the faith-based community, and businesses. The Heat Relief Regional Network works with 137 partner organizations to provide water, resources and wellness checks in communities alongside an education and awareness campaign each summer focusing on vulnerable communities. The number of heat related deaths in the county has risen in each of the last four years with nearly 200 heat related deaths in 2019.

CITY LEAD // All Departments

PARTNERSHIPS // MAG

TIMEFRAME // Short Term

GOAL 4

Increase the use of high albedo, or reflective, materials in infrastructure projects.

TARGET 4

To be determined

BASELINE

To be determined

H4.1

Ongoing Actions

Continue to implement the Cool (Energy Star) Roofs on city-owned buildings.

Coating the roof reduces the amount of energy needed to cool the building, reducing GHG emissions. Cool (Energy Star) Roofs is the standard for all departments that work with the Public Works Department (PWD) to handle their roof replacement, as well as for those buildings owned by PWD. This type of roof has been implemented for PWD owned buildings since 2005.

CITY LEAD // Public Works

PARTNERSHIPS //

TIMEFRAME // Short Term

H4.2

Pending Actions

Complete cool pavement pilot program and expand program to areas where it would be most effective.

A Cool Pavement pilot is currently underway in eight Phoenix neighborhoods and one city park. Phoenix wants to test the cool pavement material to see whether it is effective at reducing temperatures in Phoenix desert climate.

CITY LEAD // Street Transportation

PARTNERSHIPS // Office of Sustainability, ASU

TIMEFRAME // Short Term

H4.3

Pending Actions

Be a living laboratory to test cool materials for use in Infrastructure projects.

Be a living laboratory to test new materials that could mitigate urban heat island when implemented at scale. Many promising materials are coming on the market yet their performance in high temperature conditions, their durability and the overall economics need further study. For example, ASU is currently evaluating a new material from 3M that reflects heat as long wave radiation while cooling the underlying surface. ASU is also testing various coatings as part of the overall cool pavement analysis—installing temperature sensors below the pavement surface and at grade.

CITY LEAD // Street Transportation, Office of Sustainability

PARTNERSHIPS // ASU

TIMEFRAME // Medium Term

GOAL 5

Develop HeatReady certification for cities in partnership with ASU by 2025.

TARGET 5

Heat Ready Certification

BASELINE

None

H5.1

Pending Actions

Pilot HeatReady certification in partnership with ASU.

Where more than 2,000 cities including Phoenix have achieved “StormReady” certification by the National Weather Service, ASU in partnership with the city are seeking to pilot a HeatReady certification program—identifying the policies, programs and governance framework and scorecard to assist cities in preparing for increasing temperatures and heat waves. With Phoenix being the epicenter of research related to heat and a hotbed of heat-related programs, ASU and the city are seeking to develop HeatReady to allow it to become a national or international certification program.

CITY LEAD // Office of Sustainability

PARTNERSHIPS // ASU

TIMEFRAME // Short Term

H5.2

Pending Actions

Expand HeatReady Certification nationally or internationally.

After piloting and refining HeatReady Certification in Arizona, ASU and the city are seeking to test HeatReady nationally and internationally to increase its functionality and shared learnings and, more importantly, its impact. C40 and the Global Cool Cities Alliance have both expressed interest in becoming the global verification and certification body once the certification tool reaches maturity.

CITY LEAD // Office of Sustainability

PARTNERSHIPS // ASU, C40, National Weather Service, Global Cool Cities Alliance

TIMEFRAME // Short Term

WATER





WATER (W) GOALS

Goal W1: Identify and implement infrastructure projects to ensure water security.

Goal W2: Improve conservation of water resources by improving stormwater management, optimizing water use, conducting water audits, and utilizing wastewater.

Goal W3: Increase outreach and provide programs to residents and businesses to reduce water use to 155 GPCD by 2030.

2050 
GOAL

Provide a clean and reliable 100-year water supply.



1.7
MILLION
water customers



100 YEAR
water supply

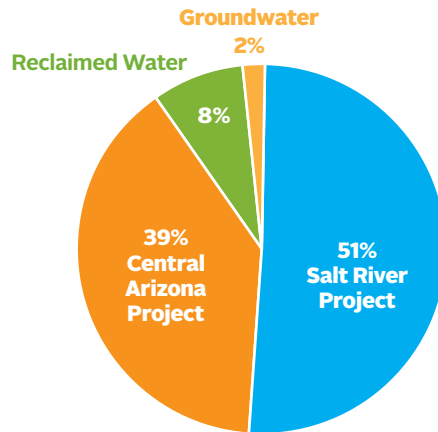


7,000
MILES
of water lines



Phoenix's first water
pipeline was made out of
REDWOOD

Phoenix Water Sources



89%
of wastewater recycled



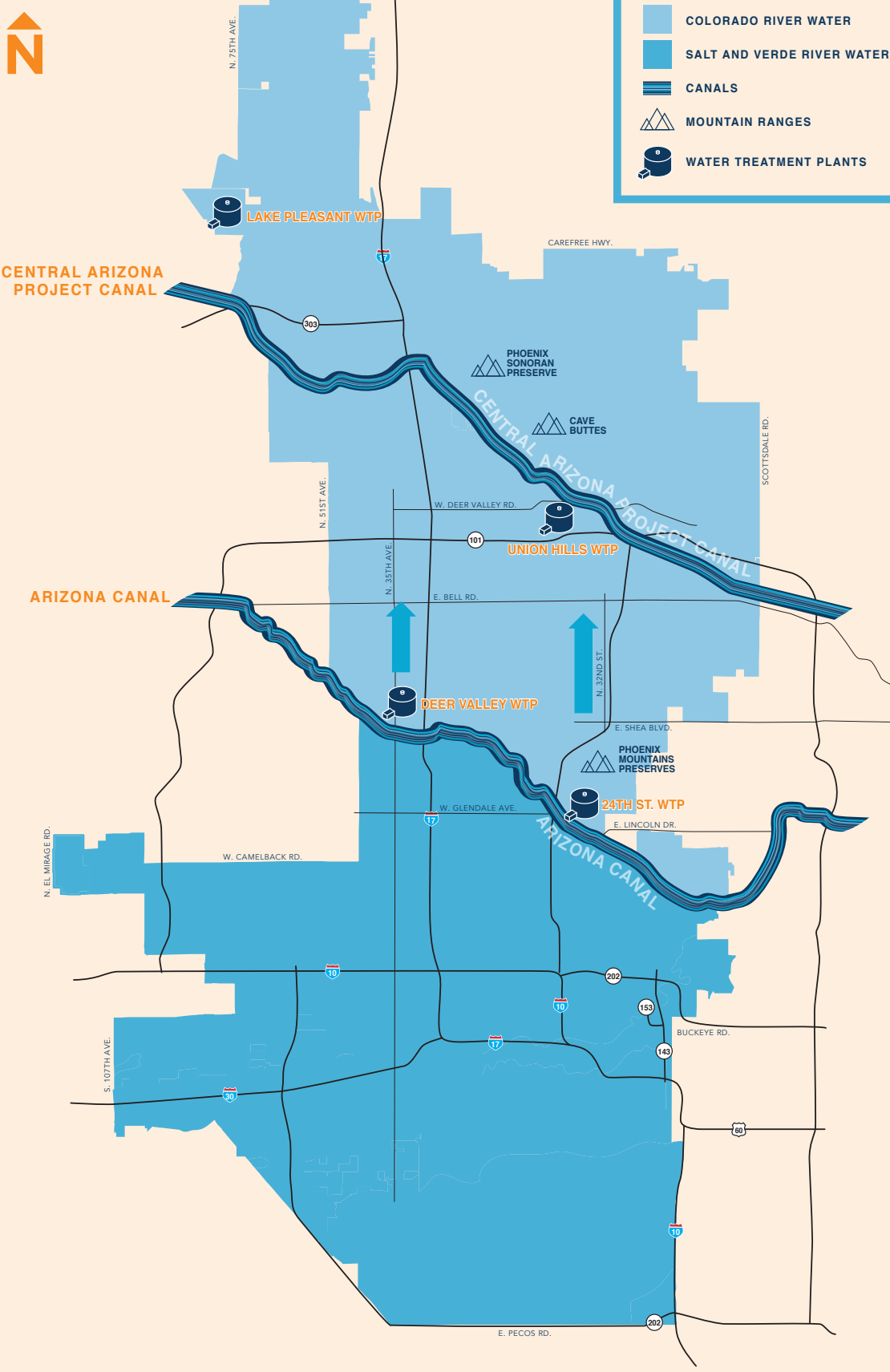
BACKGROUND

The city's Water Services Department (Phoenix Water) is more than 110 years old and is responsible for treating and distributing tap water to 1.7 million customers daily. Today, it also manages the city's sewer system and handles wastewater treatment operations for 2.5 million residents in five valley cities. Infrastructure includes 7,000 miles of water lines, 5,000 miles of sewer lines, eight treatment plants, 50,000 fire hydrants, and 90,000 manholes. Phoenix's water and sewer rates are among the lowest of comparable-sized cities nationwide. Our tap water supply is secure due to decades of planning and multiple water sources. The city reuses nearly all its wastewater on crops, wetlands, and energy production. Moving forward, the city's water and wastewater utilities are committed to energy efficiency that will pave the way to accomplishing their immediate, mid-term, and future goals in sustainability and emission reductions. We are taking action to increase water security and mitigate GHG emissions by banking water, using wastewater, increasing renewable sources of energy to power the water treatment processes, and capturing GHG emissions from these processes.

Phoenix Water GHG emissions are generated by a variety of activities. GHG emissions can occur from the combustion of purchased natural gas, the consumption of purchased electricity, methane generation during water treatment, and nitrous oxide emissions from wastewater effluent. GHG emissions also occur during the hauling and regeneration of granular activated carbon filters used in the treatment process to remove disinfection byproducts. GHG emissions from Water Services have decreased by 18.8% between 2005 and 2018 but have increased by 2.8% since 2015.

LEGEND

- COLORADO RIVER WATER
- SALT AND VERDE RIVER WATER
- CANALS
- MOUNTAIN RANGES
- WATER TREATMENT PLANTS

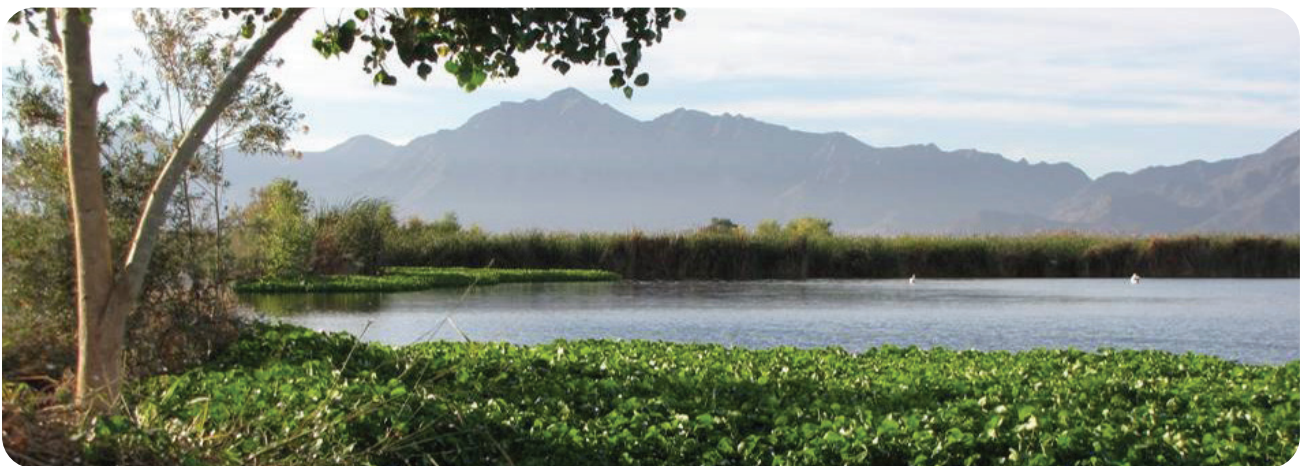


Local Government Leading the Way

While Phoenix Water enjoys a robust and diverse water portfolio, **conservation** has always been a part of the history of Phoenix Water. Rather than focusing on short-term reactive strategies during drought conditions, Phoenix focuses on long-term culture change among its residents. Residents are encouraged to adopt a desert lifestyle because, in a desert, water will always be scarce. This strategy has been very successful as Phoenix has reduced the number of gallons per capita per day (GPCD) it uses by nearly 30% over the last twenty years, despite an increase of almost 400,000 additional residents.

For over 100 years, Phoenix Water has delivered safe, reliable tap water to homes and businesses in our community. Arizona is a leader in **water banking**, meaning water is stored underground to be used later. Arizona has banked millions of acre-feet of water through the Arizona Water Banking Authority. Phoenix Water delivers renewable surface water supplies to our customers so that groundwater can be saved for the future. Phoenix has worked hard to protect local groundwater supplies so that they are available to protect against drought and a changing climate. Phoenix's efforts ensure that our underground reservoir of groundwater – water in the bank – is there when we need it.

In addition to ensuring a secure water supply, work has been done to rehabilitate natural habitats, like Tres Rios. The **Tres Rios Environmental Restoration** project involves the rehabilitation of nearly 700 acres in and around the Salt River, restoring a vital wetland and riparian habitat. The project creates a mutual relationship between the renewed wetlands and the nearby wastewater treatment plant. The lush and scenic Tres Rios is now home to more than 150 species of birds and animals like muskrats, raccoons, skunks, coyotes, bobcats, and beavers. The beautiful cottonwood groves, willows, mesquites, and other desert shrubs around the reed-lined ponds and along the trail attract many migratory and wintering songbirds. By bringing the Salt River back to the condition it was in during the early 1800s, this project is repairing a natural habitat. The trees and plants produce hundreds of thousands of volatile organic compounds including oxygen, a vital element to clean and healthy air. The reclaimed water from the wastewater treatment plant is pumped over to the wetlands, and the plants and animals take what they need before it is discharged back into the river. Nearly all of the reclaimed water generated in Phoenix is treated and reused for agricultural irrigation, local power generation, groundwater recharge, and wetland restoration.



Tres Rios Wetlands

KEY ACHIEVEMENT

Sustainability Bond Sale for Colorado River Resiliency Projects

On March 26, 2020, the city of Phoenix issued its first-ever sale of Sustainability Bonds. The bonds will fund Colorado River resiliency-related projects by the Water Services Department. One of these resiliency projects includes building a pipeline supplying North Phoenix residents (approximately 400,000 people) that are served exclusively by Colorado River water treated at two water treatment plants. The proposed 66-inch pipeline will be used to alleviate the effects of drought, by ensuring that water supplies from the Salt and Verde Rivers are available to North Phoenix during future shortage on the Colorado River.

Phoenix Water finished the construction of a 7.5 MW solar power facility at the Lake Pleasant Water Treatment Plant (WTP) in 2013. The overall reduction of GHG emissions was primarily due to the on-site solar power generation by Phoenix Water.

- 30 Acres
- 22,936 Solar Panels

For over 100 years, Phoenix Water has delivered safe, reliable tap water to homes and businesses in our community. During this time, we've literally been putting water in the bank. Arizona is a leader in water banking, meaning that we store water underground to be used at a later date. Arizona has banked millions of acre-feet of water through the Arizona Water Banking Authority. Phoenix Water delivers renewable surface water supplies to our customers so that groundwater can be saved for the future. We've worked hard to protect local groundwater supplies so that they are available to protect against drought and a changing climate. Our efforts ensure that our underground reservoir of groundwater – our water in the bank – is there when we need it.

The Drought Pipeline is essential to the economic health and vitality of Phoenix. This sustainability project will ensure all residents have access to safe, reliable, clean drinking water during the future times of shortage on the Colorado River. The City of Phoenix Water Services Department is designing additional infrastructure to continue its mission of providing a reliable water supply to our 1.5 million customers. As part of the City's preparation for resiliency in a hotter and drier future, the improvements will provide more flexibility to move Salt and Verde River water supplies to areas of the City that are currently entirely dependent on Colorado River water.



GOAL 1

Identify and implement infrastructure projects to ensure water security.

TARGET 1

To be determined

BASELINE

To be determined

W1.1

Quickstart Actions

Design and construct additional infrastructure to provide a reliable water supply to 1.7 million customers.

The Drought Pipeline Project will provide Salt and Verde River water supplies to areas of the city that are currently entirely dependent on Colorado River water. The project is essential to the economic health and vitality of Phoenix. This sustainability project will ensure all residents have access to safe, reliable, clean drinking water during the future times of shortage on the Colorado River. This project will be financed using sustainability bonds, a result of the recent development of the Green and Sustainability Bond Framework. This will result in loan service cost savings.

CITY LEAD // Water Services

PARTNERSHIPS // Street Transportation, Finance

TIMEFRAME // Short Term

W1.2

Ongoing Actions

Continue to bank water, which is storing water underground for use at a later date.

Arizona is a leader in water banking, the practice of storing water underground to be used later. Millions of acre-feet of water have been banked in Central Arizona aquifers through the Arizona Water Banking Authority. The water that is delivered to residents comes from renewable surface water supplies, so that groundwater can be saved for the future. In addition, a water-sharing agreement with Tucson will continue, where Phoenix will store some of its unused Colorado River water in aquifers in Tucson. In times of shortage, Tucson will give Phoenix some of its Colorado River water allocation in exchange for this stored water.

CITY LEAD // Water Services

PARTNERSHIPS // City of Tucson, Arizona Water Banking Authority

TIMEFRAME // Short Term

GOAL 2

Improve conservation of water resources by improving stormwater management, optimizing water use, conducting water audits, and utilizing wastewater.

TARGET 2

To be determined

BASELINE

To be determined

W2.1

Ongoing Actions

Improve stormwater drainage capacity and reduce backup surging at Phoenix Sky Harbor International Airport.

Phoenix Sky Harbor International Airport, located at the end of the Camelback Mountain south watershed, will improve stormwater drainage efficiency by performing preventative maintenance that will improve capacity and reduce backup surging preventing flooding and contamination of the stormwater runoff.

CITY LEAD // Aviation

PARTNERSHIPS // Water Services, Finance

TIMEFRAME // Short Term

W2.2

Ongoing Actions

Identify and implement water saving measures on city of Phoenix facilities and processes.

A city-wide Internal Water Efficiency Task Force was created to monitor water used by municipal operations to identify and implement water saving measures. As a result of the task force, water use dropped 46.5 million gallons. On-going tracking of water usage in Parks and Aviation Departments is possible by a GIS program developed by Water Services Department.

CITY LEAD // Water Services

PARTNERSHIPS // All Departments

TIMEFRAME // Short Term

Implement successful Phoenix Sky Harbor International Airport commercial cooling tower system upgrade program in other processes throughout city of Phoenix and encourage commercial and industrial adoption of process.

Cooling towers are one of Phoenix’s highest volume water uses. The Cooling Tower System Upgrade was successfully completed reducing water use by 20 percent. This cooling water treatment system was also installed as part of the Terminal Modernization Project and a system is now being installed in the Rental Car Center. Future opportunities are being investigated for municipal operations and commercial use.

CITY LEAD // Public Works

PARTNERSHIPS // Aviation

TIMEFRAME // Short Term

Cooling Towers

Water used by cooling towers to remove heat from buildings can account for as much as half of all water use in some commercial buildings in the Southwest. At Sky Harbor Airport’s Terminal 4, the water meter that provides make-up water for the cooling towers is one of Phoenix’s highest volume water meters. A pilot project to install a system that softens the make-up water increases the cycles of concentration and reduce water use by 20 percent. Furthermore, using a mixed oxidant generator system eliminates the use of harsh biocide chemicals that are both dangerous and expensive. Initial estimates inferred that the water savings would be 10,000,000 gallons per year. It has been over two years since the project was concluded, and the results are in with more than 21,000,000 gallons of water and thousands of pounds of chemicals saved in 2019. The project was so successful that the systems are now a standard central plant design, and similar systems have been installed at the Terminal 3 Central Plant and Rental Car Center Central Plant. The cost savings of these upgrades are achieved by the elimination of purchasing biocide chemicals, reduced water use, and increased system life. A principal factor of this type of system is that it can be scaled up or down in size to accommodate almost any size cooling tower.

Reducing water usage has saved power, which helps diminish the city’s overall carbon footprint. These success stories benefit the Phoenicians and the annual 18.4 million visitors that pass-through Sky Harbor by keeping them cool and comfortable during their travels.



Cooling tower and associated water-pretreatment equipment located at Phoenix Sky Harbor International Airport.

Implement the use of the Greater Phoenix Green Infrastructure and Low Impact Development Details for Alternative Stormwater Management.

The Greater Phoenix Green Infrastructure and Low Impact Development Details for Alternative Stormwater Management is a handbook that provides technical standard details and specifications (TSDS) to be used for low impact development to members of the design, planning and development communities in Maricopa County. These TSDS will primarily be used on right of way projects and can be implemented in private projects. Using the handbook will result in environmental benefits, water conservation, urban heat reduction, improvement in public health and additional green spaces.

CITY LEAD // Planning and Development, Water Services, Office of Environmental Programs

PARTNERSHIPS // MAG, ADEQ, ASU

TIMEFRAME // Short Term



GOAL 3

Increase outreach and provide programs to residents and businesses to reduce water use to 155 GPCD by 2030.

TARGET 3

155 GPCD
by 2030

BASELINE

170 GPCD

W3.1

Pending Actions

Expand existing SRP program that subsidizes cost of irrigation controllers for residential use.

Water conservation has always been part of Phoenix's strategy to maintain a 100-year water supply. Residents are encouraged to adopt xeriscape landscaping with efficient irrigation controllers through a program that subsidizes the cost of smart irrigation controllers for residential use. Expanding this program will reduce water use and lower costs for residents.

CITY LEAD // Water Services

PARTNERSHIPS // SRP

TIMEFRAME // Short Term

W3.2

Pending Actions

Expand Toilet Retrofit Program to include a low-income program and other incentives.

To conserve water, the feasibility of a new toilet retrofit program is being evaluated. The elements that the program will contain are a low-income program that includes toilet and professional installation at no cost to customer and a flat rebate program to all customers that purchase and install a low flow toilet that uses 1.28 gallons per flush.

CITY LEAD // Water Services

PARTNERSHIPS //

TIMEFRAME // Short Term

Phoenix has reduced the number of gallons per capita per day (GPCD) it uses by nearly **30%** over the last twenty years, despite an increase of almost **400,000** additional residents.

Expand the Homeowners Association Audit Program.

Homeowners Associations (HOA) use water to maintain common landscaped areas, which can lead to high costs and high water usage to keep the areas looking attractive. Up to 70 percent of water used by residents is for outdoor watering. Phoenix piloted a HOA Audit Program that conducted nine audits of outdoor water use within common areas managed by HOAs. Based on that pilot, the potential average savings for the HOAs that volunteered to participate was 4.5 million gallons per year if they implemented the recommendations from the audit. The program will be expanded from pilot to ongoing program by increasing the number of inspections from nine to 40.

CITY LEAD // Water Services

PARTNERSHIPS //

TIMEFRAME // Short Term

EQUITY AND ENVIRONMENTAL JUSTICE

Phoenixians are already experiencing impacts from climate change, from hotter, drier summers to record-breaking fire seasons and floods that require years for communities to fully recover.

We are all impacted by climate change, but some experience these impacts much more acutely than others. Black, Indigenous, and People of Color, indigenous people, lower-income individuals, historically underrepresented groups, children and older adults, and those experiencing multiple environmental burdens are disproportionately impacted by climate change. Our climate action will not succeed without including all Phoenixians, especially the overburdened communities.

Overburdened or disproportionately impacted communities must be identified, and involved in climate action processes.

How Climate Change Impacts Overburdened Communities

Climate change intensifies adverse conditions for people already burdened by historic and current harms to health, social wellbeing, political agency, economic conditions, and/or environmental quality. Communities already dealing with these existing burdens are more vulnerable to the impacts of climate change.

Existing disparities are worsened by climate change impacts. In Phoenix, heat extremes and poor air quality from wildfires impact individuals and families who may already be dealing with chronic health conditions, inadequate healthcare or insurance, or a lack of clear and reliable information.

Every action is a climate action. All aspects of society including, in part, our health, our economy, and our food systems are directly influenced by climate change. Our climate strategies must use this logic to understand the potential impacts, both positive and negative, direct and indirect, on overburdened and disproportionately impacted communities. Using the values as described by Colorado's Air Pollution Control Division Climate Equity Framework⁴³ will help us do that:

VALUE 1: Equitable Representation - The Climate Action Planning process should provide easily accessible opportunities for any interested person to participate.

VALUE 2: Prioritizing Benefits - Climate Action Planning strategies with the potential to provide benefits to individuals or communities, overburdened communities should be prioritized.

VALUE 3: Economic Impacts - Climate Action Planning strategies should reduce costs, including currently externalized costs, and increase economic benefits for overburdened communities wherever possible.

Overburdened Communities

Overburdened communities are, as defined by EPA: Minority, low-income, tribal, or indigenous populations or geographic locations in the United States that potentially experience disproportionate environmental harms and risks. This disproportionality can be as a result of greater vulnerability to environmental hazards, lack of opportunity for public participation, or other factors. Increased vulnerability may be attributable to an accumulation of negative or lack of positive environmental, health, economic, or social conditions within these populations or places. The term describes situations where multiple factors, including both environmental and socio-economic stressors, may act cumulatively to affect health and the environment and contribute to persistent environmental health disparities

VALUE 4: Health Impacts - Climate Action Planning strategies should minimize negative health impacts and increase health benefits for disproportionately impacted communities.

VALUE 5: Access to Solutions - Climate Action Planning strategies should promote clean technologies in ways that are equitable for all living in Phoenix.

VALUE 6: Building Resilience - Climate Action Planning strategies should improve resilience and quality of life for overburdened communities.

Community Engagement

A key component of equitable and just climate action is effective community outreach and engagement. Policies that are shaped by community and stakeholder input are more likely to have better outcomes. Phoenix will facilitate meaningful ways for people to engage early and often throughout the process. Thoughts, perspectives and ideas generated through engagement will be documented and taken into account as policy and programs are formulated.

BEST PRACTICES

1. Understand, respect, and acknowledge the histories of marginalization and mistrust

Overburdened communities have experienced a long history of systemic racism and classism. A combination of unjust laws, and unconscious bias among other things, have left many communities mired in long-standing societal inequities. This history has often fostered mistrust within impacted and disenfranchised communities. Mistrust hampers engagement with communities if not given special and explicit attention.

Phoenix will build trust by:

- **Continuing** to include racially and ethnically diverse representation on advisory groups, boards and commissions.
- **Asking** the right question such as, “What mistakes have been made in the past? How did government agencies contribute to the experiences of communities? What specific types of marginalization (geographic, linguistic, economic, racial discrimination, etc.) are communities facing and how do these intersect with climate change?”
- **Offering** multiple ways for community members to engage and recognize the varying levels of voice, power, and impact that they afford.

2. Manage expectations by being straightforward and by providing clear processes and information.

We understand the need to build trust and that community members may be disconnected from programs, policy decisions and initiatives. Clear scopes as well as clear engagement processes will be developed and implemented for each action.

The city can clearly and transparently communicate by:

- **Presenting** the scope of work so that community members understand how they a) can and cannot engage; b) when they can and cannot comment; c) how their engagement can impact outcomes, and; d) how they can connect with others both at the local and regional levels.
- Clearly **communicating** the roles, responsibilities, and capacities of those involved including fully and clearly disclosing limitations and constraints that are present.
- Using **regular, consistent** and **accessible** communication channels to communicate early and often (throughout the entire process) so that the community remains informed.

3. Use Effective Modes of Community Engagement and Communication

Community engagement can generally be classified into five types: inform, consult, involve, collaborate, and empower. The appropriate level of engagement will vary depending on the scope of the project or program or situation.

4. Prioritize local knowledge and concerns.

The unique character of Phoenix's various communities has been formed through difference and diverse sets of circumstances. Individual cultures, social and economic networks, and histories all play a part in making Phoenix such a dynamic place to live, play and work. Phoenix's diversity provides opportunities to leverage local knowledge to affect positive change. The diversity of experience is also a powerful tool in creating lasting change, as communities have an incredible range of assets to contribute to the process.

Phoenix will elevate local knowledge and concerns by:

- **Holding listening sessions, workshops, and community conversations** to understand the concerns and needs of community members. Part of this is provide space for community members and leaders to elevate their existing issues of concern, beyond government-determined agendas and priorities.
- **Making a concerted effort** to identify and work with new groups, especially those that address systems-level perspectives on climate equity, not just the typical advocacy organizations.
- **Continually cultivating partnerships** with community partners.

5. Supporting the protection of the well-being, interests, and rights of communities.

Phoenix is prioritizing outreach to and engagement with disproportionately impacted communities as they are especially vulnerable to the potential impacts of the climate crisis.

Phoenix can protect the well-being, interests, and rights of communities by:

- **Actively seeking** input and guidance from the community members on a regular basis.
- **Providing clear and easy access** to accurate and understandable data and information to help communities stay informed.

6. Earn trust through partnerships and collaborations.

Partnerships are essential to successful community engagement. Building relationships with community leaders and organizations is one of the most important undertakings when engaging disproportionately impacted communities. Building partnerships will help Phoenix keep the needs and concerns of the community at the forefront of the engagement process. Having individuals, committees, and organizations that can help ground the work in the community's concerns will help ensure that the legacies of mistrust and ineffective action are not continued.

Phoenix can nurture partnerships that engender community trust by:

- **Hosting or co-host events** with local partners where community organizations, groups, and advocacy organizations can meet to develop connections and relationships.
- **Participate in existing community activities** and events, to make it easier and more time-efficient for community members to engage.
- Identifying and working with existing organizations doing climate change work at the local level, including local government and community-based organizations, among others.
- Identifying and working with groups who are representative of the community.
- Looking for ways to elevate and address community concerns and to channel projects that will benefit communities.

Local Government Leading the Way

- 1. PRIORITIZING** - and considering communities of color, other marginalized groups, and those who experience the vulnerability to climate change and are most impacted by heat and air quality related issues. As a few examples:
 - a. the Human Services Department joins cities across the region in a nationally recognized Heat Relief Network to work with partner organizations to perform outreach and education to vulnerable populations and connect them with cooling centers, hydration stations, and other city services.
 - b. the Street Transportation Department has developed a Heat Vulnerability Walkshed Tool to help identify neighborhoods that will benefit the most from the Cool Corridors Program—to prioritize street tree planting in heat vulnerable neighborhoods
 - c. the Neighborhood Services Department delivers a Low-Income Weatherization Assistance Program focused on decreasing energy consumption and improving indoor air quality for residences within the 200% Federal Poverty Level.
 - d. the Office of Environmental Programs is leading on environmental justice by developing air quality and emission inventories across all communities to identify and target programs towards communities most impacted by poor air quality
 - e. the Housing Department is leading a community-driven redevelopment effort as part of the Choice Neighborhoods redevelopment of the Edison-Eastlake Community. This effort includes LEED for Neighborhood Development (LEED ND) certification and architectural guidelines that create “Enterprise Green Communities” to provide a new mixed-income, energy-efficient housing development that will become a showcase of sustainable development.
 - f. The city has recently established the Office of Heat Response and Mitigation to lead the implementation of the Tree and Shade Master Plan and coordinate efforts across all city departments to prioritize communities most impacted by heat by optimizing city investments in infrastructure to mitigate the effects of urban heat island.
- 2. INCLUSIVITY** – creating spaces and addressing specific areas of the Climate Action Plan with greater dialogue where these residents feel welcome to participate with their experiences. Departments across the city are increasing their efforts to receive community input on city programs by reaching out to our diverse populations through partner organizations well-respected in the community. As a few examples:
 - a. the city is expanding its efforts to advance equity and help residents lead lives with dignity through its newly established Office of Diversity, Equity and Inclusion with a vision to create better outcomes and eliminate barriers throughout city policies, programs and relations.
 - b. The city is expanding its outreach to youth and adding their voice to future policies and programs that will affect their future. This CAP hosted workshops specifically for youth to seek their input, and engaged youth leaders through the High School Sustainability Officer program.

EQUITY AND ENVIRONMENTAL JUSTICE CLIMATE ACTION PLANNING PROCESS

Timeline



Climate Liaisons

Climate Liaisons are City Staff from 29 departments across the city that have contributed to the development of the climate action plan by writing the plan, presenting and facilitating at community events. The individuals are members of staff that report directly to the director-level to provide the most up-to-date information and to ensure the decisionmakers are included in the climate action planning process. The 29 departments are:

Office of Arts and Culture

Aviation Department

Budget and Research Department

City Clerk Department

Communications Office

Community and Economic Development

Phoenix Convention Center

Office of Environmental Programs

Equal Opportunity Department

Finance Department

Fire Department

Office of Government Relations

Housing Department

Human Resources Department

Human Services Department

Information Technology Services

Law Department

Phoenix Public Library

Neighborhood Services Department

Parks and Recreation Department

Planning and Development Department

Police Department

Public Transit Department

Public Works Department

Retirement Office

Street Transportation Department

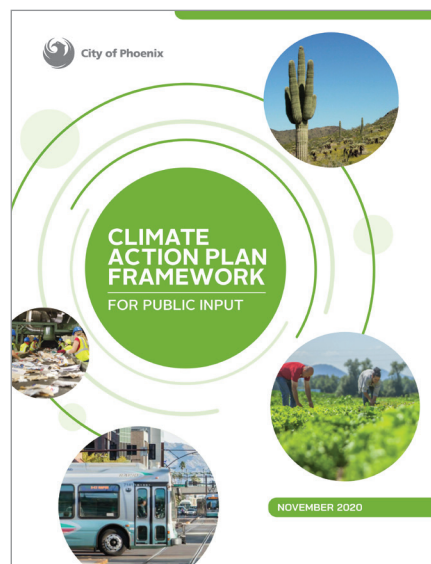
Office of Homeland Security and
Emergency Preparedness

Office of Sustainability

Water Services Department

Climate Action Plan Framework

The Climate Action Plan Framework contains climate-related goals and actions already underway by the city of Phoenix and was used as a starting point to begin the community-wide climate action planning process. The Framework was created by the Climate Liaisons and informed the residents of Phoenix as to what programs and policies are already in place or in progress for their input. The Framework can be found at <https://www.phoenix.gov/climate/>. The Framework was available for public comments from October 2020 to February 2021. Phoenix residents could provide comments via a survey online, workshops, or via email. We received 1,553 total comments that were incorporated into the draft climate action plan.



COMMUNITY INPUT

PHASE 1: SUMMER KICK-OFF SURVEY

Community input on the climate action was first elicited from the residents of Phoenix starting with a survey available online in summer 2020 and received 846 total responses with 605 responses from Phoenix residents. The survey asked about climate-related hazards, top recommended actions, community benefits that were most important, ways to decrease single occupancy vehicle travel, major barriers to addressing climate change, and preferred method of communication. Community outreach was primarily conducted virtually.

75%

EXTREMELY CONCERNED WITH:

Extreme temperatures and heat waves

Prolonged and extreme drought conditions

Decreased air quality

MAJOR BARRIERS:

Lack of government mandated regulations/support

Difficulty in changing habits

PREFERRED MEANS OF COMMUNICATION:

City of Phoenix website

Online Community Events and Workshops

Social media

50,000+

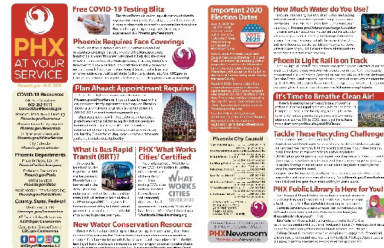
Impressions on Nextdoor about climate action

MAKE IT EASIER TO GET AROUND BY:

Promoting working from home

Make walking and bicycling more accessible

Improve bus and light rail options



Survey advertised in PAYS August 2020 newsletter

15

Village Planning Committee Presentations

COMMUNITY INPUT

PHASE 2: CLIMATE ACTION PLAN FRAMEWORK

The Climate Action Plan Framework was released in October 2020 for public input. Outreach for the Framework was available in English and Spanish and included online surveys, presentations, workshops, social media, email comments and radio and television interviews. We received 487 responses to two surveys, had 186 workshop and 150 presentation participants, and 34 emails with comments related to climate action.

487
SURVEY
RESPONSES

4
VIRTUAL
WORKSHOPS

186
PARTICIPANTS

Youth Workshop
co-hosted with Office of Sustainability's
Phoenix Union High School Sustainability
Officer Program

"Please make sure this plan for 2050 is implemented equally across low- and high-income communities. If it isn't, this could easily make class disparities worse." – Youth Workshop Participant

English with real-time
Spanish Translation Workshop
co-hosted with CHISPA Arizona

Workshop focused on Energy, Heat and
Water Sectors

Workshop focused on Air Quality, Energy,
Heat, Transportation and Waste

34
EMAILS

TOP SUPPORTED GOALS

Stationary Energy

Microgrids and new conservation and renewable-energy programs

Transportation

Implement Complete Streets Policy and Active Transportation Program and Increase EV and EV Infrastructure

Waste

Increase reuse and recovery of waste materials and transition to green alternatives

Air Quality

Decrease ozone precursor emissions

Local Food Systems

Affordable, healthy, local, and culturally appropriate food for all

Heat

Increase Shade and create Cool Corridor Network

Water

Improve conservation of water resources

"No Carbon Emissions by 2030... 2050 is way too late." -Survey Respondent

5
PRESENTATIONS

150
PARTICIPANTS

Unlimited Potential

American Society of Civil Engineers

Arizona Green Chamber of Commerce

Arizona State University
Sustainable Cities Network

Heat Preparedness and
Resilience Workgroup

FUTURE CLIMATE SPECIFIC WORK

Greenhouse Gas Inventories

LOCAL GOVERNMENT AND COMMUNITY-SCALE

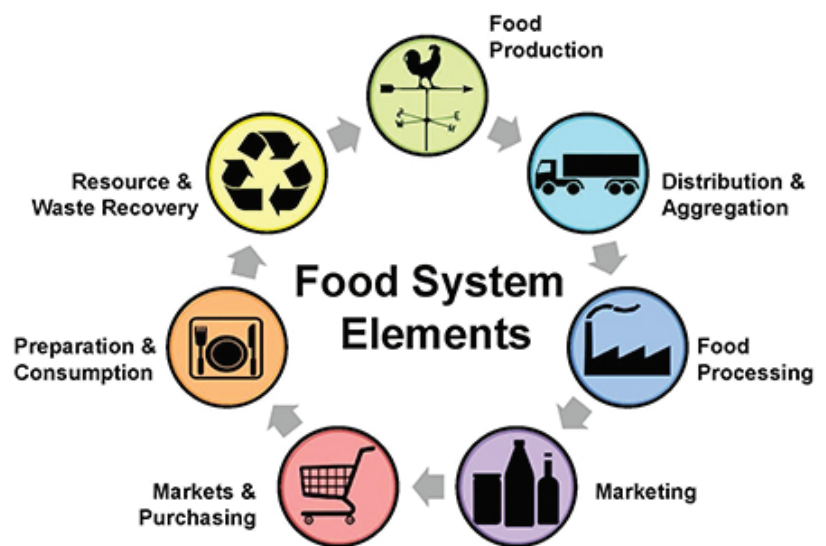
GHG emissions inventories have been conducted for local government for calendar years 2005, 2012, 2015, and 2018. Community-wide GHG emissions inventories have been conducted for calendar years 2012, 2016, and 2018. Both inventories are in progress for calendar year 2020. In the future, local government and community-scale inventories will continue to be conducted every two years. This will inform decisionmakers as to the effectiveness of the climate action plan. To view the available inventories, please visit <https://www.phoenix.gov/climate>

AGRICULTURE, FORESTRY AND OTHER LAND USE (AFOLU)

Agriculture, Forestry, and Other Land Use (AFOLU) considers the emissions and sequestration of carbon from sources and sinks in agriculture, forestry and other land use. Emissions from this sector are approximated to be one-quarter of all anthropogenic GHG emissions mainly from deforestation and agricultural emissions from livestock, soil and nutrient management.⁴⁴ This sector will be included as part of the calendar year 2020 GHG emissions inventory to estimate GHG emissions from Phoenix’s food system. The inventory will consider the GHG emissions from food system elements like producing, processing, and transporting the food all the way to determining the best way to dispose of food waste. By adding this analysis to the GHG emissions inventory, a more efficient local food system can be developed that will be able to provide food to residents, while minimizing the associated GHG emissions.

KYOTO PROTOCOLS

The Kyoto Protocol is an international treaty which extends the 1992 United Nations Framework Convention on Climate Change (UNFCCC) and applies to these six greenhouse gases: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.⁴⁶ Currently, Phoenix’s GHG inventories estimate emissions from three greenhouse gases: carbon dioxide, methane, and nitrous oxide. Emissions of hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride are low in Phoenix, but these chemicals have high global warming potentials or the ability to absorb more heat than carbon dioxide. As the emissions of carbon dioxide, methane, and nitrous oxide decrease, emissions of the remaining gases will become significant and will be included in the city’s 2026 GHG emissions inventory to accurately estimate the emissions.



Source: Texas Center for Local Food⁴⁵

CONSUMPTION-BASED

Consumption-based inventories include GHG emissions produced within the city and GHG emissions that come about as a result of consumption of goods and services that come from outside the city. These imported goods and services are attributed to the cities where they are consumed. The GHG emissions include those from production outside the city, the transportation to the city, use within the city, and finally GHG emissions from disposal.⁴⁷ It is estimated that a consumption-based inventory will show higher GHG emissions than the traditional approach. Taking the consumption-based approach will allow for the residents of Phoenix to understand the impact of their consumption on GHG emissions. A consumption-based GHG emissions inventory will be conducted for calendar year 2022.

THIRD-PARTY VERIFICATION

GHG inventories need to be verified by a third-party to ensure that the data being presented is accurate and comparable to other inventories. Phoenix either voluntarily reports to or has committed to reporting GHG inventories to C40 Cities, CDP (formerly Carbon Disclosure Project), and Global Covenant of Mayors. U.S. EPA also recommends third-party verification.⁴⁸

C40 Cities-Recommended

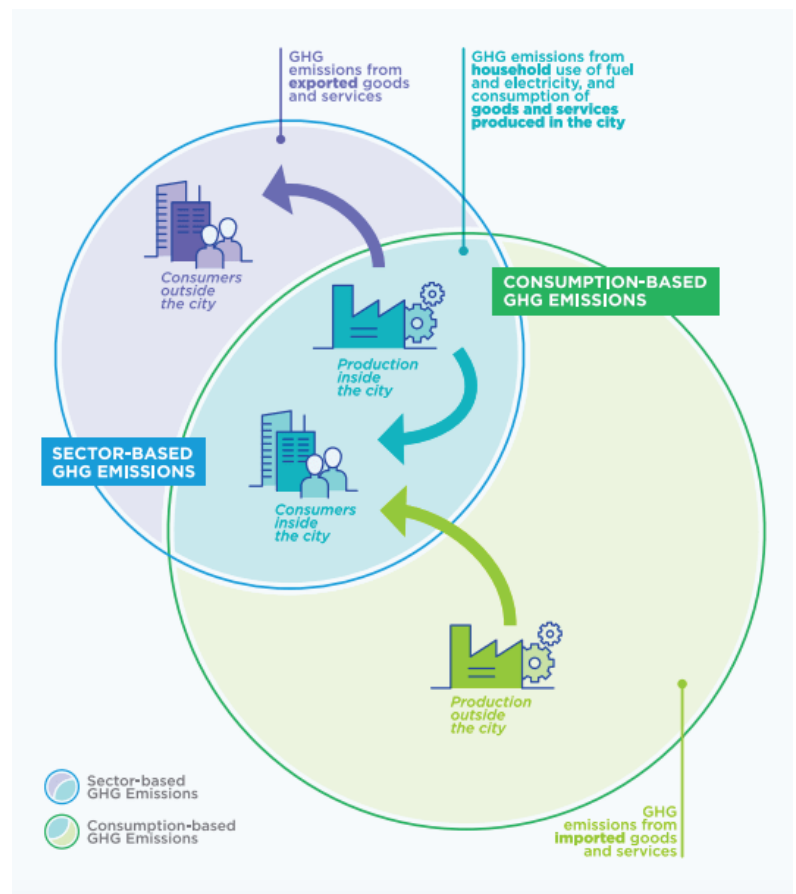
C40 Cities recommends an external review of the GHG inventory for data quality assurance and verification as part of the development of the inventory.⁴⁹

CDP-Required

Phoenix reports GHG emissions to CDP, a carbon and energy reporting platform that links environmental integrity with fiduciary duty. This platform allows residents, investors, and governments alike to view the information needed to continue to create thriving economies that are sustainable. As part of their scoring process, third-party validation is needed to ensure that the data being presented is valid.⁵⁰

Global Covenant of Mayors – Procedures being developed

Since 2015, Phoenix has also committed to the Global Covenant of Mayors for Climate and Energy, which is in the process of developing procedures for data validation in its Common Reporting Framework.⁵¹



Source: C40 Cities⁴⁹

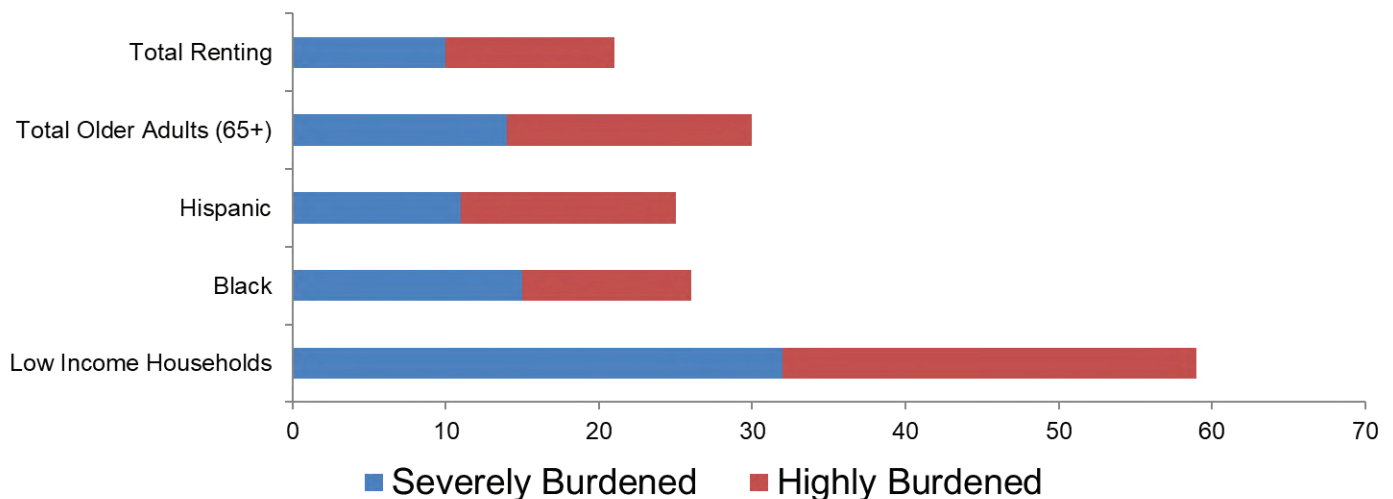
Energy Access Plan

As part of Phoenix’s commitment to the Global Covenant of Mayors, the city needs to begin to formulate an Energy Access Plan that provides energy that is secure, sustainable, and affordable in line with the United Nations Sustainable Development Goal 7. Access to secure energy will be accomplished by reducing energy demand by increasing energy efficiency and energy management, diversifying the energy mix to include renewable energy, and to diversify sources of energy. Energy should be obtained from sustainable sources, with renewable energy generation being considered first. Increasing the affordability of energy will depend on local government action along with action at the state and national levels. The local government can influence affordability through local policies, energy management and use of incentives to promote renewable sources of energy and energy efficiency measures.⁵²

ENERGY INSECURITY WORKGROUP

Currently, Phoenix is participating in the Energy Insecurity Workgroup with the goal to develop a plan alongside the Maricopa County Public Health Department, American Council for an Energy-Efficient Economy (AEEE), Arizona State University and other local stakeholders.

Severely burdened means that more than 10% of household income goes to energy. Highly burdened means that more than 6% of household income goes to energy. **Among all households in Phoenix, 10% are severely burdened and 21% are highly burdened.**⁹ Phoenix will develop an Energy Access Plan to address the needs of residents.



(Source Energy Insecurity Workgroup and AEEE⁴⁹)

Future Updates to Climate Action Plan

The city envisions a continual review, engagement, and revision process for climate action planning, using the best and latest data to guide this process, and continually improving the city’s Pathway to Zero. At a minimum, these actions and plan will be reviewed every two years at the same time as the city updates its municipal operations and community-scale GHG emissions inventories. Depending on the results of the inventories, the GHG emissions reduction pathway model will be revised. Based on the updated model and the continual input from the community and city departments, adjustments will be made to the plan to ensure that the city will achieve its goal of becoming a net-zero GHG emissions city by 2050.

REFERENCES

- ¹ Schwartz, J. (2021). U.S. Cities Are Vastly Undercounting Emissions, Researchers Find. The New York Times. <https://www.nytimes.com/2021/02/02/climate/cities-greenhouse-gas-emissions.html>
- ² Gurney, K.R., Liang, J., Roest, G. et al. Under-reporting of greenhouse gas emissions in U.S. cities. Nat Commun 12, 553 (2021). <https://doi.org/10.1038/s41467-020-20871-0>
- ³ Intergovernmental Panel on Climate Change. (2014). Assessment Report 5. <https://www.ipcc.ch/report/ar5/syr/>
- ⁴ Intergovernmental Panel on Climate Change. (2014). Assessment Report 5 Topic 2 Future Climate Changes, Risks and Impacts. https://ar5-syr.ipcc.ch/topic_futurechanges.php
- ⁵ U.S. Global Change Research Program. (2018). Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II: Southwest Chapter [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 1515 pp. <https://nca2018.globalchange.gov/chapter/25/>
- ⁶ James, I. (2021). Facing a Colorado River shortage, Arizona prepares for the pain of water cutbacks. Arizona Republic. <https://www.azcentral.com/story/news/local/arizona-environment/2021/04/30/arizona-preparing-cutbacks-colorado-river-water-amid-drought/7401706002/>
- ⁷ Maricopa County Department of Emergency Management. (2021). Maricopa County Multi-Jurisdictional Hazard Mitigation Plan. https://www.maricopa.gov/DocumentCenter/View/68419/Maricopa-County-MJMHMP-2021_MJPT-Final-Draft_2021-04-23
- ⁸ C40 Cities Climate Leadership Group. (2018). C40 Cities Deadline 2020. <https://www.c40.org/researches/deadline-2020>
- ⁹ C40 Cities Climate Leadership Group. (2021). C40 Pathways Model.
- ¹⁰ C40 Cities Climate Leadership Group. (2016). Deadline 2020 – How Cities Will Meet the Paris Agreement. https://www.c40.org/other/deadline_2020#:~:text=Deadline%202020%20is%20the%20first,Arup%2C%20the%20global%20consultancy%20firm.
- ¹¹ Arizona Public Service. (2020). Clean Energy. <https://www.aps.com/en/About/Our-Company/Clean-Energy#:~:text=In%20January%202020%2C%20we%20set,portfolio%20coming%20from%20renewable%20energy.>
- ¹² Salt River Project. 2035 Sustainability Goals: Delivering today, shaping tomorrow. <https://www.srpnet.com/environment/sustainability/2035-goals.aspx>
- ¹³ Deloitte Insights. (2020). Electric Vehicles – Setting a Course for 2030. <https://www2.deloitte.com/us/en/insights/focus/future-of-mobility/electric-vehicle-trends-2030.html>

- ¹⁴ U.S. Environmental Protection Agency. (2021). eGRID Summary Tables 2019. https://www.epa.gov/sites/production/files/2021-02/documents/egrid2019_summary_tables.pdf
- ¹⁵ City of Phoenix Human Services Department. (2019). 2019 Community Assessment. <https://www.phoenix.gov/humanservicessite/Documents/2018-2019%20City%20of%20Phoenix%20Community%20Needs%20Assessment%20w%20Appendices-%20%28Final%29.pdf>
- ¹⁶ U.S. Department of Energy. (n.d.). Energy Star Light Fixtures Replacement. <https://www.energy.gov/energysaver/articles/how-much-can-you-really-save-energy-efficient-improvements>
- ¹⁷ U.S. Department of Energy's Energy Information Administration. (2009). Household Energy Use in Arizona. https://www.eia.gov/consumption/residential/reports/2009/state_briefs/pdf/az.pdf
- ¹⁸ City of Phoenix Street Transportation Department. (n.d.). LED Street Light Program. <https://www.phoenix.gov/streets/led>
- ¹⁹ Google Project Sunroof. (n.d.). Estimated rooftop solar potential of Phoenix, AZ. <https://www.google.com/get/sunroof/data-explorer/place/ChIJy3mhUO0SK4cRrBtKNfjHaYw/#?overlay=flux>
- ²⁰ Savage, A. (2020). Phoenix Ranked Top City for Solar Power. Patch. <https://patch.com/arizona/phoenix/phoenix-ranked-top-city-solar-power>
- ²¹ U.S. Department of Energy's Energy Information Administration. (2021). Arizona State Profile and Energy Estimates Profile Analysis. <https://www.eia.gov/state/analysis.php?sid=AZ>
- ²² Terry, A.; City of Phoenix Water Services Department. (2017). City of Phoenix Lake Pleasant Solar Generation Facility. 2017 Better Buildings Summit Presentation. https://betterbuildingsolutioncenter.energy.gov/sites/default/files/Renewable%20Energy%20Fuels%20Clean%20Water_Phoenix.pdf
- ²³ Huizanhuan Energy Machinery Co., LTD. (2020). Industrial HCFC Purity Refrigerant R22 For Air Conditioning Freon Gas. <http://www.hfcreefrigerant.com/sale-4842044-industrial-hcfc-purity-refrigerant-r22-for-air-conditioning-freon-gas.html>
- ²⁴ California Air Resources Board. (2021). High-GWP Refrigerants. <https://ww2.arb.ca.gov/resources/documents/high-gwp-refrigerants#:~:text=What%20is%20Global%20Warming%20Potential%3F&text=The%20most%20common%20refrigerant%20today,a%20ton%20of%20carbon%20dioxide.>
- ²⁵ Wikipedia. (2021). Microgrid <https://en.wikipedia.org/wiki/Microgrid>
- ²⁶ Pratt, A. Flores-Espino, F. (2020). The Regulatory Path Forward for Networked Microgrids. <https://www.tdworld.com/distributed-energy-resources/article/21131999/the-regulatory-path-forward-for-networked-microgrids>
- ²⁷ ART Sonoran Studio
- ²⁸ Arizona State University Rob and Melani Walton Sustainability Solutions Service. (2020). 2018 Community-Scale Greenhouse Gas Emissions Inventory. https://www.phoenix.gov/oebsite/Documents/2018-City_of_Phoenix_Community_GHG_Report_FINAL.pdf

- ²⁹ Maricopa Association of Governments. (2020). Travel Demand Model.
- ³⁰ U.S. Department of Energy. (2021). Alternative Fuels Data Center Electric Vehicle Charging Station Locations. https://afdc.energy.gov/fuels/electricity_locations.html#/find/nearest?fuel=ELEC&location=phoenix&ev_levels=all
- ³¹ City of Phoenix. (n.d.) Phoenix Transportation 2050 Funding and Tax Revenue Distributions. <https://www.phoenix.gov/T2050/Funding>
- ³² United States Census Bureau. (2019). Census Reporter Sex of Workers by Means of Transportation to Work. https://censusreporter.org/data/table/?table=B08006&primary_geo_id=40000US69184&geo_ids=40000US69184,01000US
- ³³ Maricopa County Air Quality Department. (2019). Periodic Emissions Inventory Reports. <https://www.maricopa.gov/2652/Periodic-Emissions-Inventory-Reports>
- ³⁴ City of Phoenix Office of Arts and Culture. (2021). Little Canyon Trail <https://www.phoenix.gov/arts/public-art-program/explore-the-collection/little-canyon-trail>
- ³⁵ Valley Metro Regional Public Transportation Authority. (2020). Electric Bus Study 2020.
- ³⁶ City of Phoenix Street Transportation Department. (2021). Grand Canalscape Multi-Use Trail. <https://www.phoenix.gov/streets/grandcanalscape>
- ³⁷ Arizona State Senate. (2021). State Senate Bill 1108. <https://www.azleg.gov/legtext/55leg/1R/fiscal/SB1108.DOCX.pdf>
- ³⁸ Waste Today Magazine. (2017). Phoenix composting facility earns Envision Silver Verification. <https://www.wastetodaymagazine.com/article/phoenix-composting-facility-earns-envision-silver/>
- ³⁹ American Lung Association. (2021). State of the Air Report Cards Arizona: Maricopa. <https://www.lung.org/research/sota/city-rankings/states/arizona/maricopa>
- ⁴⁰ Arizona Department of Health Services. (2021). Heat-Related Illness Emergency Department & Inpatient Admissions (Hospitalizations) 2016-2020, Arizona Residents and Non-Residents. <https://www.azdhs.gov/documents/preparedness/epidemiology-disease-control/extreme-weather/pubs/heat-related-illness-emergency-department-and-inpatient-admissions-in-arizona-by-year.pdf>
- ⁴¹ James, I. (2021). Heat killed a record number of people in Arizona last year, ‘a staggering increase’. Arizona Republic. <https://www.azcentral.com/story/news/local/arizona-environment/2021/01/31/heat-killed-record-number-people-arizona-last-year/4294654001/>
- ⁴² City of Phoenix. (2010). Tree and Shade Master Plan. https://www.phoenix.gov/parkssite/Documents/PKS_Forestry/PKS_Forestry_Tree_and_Shade_Master_Plan.pdf

- ⁴³ Colorado Department of Public Health and Environment Air Pollution Control Division. (2021). Climate Equity Framework. https://docs.google.com/document/d/1wY19usrbJd3fXQkeEkX8V4reWE1pr5hzz4h_E0MFD08/edit
- ⁴⁴ Smith, P. Bustamante, M. Intergovernmental Panel on Climate Change. (2014). Assessment Report 5 Chapter 11 Agriculture, Forestry and Other Land Use (AFOLU). https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter11.pdf
- ⁴⁵ Texas Centers for Local Food. (2021). How can strong local and regional food economies strengthen our Texas economy? <https://texaslocalfood.org/economic-development/>
- ⁴⁶ United Nations Framework Convention on Climate Change. (1992). What is the Kyoto Protocol? https://unfccc.int/kyoto_protocol
- ⁴⁷ C40 Cities Climate Leadership Group. (2018). Consumption-based GHG Emissions of C40 Cities. <https://www.c40.org/researches/consumption-based-emissions>
- ⁴⁸ U.S. Environmental Protection Agency Center for Corporate Climate Leadership. (2021). GHG Inventory Development Process and Guidance. <https://www.epa.gov/climateleadership/ghg-inventory-development-process-and-guidance>
- ⁴⁹ C40 Cities Climate Leadership Group. (n.d.). Greenhouse Gas Emission Inventory Development Workshop Participant Handbook. https://cdn.locomotive.works/sites/5ab410c8a2f42204838f797e/content_entry5ab410fb74c4833febe6c81a/5ae07f69a2f4220ae645dd8c/files/GHG_Emission_Inventory_Development_Handbook.pdf?1578595728
- ⁵⁰ CDP. (2021). Verification. <https://www.cdp.net/en/guidance/verification>
- ⁵¹ Global Covenant of Mayors for Climate and Energy. (2018). Global Covenant of mayors Common Reporting Framework. https://www.globalcovenantofmayors.org/wp-content/uploads/2019/04/FINAL_Data-TWG_Reporting-Framework_website_FINAL-13-Sept-2018_for-translation.pdf
- ⁵² Energy Insecurity and Public Health: Going Further through Cross-Sector Collaboration Workgroup. (2021). March 25, 2021 Virtual Meeting.

ACTIONS MATRIX - STATIONARY ENERGY

STATIONARY ENERGY SECTOR (SES)				
GOAL SES1	Achieve net-zero GHG emissions for municipal operations electricity use by 2030 through renewable energy projects, energy efficiency upgrades, and utility partnerships.			
Quickstart Actions	City Lead	Partnerships	Timeframe	
SES1.1	<p>Install solar energy generation systems on affordable housing neighborhoods.</p> <p>Housing developments will include solar power generation as part of the APS Solar Communities Program.</p>	Housing	APS	Short Term
SES1.2	<p>Replace lighting in municipal operations with light emitting diodes (LEDs) to reduce electricity consumption.</p> <p>Replacing incandescent and fluorescent lighting in municipal operations with LEDs results in lower electricity consumption and longer lifetime of the device.</p>	Public Works, Convention Center, Police, Information, Technology Services, Aviation		Short Term
Ongoing Actions				
SES1.3	<p>Double the solar energy generation systems installed on city-owned infrastructure adding 30MW of new solar capacity by 2030.</p> <p>The cost of solar photovoltaic systems has dropped 80% from 2010 costs, and where site conditions are normal and utilities pay full avoided costs for self-generation, solar rooftop, ground mount and carport arrays now provide electricity at cost parity with utility company power. The city energy team has developed over 40 behind-the-meter solar projects on city properties, ranging from 3 kW to 5 MW.</p>	Office of Sustainability	Valley Metro, APS, SRP	Long Term
SES1.4	<p>Replace heating, ventilation, and air conditioning (HVAC) equipment units to increase energy efficiency and phase out R-22 refrigerant.</p> <p>The Montreal Protocol requires the U.S. to reduce its consumption of HCFCs by 99.5 percent necessitating that equipment utilizing refrigerants be phased out. Approximately 300 of 900 HVAC units using this R-22 refrigerant have been replaced.</p>	Public Works		Short Term
SES1.5	<p>Use Energy Management Plans to identify opportunities to reduce energy use and cost at city-owned facilities.</p> <p>As part of the facilities maintenance program, an energy management program (EMP) is used that includes ongoing energy audits to identify opportunities to reduce energy use and cost.</p>	All Departments		Short Term
SES1.6	<p>Contract with Partners to secure 250MW of utility-scale renewable energy projects, to offset or displace 100% of utility provided electricity consumed in city operations by 2030.</p> <p>After lowering city energy use through energy conservation and efficiency programs, and building on-site solar projects to the extent practical, offset the remaining electricity used in city operations through utility-scale renewable energy projects. These may be developed by a range of procurement tools that assure financial responsibility to our taxpayers, minimal financial and business risks to city budgets and verifiable additionality of carbon reduction to city operations.</p>	Office of Sustainability	APS, SRP, Renewable Energy Providers	Medium Term
Pending Actions				
SES1.7	<p>Install solar energy generation systems at Aviation Department properties, including Phoenix Sky Harbor International Airport.</p> <p>There are solar energy generation systems at Sky Harbor International Airport. Possible future solar energy system installations are being considered through a partnership with APS or through solar service agreements (SSA).</p>	Aviation	APS	Long Term
SES1.8	<p>Install solar energy generation systems at landfills.</p> <p>Landfills are potential candidates for placing large solar energy generation systems. The SR-85 landfill has an existing 10 MW solar field operated by Arizona Public Services (APS) and other portions of the 2,650-acre landfill site are suitable to additional solar projects.</p>	Public Works	APS	Long Term

ACTIONS MATRIX - STATIONARY ENERGY

SES1.9	Install solar energy generation systems at water and wastewater treatment plants. Installation of solar energy generation systems at water and wastewater treatment plants are being considered similar to the Solar Power Facility at the Lake Pleasant WTP solar power facility that was completed in 2013 in partnership with SunPower Corp. through an SSA.	Water Services	SunPower Corp.	Long Term
SES1.10	Emerging Technologies Program research on new and innovative ways to save energy for municipal operations. Investigate new and innovative ways that save energy by evaluating technologies that reduce cooling loads in a facility.	Public Works	Office of Sustainability	Short Term
SES1.11	Reduce energy consumption at City facilities by 30% (2012 baseline) by 2030. Electricity consumed by municipal operations of the City of Phoenix totaled about 581,000,000 kWh in 2020, or about 5% of all electricity used in the city limits. Services that consume that energy include emergency response; neighborhood services, housing, elderly and other community services; water treatment and delivery, and wastewater treatment; aviation services at three airports; monitoring and environmental services; convention and cultural facilities; and support services. Energy consumption will be reduced by through increased building and process efficiencies.	Office of Sustainability	All Departments	Medium Term
GOAL SES2	Support energy-efficiency upgrades to existing buildings throughout the city by developing three new community-wide conservation and renewable-energy programs by 2025.			
Ongoing Actions		City Lead	Partnerships	Timeframe
SES2.1	Provide services and products to enhance and promote the provision of safe, efficient, sustainable and affordable residences and neighborhoods. Administer programs citywide that provide low- and moderate-income Phoenix residents access to housing rehabilitation services for homeowners and renters, which address emergency health and safety concerns, stabilize critical systems, remediate lead hazards, and improve energy efficiency; and preserve naturally occurring affordable rental housing.	Neighborhood Service	Non-Profits, Small Businesses, Community Partners	Short Term
Pending Actions				
SES2.2	Attract sustainable and inclusive businesses by developing entrepreneurship and leadership programs to achieve 2050 goals. Create, launch and lead a new business attraction strategy designed to recruit both national and international low and post-carbon companies to the city of Phoenix. Develop an inclusive entrepreneurship program that addresses the systemic barriers to wealth generation and small business formation, serves communities most impacted by the effects of climate change and supports and promotes the growth of entrepreneurs and innovators developing business models around climate action.	Community and Economic Development	Arizona State University, Arizona State Workforce Board, Maricopa County Community College	Short Term
SES2.3	Strongly advocate for distributed solar energy systems (rooftop and carport solar) and for a cleaner electric grid, with more utility-scale solar arrays. As the largest city in Arizona, Phoenix needs to lead the advocacy for a cleaner grid and increased access to solar. With direction from the Mayor and City Council, the city will speak to utilities, other levels of governments and the Arizona Corporation Commission to allow the city to be a leader in renewable energy.	Office of Government Relations, Office of Sustainability		Medium Term

ACTIONS MATRIX - STATIONARY ENERGY

GOAL SES3		Promote development of community-wide energy projects, including microgrids, that improve the sustainability and resilience of the surrounding community's electricity grid.		
Pending Actions		City Lead	Partnerships	Timeframe
SES3.1	<p>Install microgrids in city-owned facilities that serve the city's redundancy needs and utilities long-term energy goals.</p> <p>During the 23rd Ave Wastewater Treatment Plant (WWTP) Power Redundancy study, Phoenix partnered with APS to install a microgrid that would serve both the city's power redundancy needs and APS's long-term goals. Additional power redundancy studies will be conducted at different facilities. Microgrids will be installed at those facilities identified to show a benefit to the power redundancy needs at those locations.</p>	Water Services	APS	Short Term
GOAL SES4		Design and construct all new buildings within the city to Living Building Challenge, Net-Positive Design, or equivalent design standards by 2050.		
Pending Actions		City Lead	Partnerships	Timeframe
SES4.1	<p>Update zoning and other codes and streamline permitting processes for green/sustainable construction and renewable energy (solar) projects to reduce barriers for consumers.</p> <p>Updating zoning and other planning and development codes to promote green/sustainable construction projects to match internationally recognized sustainability codes. Currently, compliance with the 2012 International Green Construction Code is voluntary. A study of options for ordinances for electric vehicle charging stations and associated infrastructure is being conducted. The city continues to explore PV Solar design software solutions that would ensure code compliance, eliminate the need for plan review and reduce solar permit processing time.</p>	Planning and Development		Short Term
SES4.2	<p>Develop embodied carbon calculators applicable to the Phoenix climate and building materials used within the region.</p> <p>Work with providers of embodied carbon calculators to develop calculators applicable to our climate zone and to test those tools on a sample of the building stock. These calculators can then be used to determine which methods of construction can be used to lower GHG impact.</p>	Planning and Development		Medium Term
SES4.3	<p>Design and construct all city of Phoenix municipal operations facilities to Living Building Challenge, Net Positive Design, or equivalent design standards by 2050.</p> <p>The Living Building Challenge is an international sustainable building certification program that promotes the most advanced measurement of sustainability in the built environment. On July 6, 2018, the Phoenix City Council adopted the 2018 International Energy Conservation Code (2018 IECC), which is a model code that establishes minimum design and construction requirements for energy efficiency.</p>	Planning and Development		Long Term
SES4.4	<p>Develop incentives and standards to foster private sector developments that meet or exceed the Living Building Challenge, Net Positive Design, or equivalent design standards by 2050.</p> <p>New incentives to foster private sector developments that meet or exceed the Living Building Challenge, Net Positive Design, or equivalent design standards, are necessary to spur innovation, create showcase projects, and build capacity in the industry. Planning and Development will work with industry to accelerate high-performance building in the region. Phoenix is currently in the plan review stage for construction of the city's first net-zero building in collaboration with the Sonoran Studio.</p>	Planning and Development	All Departments	Long Term

ACTIONS MATRIX - STATIONARY ENERGY

GOAL SES5		Obtain electricity from an electricity grid that is carbon-neutral by 2050.		
Pending Actions		City Lead	Partnerships	Timeframe
SES5.1	<p>Increase renewable and clean energy resources.</p> <p>APS and SRP are the utilities that serve Phoenix and the surrounding areas. By 2030, APS set a goal to achieve a resource mix that is 65 percent clean energy, with 45 percent coming from renewable energy by 2030. APS has also announced a goal to deliver 100 percent clean, carbon-free electricity by 2050. SRP set a goal to reduce the amount of carbon dioxide emissions emitted per megawatt-hour by 62 percent from 2005 levels by 2035 and by 90 percent by 2050.</p>	Office of Sustainability	APS, SRP	Long Term
SES5.2	<p>Leverage the City's purchasing power to procure 100 percent renewable electricity for City of Phoenix municipal operations.</p> <p>Municipal operations are responsible for 3.8 percent of Phoenix's total GHG emissions from electricity use as of the 2018 GHG emissions inventory. To demonstrate leadership, the City had committed to procure 100 percent renewable electricity for municipal operations by 2050. An initial project with SRP will provide 10.7 MW of electricity generated from utility-scale solar farms.</p>	Office of Sustainability	APS, SRP	Long Term

ACTIONS MATRIX - TRANSPORTATION

TRANSPORTATION SECTOR (TS)			
GOAL TS1	Implement the city's Complete Streets Policy and Active Transportation Program to encourage multiple modes of transportation.		
Ongoing Actions	City Lead	Partnerships	Timeframe
<p>TS1.1</p> <p>Increase bike lane mileage in the city of Phoenix and ensure the bicycle network is connected and comfortable for riders of all ages and abilities.</p> <p>Bicycling promotes a healthy lifestyle and has significantly lower emissions and requires much less infrastructure than a motor vehicle. Phoenix City Council adopted the Comprehensive Bicycle Master Plan in November 2014. This plan will help develop a comprehensive bicycle network that is fully connected with the Phoenix community and other transportation networks. There are 1,065 miles of bi-directional bike lanes with a goal of 1,995 miles by 2050. In addition to the Comprehensive Bicycle Master Plan, the T2050 Mobility Improvements subprogram was established to improve neighborhood mobility through the construction of new sidewalks and multi-modal connectivity through the provision of new bicycle facilities.</p>	Street Transportation		Long Term
Pending Actions			
<p>TS1.2</p> <p>Create a network of multi-use paths along the existing canal network in Phoenix.</p> <p>The canal network is used to transport water throughout Phoenix and provides an opportunity to incorporate alternative mobility improvements along its banks. In 2020, Phoenix opened the initial 12 miles of shared use path along the Grand Canal in Central Phoenix from Interstate 17 to the city of Tempe. This shared use path provides safe and convenient walking and biking access between neighborhoods, transit corridors, local employment, shopping, education and recreation centers. The next segments will be under design in late 2020 with implementation by late 2023. 45 percent of canals have paved paths. By 2050, 90 percent of canals will have paved and connected paths, with crossings at major streets or barriers.</p>	Street Transportation	ADOT, MAG, SRP	Long Term
<p>TS1.3</p> <p>Develop a series of corridors with a strong emphasis on active transportation and connections to high-capacity transit corridors.</p> <p>Two city-wide initiatives, the Key Corridor Master Plan (KCMP) and Active Transportation Plan, currently underway will help develop a more robust bicycle and pedestrian network throughout the 15 villages in Phoenix.</p>	Street Transportation	MAG	Long Term
<p>TS1.4</p> <p>Develop communities that are walkable and have access to light rail as part of Reinvent PHX.</p> <p>Reinvent PHX is a collaborative partnership committed to developing walkable, opportunity-rich communities connected to light rail. Five Transit oriented development (TOD) districts were identified and sustainability, health impact, and economic assessments were produced to create action plans for each district through district steering committees. The total acreage of expanded infill development within TOD areas is 403 acres. 707 affordable housing units have been developed within the TOD areas. Over seven miles of bike lanes have been added to TOD areas. This process establishes a new, transit-oriented model for urban planning and development along the city's light rail system.</p>	Planning and Development	Community and Economic Development, U.S. Department of Housing and Urban Development, Arizona State University, Vitalyst Health Foundation	Long Term
GOAL TS2	Increase the community-wide use of low carbon fuels (i.e., fuels other than gasoline and diesel).		
Ongoing Actions	City Lead	Partnerships	Timeframe
<p>TS2.1</p> <p>All city of Phoenix fleet will be fueled by alternative fuels or GHG net-zero fuels, including electricity.</p> <p>The city fleet will continue to transition to low carbon alternative fuels. Currently, 73 percent of the fuel used by the fleet is alternative fuel.</p>	Public Works, Public Transit, Aviation, Police		Long Term

ACTIONS MATRIX - TRANSPORTATION

TS2.2	<p>The majority of new garbage trucks will be replaced with cleaner burning options such as compressed natural gas (CNG) or electric as they become available.</p> <p>As part of cleaner air initiatives, diesel-engine solid waste trucks are being replaced with CNG-fueled ones, increasing air quality and reducing GHG emissions. Nearly every new garbage truck is powered by CNG and is slow filled overnight in the yard where they are maintained. CNG fuel reduces emissions and particulates and with overnight fueling saves employee time waiting in line to fuel daily, further reducing emissions. By 2030, the majority of existing garbage trucks will be replaced with cleaner burning CNG-fueled trucks or electric vehicle garbage truck options as they become available. The Solid Waste Field Services division utilizes a fleet of alternative fuel equipment to collect, reuse and recycle green organics, and bulk trash from approximately 400,000 residential customers each week and uses 100% alternative fuel, with 150 units using CNG, and 60 of which use ultra-low NOx CNG engines.</p>	Public Works	Medium Term	
Pending Actions				
TS2.3	<p>Advocate for state and local regulations that promote alternative fuel sales in the Phoenix metropolitan area.</p> <p>Alternative fuels are fuels that are not gasoline or regular diesel. These fuels are used in place of fossil fuels to decrease GHG emissions. It is important to advocate for further local GHG emissions reductions from state and local regulations that promote alternative fuel sales in the Phoenix metropolitan area as directed by the Mayor and City Council.</p>	Office of Government Relations	ADEQ	Short Term
GOAL TS3	Promote electric vehicles (EVs) and related charging infrastructure in the community to triple the EV charging capacity on city property by 2025 and support EV adoption resulting in 30% of new car sales being EVs by 2030.			
Quickstart Actions				
TS3.1	<p>Complete construction of the Phoenix Sky Train®.</p> <p>The automated PHX Sky Train® connects travelers between the METRO Light Rail 44th Street and Washington stop and the airport. 1.9 miles have been completed with 2.5 additional miles scheduled for completion by 2022.</p>	Aviation	Short Term	
TS3.2	<p>Increase EV Infrastructure development in single-family, multi-family and commercial properties through incentives and building codes.</p> <p>PDD staff will collaborate with building organizations and other stakeholders to identify incentives and code considerations and ensure all concerns are addressed and incorporated into the building code adoption process. An EV Ready Building Code Policy will be developed and incentives addressing EV charging parking requirements for new multi-family and commercial construction developments and connection requirements for new single-family construction to include information on conduit, wiring, and electrical capacity. A strategy will be developed to streamline the administrative process and decrease application timelines for simplifying the City permitting process for property owners who wish to install charging infrastructure on existing single-family, multi-family, and commercial properties.</p>	Office of Sustainability, Planning and Development	APS, SRP, Developers	Short Term
Ongoing Actions				
TS3.3	<p>Develop community outreach and EV engagement campaign and EV Roadmap Action Plan.</p> <p>Engage regional businesses and EV stakeholder groups to advance EV initiatives. Develop outreach campaigns to underserved communities to develop a targeted program to address mobility needs and access. Create city staff EV team to act as internal EV advocacy and outreach ambassadors to assist in informing Departments and participating in EV events. Engage EVAZ to collaborate on a regional level.</p>	Office of Sustainability	ASU, APS, SRP, Local Auto Dealers	Short Term

ACTIONS MATRIX - TRANSPORTATION

TS3.4	<p>Implement equity principles into EV policies and programs.</p> <p>Develop a strategy to expand eMobility access to communities with relatively fewer transportation resources and options. Promote inclusive collaboration to ensure all communities have a voice in helping to shape EV policies and programs. Prioritize initiatives that maximize benefits to vulnerable communities.</p>	Office of Sustainability	ASU, APS, SRP, Local Auto Dealers	Short Term
TS3.5	<p>Increase EV charging infrastructure installations on city managed/owned properties.</p> <p>A citywide EV charging infrastructure plan and policy will be developed for Phoenix that will include equity considerations when identifying locations for EV charging accessible by the public, fleet and city employees. Continue to seek out funding opportunities to accelerate vehicle electrification and EV charging infrastructure that may significantly defray the cost of both new fleet vehicles and associated charging infrastructure.</p>	All Departments	APS, SRP	Medium Term
TS3.6	<p>Replace the light-duty municipal internal combustion engine city fleet with EVs where operationally feasible.</p> <p>An action team comprised of existing Fleet Managers and maintenance staff will be formed to provide training and awareness raising of vehicle makes and model opportunities that are available and forthcoming. A Green Fleets Program and Procurement Policy will be developed by 2022 that will reflect how decisions will be made about vehicle purchasing and replacement so that at each decision point, consideration and analysis is given to purchasing a vehicle that would reduce or eliminate carbon emissions. Update the centralized procurement policy and/or process to enable the consideration of total cost in FY22. Use vehicle lease-to-own programs, where financially sound, in accordance with the Climate Mayor's Purchasing Collaborative to procure future EVs. Conduct pilot programs to include medium to heavy duty fleet equipment (ex. transit buses, solid waste trucks, and street sweepers).</p>	Public Works, Office of Sustainability, Aviation	APS, SRP, Mayors Climate Purchasing Collaborative	Medium Term
TS3.7	<p>Increase EV adoption by the public to achieve 30% of new car</p> <p>Develop city incentive programs and strategies in partnership with utilities and stakeholders to assist the public with equitable access to EVs, EV chargers, and/or other programs such as car share, ride share, and E-bikes. Coordinate with local auto dealers to develop programs and incentive opportunities to include purchase and leasing options. Raise awareness of the used car markets as viable purchasing options.</p>	Office of Sustainability	APS, SRP	Medium Term
TS3.8	<p>Install electric vehicle charging stations for nonroad equipment on city of Phoenix Aviation properties.</p> <p>Using VALE grants, the Aviation Department is developing electric ground support equipment infrastructure at Phoenix Sky Harbor International Airport. Teaming with the airlines, over 100 fuel-driven ground support equipment units have been retired and replaced with electric units. Forty electric charging stations have been installed and additional infrastructure will be installed in future terminal construction projects.</p>	Aviation	Airlines, Maricopa County	Short Term
Pending Actions				
TS3.9	<p>Advocate for state and local regulations that incentivize that new vehicle sales in the Phoenix metropolitan area be batteryelectric or plug-in electric vehicles, including electric vehicle charging infrastructure.</p> <p>Federal tax credits are available for some all-electric and plug-in hybrids models. Policy support at the state and local levels is needed to increase sales of electric vehicles and will be pursued as directed by the Mayor and City Council. This includes developing ordinances for electric vehicle charging infrastructure to support the adoption of electric vehicles.</p>	Office of Government Relations	Office of Sustainability, MAG, Maricopa County, APS, SRP	Short Term

ACTIONS MATRIX - TRANSPORTATION

GOAL TS4		Reduce the percent of single occupant vehicle trips taken to 60% of all trips, while maintaining a thriving economy.		
Quickstart Actions		City Lead	Partnerships	Timeframe
TS4.1	<p>Establish a policy that promotes teleworking for city of Phoenix municipal operations.</p> <p>Maricopa County Ordinance P-7 Travel Reduction Program requires a reduction of the amount of travel performed in a single occupancy vehicle by using alternative forms of travel. Teleworking is an important element of a travel reduction plan and should be established for city of Phoenix employees where possible. It is also important to incentivize and promote teleworking for all employers, regardless of size. During the pandemic, 25 percent of employees participated in the telework program. An Ongoing Telework Program will be established to continue to allow those positions to continue teleworking, when possible.</p>	Office of Environmental Programs		Short Term
Ongoing Actions		City Lead	Partnerships	Timeframe
TS4.2	<p>Expand bus service network and service hours, and introduce new bus rapid transit corridors as part of T2050.</p> <p>The bus service network is being expanded to include 75 miles of bus rapid transit and corridors are being evaluated. Service hours have been increased to match light rail operating hours, with increased frequency on high-demand routes to every 15-minutes.</p>	Public Transit	Street Transportation, Valley Metro	Long Term
TS4.3	<p>Increase the number of light rail miles in Phoenix by adding high capacity corridors across the city as part of T2050.</p> <p>Light rail corridors are being constructed to connect the city. 42 miles of light rail will be added to the already existing 20 miles of light rail.</p>	Public Transit	Street Transportation, Valley Metro	Long Term
TS4.4	<p>Continuously evaluate routing efficiencies and reciprocal agreements as applicable.</p> <p>The Solid Waste division employs routing efficiencies and utilizes reciprocal agreements with private haulers and other municipal entities to reduce trips and distance traveled hauling garbage to transfer stations and landfill. These agreements provide economic value and increased service efficiency for the solid waste operations. In addition, the city is evaluating siting of new transfer stations to reduce emissions and miles driven.</p>	Public Works		Short Term
TS4.5	<p>Transition to digital communications with residents, where possible, without a decrease in the level of service provided.</p> <p>A transition to digital communications will decrease GHG emissions by eliminating the need for printed materials and their distribution. It is important to consider residents who may not be able to receive communications digitally.</p>	Communications Office		Long Term
Pending Actions				
TS4.6	<p>Make job training for city of Phoenix employees available in a digital format.</p> <p>Providing job training in a digital format reduces GHG emissions. These reductions may come from reduced amount of travel to a training facility, reduction of space dedicated to training, and printing of training materials. Using Coronavirus Aid, Relief, and Economic Security (CARES) Act funds, a learning management system is being developed that will provide virtual learning opportunities with access to a large database of training material that will reduce in-person facilitation of training and reduced hard copy of training materials.</p>	Human Resources Department	Information Technology Services Department	Short Term

ACTIONS MATRIX - WASTE AS A RESOURCE

WASTE AS A RESOURCE (WR)				
GOAL WR1	Implement programs to reduce waste, increase the reuse, recycling and recovery of waste materials and promote social and economic value.			
Quickstart Actions	City Lead	Partnerships	Timeframe	
WR1.1	<p>Reuse recycled asphalt in street pavement pilot program.</p> <p>The Reclaimed Asphalt Pavement (RAP) Project is assessing the cost effectiveness and performance using different proportions of RAP on Phoenix streets as part of traditional paving materials. Phase II was recently completed, which involved performance tests on a road section within the city. If the pilot is successful, this process will be applied on many city streets.</p>	Street Transportation	Public Works, Arizona State University	Short Term
Ongoing Actions				
WR1.2	<p>Continue to identify and collect waste materials to recycle.</p> <p>Programs are in place to recycle used fluorescent lamps, tires, batteries and steel, which can generate revenue. In fiscal year 2019-2020, 27,343 tires and 10,350 batteries were recycled. Approximately 1,100 tons of steel is recycled annually.</p>	Public Works		Long Term
WR1.3	<p>Continue to implement reuse programs to eliminate waste by reusing items previously identified as waste.</p> <p>Waste materials are identified and collected for reuse. The Make Ready program reuses auto parts reducing waste sent to the landfill and saving over \$120,000 in fiscal year 2019-2020.</p>	Public Works		Long Term
WR1.4	<p>Continue to implement waste reduction programs at the two material recovery facilities, including a composting facility that recovers organic waste.</p> <p>Material recovery facilities (MRFs) are specialized facilities that receive, separate, and prepare recyclable materials for sale. Phoenix has two MRFs, one at the North Gateway Transfer Station and one at the 27th Avenue Transfer Station. The city's composting facility was opened in 2017 and is a key component of Reimagine Phoenix. Phoenix processes roughly 169,000 tons of recyclables and 55,000 tons of organic waste per year at these facilities.</p>	Public Works		Long Term
WR1.5	<p>Use the Adaptive Reuse Program to continue to assist with streamlining the process and steps required to repurpose existing buildings for new business uses.</p> <p>Repurposing existing buildings for new uses can be challenging. Phoenix's Adaptive Reuse Program encourages the reuse (recycling) of buildings to promote business uses and offers incentives that help bring life to underutilized buildings, supports local businesses, takes advantage of existing infrastructure and supports our neighborhoods. During the past five years, the city of Phoenix has assisted 151 qualified adaptive reuse projects by providing over \$450,000 in Adaptive Reuse Incentives.</p>	Planning and Development		Long Term

ACTIONS MATRIX - WASTE AS A RESOURCE

GOAL WR2		Reduce GHG emissions resulting from the degradation of waste by capturing landfill gas and converting 100% of the methane (up to 1500 SCFM) from the SR 85 landfill into renewable natural gas as a substitute for fossil natural gas. Have contract executed and facility constructed and operational by March 2023.		
Quickstart Actions		City Lead	Partnerships	Timeframe
WR2.1	<p>Capture and reuse methane as vehicle fuel as part of the Landfill Gas Recovery Project at SR-85 Landfill.</p> <p>State Route 85 (SR-85) Landfill is Phoenix's only active landfill and receives over one million tons of waste per year from Phoenix and other sources. The waste decomposes and produces landfill gas that is roughly half methane and half carbon dioxide. A project will be developed in the future to capture the landfill gas and use it as fuel.</p>	Public Works		Short Term
Ongoing Actions				
WR2.2	<p>Continue to utilize methane capture systems on active and decommissioned landfills to oxidize methane that is produced to reduce GHG emissions potential.</p> <p>Landfill gas capture systems are utilized at SR-85, the city's only active landfill, and decommissioned landfills, including Skunk Creek, 27th Avenue, Deer Valley, 19th Avenue, and Del Rio landfills. These systems capture methane gas that is produced by decomposing waste and is combusted to produce a less GHG intensive gas.</p>	Public Works		Short Term
GOAL WR3		Increase waste-diversion participation by all residents and businesses.		
Ongoing Actions		City Lead	Partnerships	Timeframe
WR3.1	<p>Provide outreach and feedback to residents what can and cannot be recycled through presentations to schools and communities.</p> <p>The Zero Waste team provides education on proper recycling, including group tours of the city's North Gateway Transfer Station and MRF, educational presentations to schools, neighborhood and community meetings, and hosting informational booths at community events. In 2019, the Public Works Zero Waste team interacted with approximately 23,500 community members. In 2020, the Zero Waste team extended its reach through digital efforts including the creation of Recycle+, the transition to virtual presentations, and the development of more online resource documents. These digital practices will continue to provide residents additional access to the team.</p>	Public Works		Short Term
Pending Actions				
WR3.2	<p>Increase organic diversion from the landfill.</p> <p>Waste diversion efforts include diversion of organic materials. Through the Green Organics Residential Collection program, organic material, like yard trimmings, untreated wood, tree fruit, and cactus, is collected from residential properties. Additional material is collected directly by the transfer stations. Program goals include establishing value in the local compost market by manufacturing a high-quality compost, reducing environmental and climate impacts from landfilling, and creating more community awareness around organic commodities and waste.</p>	Public Works		Short Term
WR3.3	<p>Increase number of businesses that participate in the Phoenix Green Business Leader Program that recognizes Phoenix businesses that have sustainable practices, including increased waste diversion.</p> <p>The Green Business Leader (GBL) program started in 2017 as part of the Reimagine Phoenix initiative to create public-private partnerships to further waste diversion in the city. In 2019, the GBL program expanded to recognize businesses for efforts around water conservation, energy efficiency and sustainable purchasing, in addition to waste diversion. There are more than 100 certified Green Businesses.</p>	Public Works	Office of Sustainability, Office of Environmental Programs, Water Services	Short Term

ACTIONS MATRIX - WASTE AS A RESOURCE

WR3.4	<p>Increase number of businesses that participate in the “green tenant” program at Sky Harbor International Airport.</p> <p>As part of the Aviation Department Sustainability Management Plan Update, a voluntary “Green Tenant” program is being developed to encourage greater collaboration between the Aviation Department and airport tenants on airport sustainability goals. Aviation Department met the waste diversion goal of 40 percent in 2019, a year earlier than targeted.</p>	Aviation	Airport Tenants	Short Term
WR3.5	<p>Increase the number of existing buildings that are repurposed instead of demolished.</p> <p>In addition to reuse of materials, it is important to reuse buildings through the Adaptive Reuse Ordinance where existing buildings are repurposed. There are eleven adaptive reuse projects underway in Eastlake-Garfield, four in Midtown, nine in Uptown, and two in Gateway.</p>	Planning and Development		Long Term
GOAL WR4 Transition to green alternatives from environmentally hazardous materials.				
Ongoing Actions				
		City Lead	Partnerships	Timeframe
WR4.1	<p>Continue using vegetable-based inks that are formulated to reduce solvents.</p> <p>Volatile organic compounds are chemicals that evaporate quickly and are precursors to ozone. One way to limit their use is to transition to vegetable-based inks that are formulated to minimize and, in some cases, eliminate the use of volatile organic compounds as much as possible. The City Clerk Department Print Services Section currently uses vegetable-based inks.</p>	City Clerk	State of Arizona	Short Term
WR4.2	<p>Use digital communication or recycled paper when possible.</p> <p>To decrease the production of waste from paper-based transactions and communications, digital communications will replace paperbased communications. If paper is still necessary, the paper that is used should contain recycled content.</p>	Communications, City Clerk, Human Resources		Short Term
WR4.3	<p>Update Sustainable Purchasing Policy to be applicable city-wide in future city contracts.</p> <p>The Sustainable Purchasing Policy was created to integrate contract provisions for more sustainable products and services and to consider the best value considering price, performance, and environmental characteristics over the lifecycle of the product or service. Currently, special terms and conditions exist for the Office of Environmental Programs regarding air quality, energy star/energy efficiency, environmentally-preferred products, hazardous materials, recovered materials, etc. These terms and conditions need to be updated to reflect current city environmental policy and then rolled-out citywide to procurement templates, barring conflicts with already existing regulations, so all departments and their respective vendors can more readily select, incorporate, and enforce them when applicable to their solicitations.</p>	Office of Environmental Programs	Finance	Short Term
GOAL WR5 Expand brownfield redevelopment along the Rio Salado in Phoenix.				
Pending Actions				
		City Lead	Partnerships	Timeframe
WR5.1	<p>Increase the cleanup and redevelopment of brownfields in the Rio Reimagined Project area.</p> <p>The Rio Reimagined Project encompasses more than 78,000 acres and 1,189 potential brownfields. Cleaning up and reuse of these properties brings community, economic, and environmental benefits. The Rio Salado, Agua Fria and Gila Rivers will be revitalized by reconnecting the community with the river and be a catalyst for economic growth. Utilize resources obtained through a U.S. EPA grants to conduct environmental assessments and cleanup.</p>	Office of Environmental Programs, Community and Economic Development	U.S. EPA, ADEQ, ASU, Cities of Avondale, Buckeye, Mesa, and Tempe	Medium Term

ACTIONS MATRIX - WASTE AS A RESOURCE

GOAL WR6		Reduce GHG emissions from water and wastewater treatment by capturing biogas from treatment processes and increasing renewable sources of energy.		
Pending Actions		City Lead	Partnerships	Timeframe
WR6.1	<p>Identify water and wastewater facilities where biogas can be treated, transferred and sold as a renewable green energy commodity. Investigate other opportunities for biogas capture.</p> <p>Renewable energy projects provide biological sources of natural gas, which can displace natural gas from fossil fuel sources. Biogas that is produced as a result of treatment at the wastewater treatment plants contains methane. As part of the city's pledge to be a sustainable and cost-effective utility, a renewable energy project at 91st Avenue Wastewater Treatment Plant treats, transfers and sells biogas as a renewable green energy commodity. The city will investigate other opportunities for biogas capture at other water and wastewater treatment facilities.</p>	Water Services	Ameresco, Inc.	Short Term

ACTIONS MATRIX - AIR QUALITY

AIR QUALITY (AQ)				
GOAL AQ1	Meet U.S. EPA National Ambient Air Quality Standards (NAAQS).			
Quickstart Actions	City Lead	Partnerships	Timeframe	
AQ1.1	<p>Establish air pollutant baseline levels and set reduction targets that meet NAAQS.</p> <p>These targets will put us on a path towards meeting World Health Organization Air Quality Guidelines for particulate matter, nitrogen dioxide, ozone, and sulfur dioxide. Phoenix already meets the Guidelines for nitrogen dioxide and sulfur dioxide.</p>	Office of Environmental Programs	Maricopa County Air Quality Department, Maricopa Association of Governments	Short Term
AQ1.2	<p>Implement new substantive policies and programs to address top causes of air pollution emissions within Phoenix and under Phoenix's control by 2025.</p> <p>Within five years, Phoenix will implement new substantive policies and programs to complement those policies and programs already in place. Some of these already exist and only need to be fully implemented, like the expansion of the public transit system, including light rail, and the creation of safe and accessible walkways and bike paths to commute. Many of the actions within the climate action plan will contribute to decreasing air pollution emissions throughout the city and region. New policies and programs may include increased air quality monitoring, financial incentives, and increased education and outreach.</p>	Office of Environmental Programs	Maricopa County Air Quality Department	Short Term
AQ1.3	<p>Publicly report annually on progress in reducing pollution levels relative to targets and achieving the commitments in the Clean Air Cities Declaration.</p> <p>Progress will be reported annually to C40 Clean Air Cities and be made available publicly.</p>	Office of Environmental Programs	Communications Office	Short Term

ACTIONS MATRIX - LOCAL FOOD SYSTEMS

LOCAL FOOD SYSTEMS (LFS)				
GOAL LFS1	All people living in Phoenix will have enough to eat and have access to affordable, healthy, local, and culturally appropriate food.			
Pending Actions	City Lead	Partnerships	Timeframe	
LFS1.1	<p>Incorporate agriculture, food processing, and distribution into existing and future land use plans. Collaborate with key partners to facilitate new opportunities for urban-scale gardens, farms, gleaning, and distribution systems.</p> <p>PlanPHX emphasizes the importance of residents having access to healthy food and sets measures for access within a ¼-mile. Policies that are supportive of food access should be integrated into future redevelopment, transit-oriented, and other land use plans. Explore criteria for various transportation, tree and shade, urban heat island and similar projects that create safe and convenient connections between residential neighborhoods and healthy food assets. Study the impacts of local food production on food equity and social justice for low income communities.</p>	Office of Environmental Programs	Planning and Development	Short Term
LFS1.2	<p>Use existing financial resources for food production and infrastructure. Pursue grants and other funding opportunities that will enhance the community's access to healthy foods.</p> <p>Identify funding resources available through private sector, government, and philanthropic sources. It is important to determine the viability of using current funding mechanisms available from the City that can be used for food system improvements. Collaborate with key partners to facilitate new opportunities for urban-scale gardens, farms, gleaning, and distribution systems.</p>	Office of Environmental Programs	Governmental, philanthropic and place-based funders	Short Term
LFS1.3	<p>Partner with schools and others to support and promote education for youth and adults.</p> <p>Support education and awareness on all aspects of the food system and create opportunities to create or enhance urban agriculture, health and nutrition education for youth, adults, and seniors. Collaborate with state and county agencies working with school districts in Phoenix and support Farm to Table programs in schools.</p>	Office of Environmental Programs	City of Phoenix Youth & Education Office, Phoenix School Districts, Nonprofits, community & grassroots organizations	Short Term
LFS1.4	<p>Promote existing healthy food assets, such as farmers markets, grocery stores, retail, community gardens, farms, etc.</p> <p>Focus on efforts to address challenges within communities with limited access to fresh healthy food, followed by a city-wide approach to planning for food access for all communities. Identify existing food and farm assets within food desert areas, such as the South Phoenix and Maryvale communities. Develop asset maps that are accessible by residents through a variety of communication tools, including online mapping, apps, social media with written resources available at city libraries, community centers, and recreation centers.</p>	Office of Environmental Programs	Community and Economic Development	Short Term
GOAL LFS2	Businesses that produce, process, distribute, and sell local and healthy food will be recognized as integral to the economy and encouraged to grow and thrive in Phoenix.			
Pending Actions	City Lead	Partnerships	Timeframe	
LFS2.1	<p>Recognize food production as a highest and best use of land.</p> <p>Phoenix has the potential to be an agricultural technology innovation hub, with a focus on farming that is water efficient, restorative and adaptable to the arid climate and high temperatures. Coordination with internal and external economic development professionals will be done to evaluate the economic development potential of the food system as a local industry cluster. Create opportunities to connect food production businesses with available land. Continue to collaborate with academic partners to establish an agriculture technology initiative.</p>	Office of Environmental Programs	Community and Economic Development, University of Arizona, Arizona State University	Short Term
LFS2.2	<p>Incorporate agriculture, food processing, and distribution into existing and future economic development plans.</p> <p>Assist agricultural entrepreneurs and existing food-related businesses and identify financial and technical resources and the most effective means to make those resources available. Develop comprehensive, user-friendly information on the requirements of food production, processing, and distribution businesses that is available from the city and through partners.</p>	Office of Environmental Programs	Municipal/Regional/State Economic Development Organizations (EDOs)	Short Term

ACTIONS MATRIX - LOCAL FOOD SYSTEMS

LFS2.3	<p>Establish a local food buying preference in future City contracts and include in current Sustainable Purchasing Policy.</p> <p>Develop appropriate contract language that can be incorporated into city contracts for the purchase of local food. Coordination with internal departments to develop guidelines and language, and potentially set procurement goals. Provide healthy, local produce to city employees through a Community Supported Agriculture (CSA) program and pilot in downtown city facilities initiated. Explore the development of healthy procurement guidelines for city events and facilities.</p>	Office of Environmental Programs	Finance	Short Term
LFS2.4	<p>Partner with stakeholders to support and promote a Buy Local Food campaign.</p> <p>Educate and engage residents on the benefits of purchasing locally-produced food. Develop a Buy Local Food Campaign in collaboration with partners, such as Local First Arizona Foundation and others. Partnership opportunities with grocers to further promote Buy Local will be established or enhanced.</p>	Office of Environmental Programs	Local First Arizona Foundation, MarCo, Local Food Producers, Grocers	Short Term
<p>GOAL LFS3</p>		<p>Growing food in Phoenix and the region will be easy and valued whether for personal use or for business.</p>		
<p>Pending Actions</p>		<p>City Lead</p>	<p>Partnerships</p>	<p>Timeframe</p>
LFS3.1	<p>Update codes and ordinances where appropriate to eliminate barriers and encourage developing a healthy food infrastructure.</p> <p>Existing zoning codes will be further clarified to clearly identify which zoning classifications and requirements are needed for various agricultural and food production uses, commercial and residential, including, hydroponic, aquaponics, growing inside structures, and for burgeoning uses, such as rooftop and building-integrated agriculture. Identify and update/amend appropriate sections of the zoning code to clearly identify zoning districts in which agricultural land uses are permitted. Develop definitions for agricultural land uses. Develop streamlined processes for agricultural zoning. Explore the development of an "Agritainment" zoning districts, and zoning incentive models (density, PAD district, similar zoning options) that encourages set asides of land for food production.</p>	Office of Environmental Programs	Planning and Development, local food producers, and businesses	Short Term
LFS3.2	<p>Explore development of agriculture community land trusts and/or preservation mechanisms.</p> <p>Various mechanisms that could be used in concert with nonprofit and private partnerships to preserve land for food production will be identified, as well as best practices of other cities. Existing city policies impacting agricultural land uses will be reviewed. Recommendations will be made for new or modifications to existing policies.</p>	Office of Environmental Programs	Community and Economic, Real Estate, Water Services, Planning and Development, MarCo, Arizona Community Land Trust	Short Term
LFS3.3	<p>Explore the use of city-owned parcels as opportunities for urban agriculture, focused on food deserts within irrigation districts.</p> <p>Develop, with city departments, guidelines on how to lease/buy city owned land for food production, including establishing appropriate minimum length of lease terms feasible for agriculture. Adopt policies allowing the use of park land and other city-owned land, where feasible and appropriate, for food production. An inventory of land potentially available for agricultural use will be created, including Brownfields. Upon identification of available city-owned land located in food desert and irrigation district areas, a Request for Proposal for agricultural development may be issued.</p>	Office of Environmental Programs	Parks and Recreation, Public Works, Water Services, Real Estate	Short Term

ACTIONS MATRIX - LOCAL FOOD SYSTEMS

LFS3.4	<p>Support the growth of land uses that contribute to a healthy and sustainable food system (i.e. grocery stores, community gardens, urban farms and other urban agriculture elements).</p> <p>In addition to city-owned land, there is the opportunity to support efforts to expand urban food production on residential, commercial and institutional properties. Support and encourage collaboration between public and private sectors and small/medium sized farms, food-hubs, mobile markets, co-ops, community and back-yard gardens. Establish community commercial kitchens and/or use existing commercial kitchens. Explore opportunities to work with vacant schools with kitchens to use as a training and economic development resource will be performed.</p>	Office of Environmental Programs	Planning and Development, Community and Economic Development, Greater Phoenix Economic Council, school districts	Short Term
LFS3.5	<p>Use existing and explore new job training resources, where feasible, and partner with others to provide training opportunities.</p> <p>A cornerstone in a sustainable local food system is the development of career pathways in farming. Support programs focused on training future farmers and collaborate with partners and institutions, such as the University of Arizona Cooperative Extension of Maricopa County. Identify other potential partners with a focus on providing training for new farmers. Facilitate business training programs for farmers to gain more marketing knowledge and expertise. Explore city policies that support the creation of agricultural employment training opportunities to further promote job creation in the agriculture sector.</p>	Office of Environmental Programs	City of Phoenix Workforce Development, Maricopa Community Colleges, University of Arizona	Short Term
GOAL LFS4	Food-related waste will be prevented, reused, or recycled. Sustainable food production practices that maintain a healthy environment are desired.			
Pending Actions		City Lead	Partnerships	Timeframe
LFS4.1	<p>Update codes and ordinances to clarify food waste diversion, i.e., composting opportunities.</p> <p>Providing clear and understandable codes and ordinances to clarify food waste diversion, such as composting, is essential to a thriving local food system. This includes identifying and updating/amending appropriate sections of the zoning code to clearly identify zoning requirements for composting opportunities.</p>	Office of Environmental Programs	Planning and Development, Public Works Department, MarCo, Business	Short Term
LFS4.2	<p>Support and promote methods to prevent edible food from entering the waste stream.</p> <p>A key factor in preventing food waste is to provide means for edible food to be consumed. In the United States an estimated 30-40% of food goes uneaten and ends up in landfills, further contributing to GHG emissions. Creating opportunities to provide edible food to those that don't have enough to eat involves collaborating with stakeholders to identify solutions. Opportunities for collaboration with other stakeholders involved in the prevention of food waste and food rescue will be evaluated.</p>	Office of Environmental Programs	Public Works, MarCo, Waste Not, restaurants, institutions	Short Term
LFS4.3	<p>Promote and support sustainable practices in all areas of the food system.</p> <p>The food economy is an integral contributor to the overall economic vitality of the City. Business opportunities are varied, from agricultural entrepreneurs, catering, restaurants, food trucks, mobile markets, retail, such as neighborhood bodegas or convenience stores, and for backyard gardeners to sell their produce. Identifying and providing business resources, including water and energy efficiency, regenerative agricultural practices, and safe food handling are keys to creating a sustainable food economy. Continue working toward development of a Sustainable Food Economy Accelerator for entrepreneurs. identify mechanisms to assist food-related businesses, including technical assistance and financial resources.</p>	Office of Environmental Programs	Community and Economic Development, ASU, Cities within Maricopa County	Short Term

ACTIONS MATRIX - LOCAL FOOD SYSTEMS

GOAL LFS5		Develop food policies and actions that address local and global challenges posed by climate change, urbanization, political and economic crises, population growth and other factors.		
Pending Actions		City Lead	Partnerships	Timeframe
LFS5.1	<p>Research policies and actions that plan for future shocks related to changing population growth, hazards, economic conditions and climate.</p> <p>Conduct research on best practices and explore ways to integrate food system resiliency within existing and future hazard mitigation, emergency response, and or resilience planning efforts. OEP would serve as the lead for food systems in future resilience planning. Coordination with City Departments and external stakeholders will identify opportunities for food system integration.</p>	Office of Environmental Programs	Stakeholders from within all aspects of the local food system.	Short Term
LFS5.2	<p>Convene local food producers with city staff, leaders, and elected officials to build trust and understanding.</p> <p>Create opportunities and collaborate with stakeholders to identify solutions for providing edible food to those that don't have enough to eat.</p>	Office of Environmental Programs	Phoenix elected officials and city departments, Local First Arizona Foundation, local food producers	Short Term
LFS5.3	<p>Explore funding opportunities from federal, state, and philanthropic organizations for food system activities and staff.</p> <p>Identify and submit for funding opportunities from federal, state, and philanthropic organizations for food system activities and staff. Resources to conduct recommended actions will be needed. Obtaining funding from all feasible and available resources will be paramount to the success of achieving the goals, strategies and actions identified.</p>	Office of Environmental Programs	Potential funders	Short Term
LFS5.4	<p>Complete a GHG Emissions Inventory for the local food system, defined as Maricopa County.</p> <p>Complete a GHG emissions inventory of the local food system, that is Maricopa County, to determine which reduction actions will be necessary to reduce the GHG emissions from the production, processing and delivery of food across Phoenix and the region.</p>	Office of Environmental Programs	MarCo; University of Arizona, NRDC, ICLEI, ASU	Short Term

ACTIONS MATRIX - HEAT

HEAT (H)			
GOAL H1	Create a network of 30 cool corridors in vulnerable communities by 2030 to facilitate movement from residents' homes to their places of employment, education and play.		
Quickstart Actions	City Lead	Partnerships	Timeframe
<p>H1.1 Develop walkshed mapping tool to identify key pedestrian corridors and priority routes for adding shade in vulnerable neighborhoods and increase shade provided by trees or constructed shade.</p> <p>A next generation Walkshed mapping tool, based on the principles of a model developed by Harvard students studying in Phoenix, is being developed in partnership with ASU to identify key pedestrian corridors and priority routes for adding shade in vulnerable neighborhoods. The tool considers zero car households, proximity to schools, shopping and transit, and identified the most likely routes or "walkshed" that pedestrians would likely take in a given neighborhood. The tool is being piloted in 2021 and will be used to select corridors for implementing priority tree and shade elements.</p>	Office of Sustainability	ASU	Short Term
Pending Actions			
<p>H1.2 Update Phoenix's Walkable Urban Code to include additional heat mitigation actions.</p> <p>The Walkable Urban Code regulates development in proximity to light rail stations. Additional heat mitigation actions are being considered to be included in the code, along with the current shade requirements.</p>	Planning and Development		Short Term
<p>H1.3 Achieve "Tree Equity" where all of Phoenix's neighborhoods will reach a minimal standard of tree canopy cover that is feasible and appropriate for the city's desert climate and conditions by 2030.</p> <p>A new MOU with American Forests signed in 2021 hopes to achieve "Tree Equity" where all of Phoenix's neighborhoods will reach a minimal standard of tree canopy cover that is feasible and appropriate for the city's desert climate and conditions by 2030. Tree Equity is the term American Forests trademarked to raise awareness about the need to address historic disparities in tree canopy in cities throughout the United States.</p>	Office of Sustainability	Street Transportation	Medium Term
GOAL H2	Increase shade provided by trees or constructed shade in 'flatland' parks, not the preserves, streets and rights-of-way to achieve a 25% tree & shade canopy in pedestrian areas by 2030 prioritizing communities most vulnerable to heat.		
Ongoing Actions	City Lead	Partnerships	Timeframe
<p>H2.1 Educate city staff on proper tree care, including Right Tree, Right Place training, and the use of tall pots to help establish plants.</p> <p>Increasing the tree canopy of the urban forest requires that the right trees are planted in the right place for long-term growth. Recently, in order to increase the success rate of planting, a method was piloted to use tall pots to increase the number of plants that survive.</p>	Parks & Recreation	Street Transportation, Office of Sustainability, AmeriCorps VISTA	Short Term
<p>H2.2 Update city's tree inventory by 2023.</p> <p>The 2021 Budget approved funding for updating the City's Tree Inventory—where every tree in parks, streets and rights of way will be inventoried. A contract will be issued to measure and report on tree information including the identification of lost and unhealthy trees. Using TreeKeeper software, trees will be tracked as they are planted and removed, along with the estimated value of the trees and their associated environmental benefits.</p>	Parks and Recreation	TreeKeeper	Short Term
<p>H2.3 Implement Project sunBLOCK, which includes permanent and temporary public art microclimates.</p> <p>Project sunBLOCK is composed of permanent and temporary public art microclimates that lower the intense heat confronting pedestrians along key corridors in two of Central Phoenix's hottest neighborhoods by 2023. The project brings community, artists, designers and environmental specialists together to create designs that both visually and physically cool transit stops and surrounding streetscapes.</p>	Arts and Culture	National Endowment for the Arts, Public Transit, Street Transportation	Short Term

ACTIONS MATRIX - HEAT

H2.4	<p>Continue to implement the Tree and Shade Master Plan to establish 25% tree and shade canopy in streets and pedestrian areas by 2030.</p> <p>The Tree and Shade Master Plan launched in 2010 with a vision to double the tree and shade canopy by 2030. The Tree and Shade Master Plan implementation is supported by over \$5 million in annual funding to city departments as part of a City-wide program with over 4,000 trees now being planted annually on city streets, parks and rights of way. This goal is further supported by the tree planting as part of the cool corridors with an additional 1,800 trees per year and an additional 1,000 trees per year through public donations for a total anticipated tree planting of 6,800 trees annually.</p>	Street Transportation, Parks and Recreation	Office of Sustainability, Planning and Development	Medium Term
H2.5	<p>Increase tree and shade canopy of parks to 25% by 2030.</p> <p>The Parks and Recreation Department has set a goal to plant 1,500 trees annually. As of summer 2020, 131 out of 160 flatland parks currently meet the 25% canopy coverage.</p>	Parks and Recreation		Medium Term
Pending Actions				
H2.6	<p>Increase shade at public transit stops in the City.</p> <p>An overarching goal of the T2050 plan was to provide all residents in the city with accessible transit and build ridership. Within that goal is the element to provide shade at all 4,050 bus stops in the city. Currently, 2,680 of those bus stops have constructed shade structures.</p>	Public Transit		Medium Term
H2.7	<p>Coordinate and track the planting of trees to achieve the 25% tree and shade canopy goal.</p> <p>At the direction of the Phoenix City Council, the Environmental Quality and Sustainability Commission (EQSC) created the Urban Heat Island/Tree and Shade Subcommittee (UHITS) with the purpose to evaluate, analyze and recommend policies to address the issues surrounding Urban Heat and to advance implementation of the Phoenix Tree and Shade Master Plan. Input and recommendations from the subcommittee will be provided to the EQSC for approval and then passed on to City Council.</p>	Office of Environmental Programs, Office of Sustainability	Environmental Quality and Sustainability Commission	Short Term
GOAL H3 Provide resources and services to residents to manage heat.				
Ongoing Actions				
		City Lead	Partnerships	Timeframe
H3.1	<p>Educate the community on proper planting and care for trees through the Citizen Forester Program.</p> <p>Increasing the tree canopy throughout the city will require community participation. Education on how to properly plant and care for trees is provided through the Citizen Forester program. Citizen Foresters advocate for trees by promoting best practices regarding proper tree planting and maintenance techniques, while supporting community efforts to achieve tree and shade canopy goals. Residents can become certified as Citizen Foresters and assist in the planting and care of the urban forest.</p>	Parks and Recreation	Street Transportation, Office of Sustainability, AmeriCorps VISTA,	Short Term
H3.2	<p>Continue to participate in the Heat Relief Regional Network.</p> <p>The Heat Relief Regional Network is a regional partnership of the Maricopa Association of Governments (MAG), municipalities, nonprofit organizations, the faith-based community, and businesses. The Heat Relief Regional Network works with 137 partner organizations to provide water, resources and wellness checks in communities alongside an education and awareness campaign each summer focusing on vulnerable communities. The number of heat related deaths in the county has risen in each of the last four years with nearly 200 heat related deaths in 2019.</p>	All Departments	MAG	Short Term

ACTIONS MATRIX - HEAT

GOAL H4		Increase the use of high albedo, or reflective, materials in infrastructure projects.		
Ongoing Actions		City Lead	Partnerships	Timeframe
H4.1	<p>Continue to implement the Cool (Energy Star) Roofs on city-owned buildings.</p> <p>Coating the roof reduces the amount of energy needed to cool the building, reducing GHG emissions. Cool (Energy Star) Roofs is the standard for all departments that work with the Public Works Department (PWD) to handle their roof replacement, as well as for those buildings owned by PWD. This type of roof has been implemented for PWD owned buildings since 2005.</p>	Public Works		Short Term
Pending Actions				
H4.2	<p>Complete cool pavement pilot program and expand program to areas where it would be most effective.</p> <p>A Cool Pavement pilot is currently underway in eight Phoenix neighborhoods and one city park. Phoenix wants to test the cool pavement material to see whether it is effective at reducing temperatures in Phoenix desert climate.</p>	Street Transportation	Office of Sustainability, ASU	Short Term
H4.3	<p>Be a living laboratory to test cool materials for use in Infrastructure projects.</p> <p>Be a living laboratory to test new materials that could mitigate urban heat island when implemented at scale. Many promising materials are coming on the market yet their performance in high temperature conditions, their durability and the overall economics need further study. For example, ASU is currently evaluating a new material from 3M that reflects heat as long wave radiation while cooling the underlying surface. ASU is also testing various coatings as part of the overall cool pavement analysis—installing temperature sensors below the pavement surface and at grade.</p>	Street Transportation, Office of Sustainability	ASU	Medium Term
GOAL H5		Develop HeatReady certification for cities in partnership with ASU by 2025.		
Quickstart Actions		City Lead	Partnerships	Timeframe
H5.1	<p>Pilot HeatReady certification in partnership with ASU.</p> <p>Where more than 2,000 cities including Phoenix have achieved “StormReady” certification by the National Weather Service, ASU in partnership with the City are seeking to pilot a HeatReady certification program—identifying the policies, programs and governance framework and scorecard to assist cities in preparing for increasing temperatures and heat waves. With Phoenix being the epicenter of research related to heat and a hotbed of heat-related programs, ASU and the city are seeking to develop HeatReady to allow it to become a national or international certification program.</p>	Office of Sustainability	ASU	Short Term
Pending Actions				
H5.2	<p>Expand HeatReady Certification nationally or internationally.</p> <p>After piloting and refining HeatReady Certification in Arizona, ASU and the city are seeking to test HeatReady nationally and internationally to increase its functionality and shared learnings and, more importantly, its impact. C40 and the Global Cool Cities Alliance have both expressed interest in becoming the global verification and certification body once the certification tool reaches maturity.</p>	Office of Sustainability	ASU, C40, National Weather Service, Global Cool Cities Alliance	Short Term

ACTIONS MATRIX - WATER

WATER (W)			
GOAL W1	Identify and implement infrastructure projects to ensure water security.		
Quickstart Actions	City Lead	Partnerships	Timeframe
<p>W1.1 Design and construct additional infrastructure to provide a reliable water supply to 1.7 million customers. The Drought Pipeline Project will provide Salt and Verde River water supplies to areas of the city that are currently entirely dependent on Colorado River water. The project is essential to the economic health and vitality of Phoenix. This sustainability project will ensure all residents have access to safe, reliable, clean drinking water during the future times of shortage on the Colorado River. This project will be financed using sustainability bonds, a result of the recent development of the Green and Sustainability Bond Framework. This will result in loan service cost savings.</p>	Water Services	Street Transportation, Finance	Short Term
Ongoing Actions			
<p>W1.2 Continue to bank water, which is storing water underground for use at a later date. Arizona is a leader in water banking, the practice of storing water underground to be used later. Millions of acre-feet of water have been banked in Central Arizona aquifers through the Arizona Water Banking Authority. The water that is delivered to residents comes from renewable surface water supplies, so that groundwater can be saved for the future. In addition, a water-sharing agreement with Tucson will continue, where Phoenix will store some of its unused Colorado River water in aquifers in Tucson. In times of shortage, Tucson will give Phoenix some of its Colorado River water allocation in exchange for this stored water.</p>	Water Services	City of Tucson, Arizona Water Banking Authority	Short Term
GOAL W2	Improve the conservation of water resources by improving stormwater management, optimizing water use, conducting water audits, and utilizing wastewater.		
Ongoing Actions	City Lead	Partnerships	Timeframe
<p>W2.1 Improve stormwater drainage capacity and reduce backup surging at Phoenix Sky Harbor International Airport. Phoenix Sky Harbor International Airport, located at the end of the Camelback Mountain south watershed, will improve stormwater drainage efficiency by performing preventative maintenance that will improve capacity and reduce backup surging preventing flooding and contamination of the stormwater runoff.</p>	Aviation	Water Services, Finance	Short Term
<p>W2.2 Identify and implement water saving measures on city of Phoenix facilities and processes. A city-wide Internal Water Efficiency Task Force was created to monitor water used by municipal operations to identify and implement water saving measures. As a result of the task force, water use dropped 46.5 million gallons. On-going tracking of water usage in Parks and Aviation Departments is possible by a GIS program developed by Water Services Department.</p>	Water Services	All Departments	Short Term
Pending Actions			
<p>W2.3 Implement successful Phoenix Sky Harbor International Airport commercial cooling tower system upgrade program in other processes throughout city of Phoenix and encourage commercial and industrial adoption of process. Cooling towers are one of Phoenix's highest volume water uses. The Cooling Tower System Upgrade was successfully completed reducing water use by 20 percent. This cooling water treatment system was also installed as part of the Terminal Modernization Project and a system is now being installed in the Rental Car enter. Future opportunities are being investigated for municipal operations and commercial use.</p>	Public Works	Aviation	Short Term

ACTIONS MATRIX - WATER

W2.4	<p>Implement the use of the Greater Phoenix Green Infrastructure and Low Impact Development Details for Alternative Stormwater Management.</p> <p>The Greater Phoenix Green Infrastructure and Low Impact Development Details for Alternative Stormwater Management is a handbook that provides technical standard details and specifications (TSDS) to be used for low impact development to members of the design, planning and development communities in Maricopa County. These TSDS will primarily be used on right of way projects and can be implemented in private projects. Using the handbook will result in environmental benefits, water conservation, urban heat reduction, improvement in public health and additional green spaces.</p>	Planning and Development, Water Services, Office of Environmental Programs	MAG, ADEQ, ASU	Short Term
GOAL W3		Increase outreach and provide programs to residents and businesses to reduce water use to 155 GPCD by 2030.		
Pending Actions		City Lead	Partnerships	Timeframe
W3.1	<p>Expand existing SRP program that subsidizes cost of irrigation controllers for residential use.</p> <p>Water conservation has always been part of Phoenix's strategy to maintain a 100-year water supply. Residents are encouraged to adopt xeriscape landscaping with efficient irrigation controllers through a program that subsidizes the cost of smart irrigation controllers for residential use. Expanding this program will reduce water use and lower costs for residents.</p>	Water Services	SRP	Short Term
W3.2	<p>Expand Toilet Retrofit Program to include a low-income program and other incentives.</p> <p>To conserve water, the feasibility of a new toilet retrofit program is being evaluated. The elements that the program will contain are a low-income program that includes toilet and professional installation at no cost to customer and a flat rebate program to all customers that purchase and install a low flow toilet that uses 1.28 gallons per flush.</p>	Water Services		Short Term
W3.3	<p>Expand the Homeowners Association Audit Program.</p> <p>Homeowners Associations (HOA) use water to maintain common landscaped areas, which can lead to high costs and high water usage to keep the areas looking attractive. Up to 70 percent of water used by residents is for outdoor watering. Phoenix piloted a HOA Audit Program that conducted nine audits of outdoor water use within common areas managed by HOAs. Based on that pilot, the potential average savings for the HOAs that volunteered to participate was 4.5 million gallons per year if they implemented the recommendations from the audit. The program will be expanded from pilot to ongoing program by increasing the number of inspections from nine to 40.</p>	Water Services		Short Term