



2021

# Energy & Sustainability

## Work Plan



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# Knoxville's Vision

Mayor's Statement



**A**s Mayor of Knoxville, I'm committed to working toward a clean and resilient future for our city. I believe in being good stewards of our natural resources.

I'm grateful to everyone, especially Climate Council members and our community and industry partners, who have contributed to this update of the City of Knoxville's Sustainability Plan. Thank you for lending your time and expertise to helping establish progressive goals and identifying ways to achieve them.

Our Sustainability Plan identifies buildings, transportation and waste management as areas where emissions can best be managed and reduced. This work plan serves as a guidepost for city departments as they develop projects to make Knoxville clean and resilient. This plan outlines our successes and, as our city continues to

prosper, helps focus our sights on where we can reduce emissions and make Knoxville a great place to live.

There is no one single solution to reducing our municipal and community emissions and their impact on our environment and climate. Together, we are plotting a roadmap to reach our goals that reflects the priorities of our residents.

Through the work of our Office of Sustainability, the City of Knoxville is demonstrating how a municipality can take responsibility for our impact and reduce it.

We are taking steps now that will make a difference in 2030, 2050 and beyond.

*Indya Kincannon*

Mayor Indya Kincannon





Report prepared by the  
Office of Sustainability  
Brian Blackmon, Director  
Grace Levin, Sustainability Coordinator  
Sharath Reredy, AmeriCorps member

# Sustainability Leaders

## Director's Statement

Changing and improving the City of Knoxville isn't done in a vacuum. Reducing community emissions takes the work of many passionate individuals (and their teams), and luckily Knoxville is home to many sustainability leaders from non-profits to businesses, and from federal research partners to enthusiastic citizen climate activists. Our success is rooted in their hard work.

Brian Blackmon  
Director, Office of Sustainability

## Contributors

### Mayor's Climate Council

Mayor Indya Kincannon  
Pastor Chris Battle, The Underground Collective/Battlefield Farms  
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\*E, Equity; T, Transportation; B, Buildings & Energy; W, Waste

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Rick Held, Community Voices

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#### **Energy/Building Technical Working Group**

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#### **Special Thank You**

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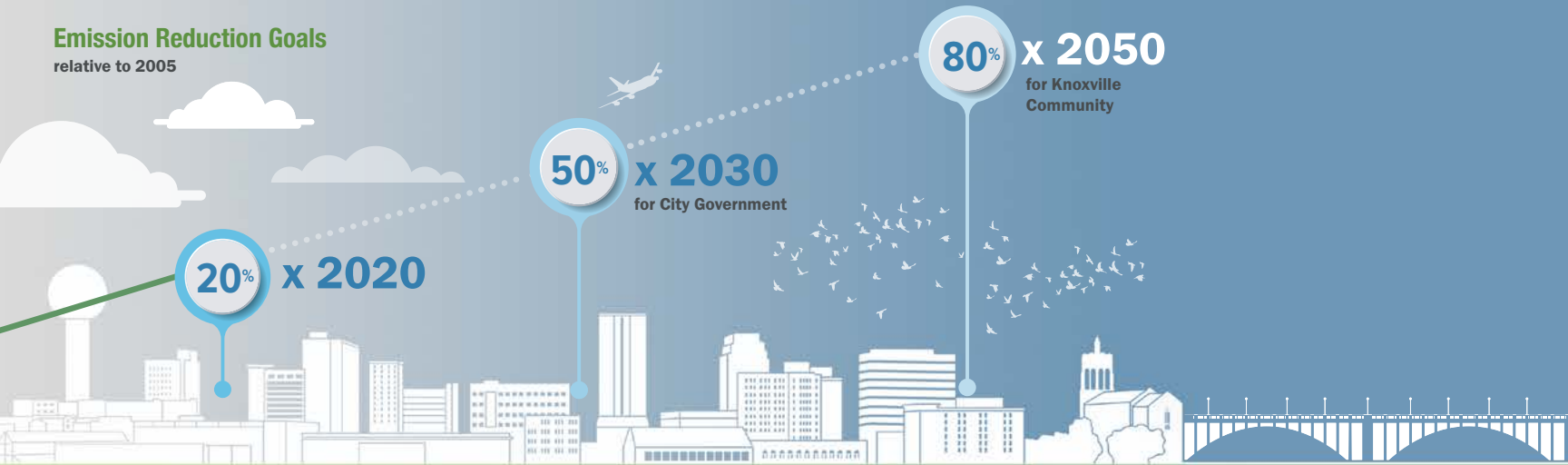


# History

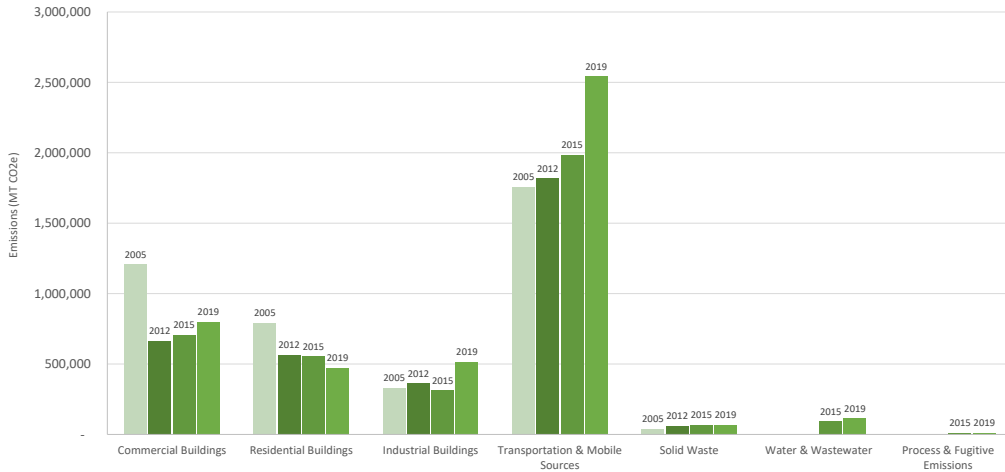
## Emission Reduction Goals

In 2008, the City of Knoxville set a goal to reduce greenhouse gas emissions 20% by 2020 relative to 2005 levels for both municipal operations and the Knoxville community. Resolution R-265-2019, adopted by City Council on Aug. 13, 2019, confirmed target reductions of 50% by 2030 for City operations and an 80% reduction by 2050 for community emissions.

### Emission Reduction Goals relative to 2005



Community Emissions by Sector (2005-present)



For more than a decade, the City of Knoxville has worked to make Knoxville a greener, more sustainable city – one where the economy, environment and community can thrive together today and in the future. In 2008, the City set a goal to reduce greenhouse gas emissions 20% by 2020 relative to 2005 levels for both municipal operations and the community. In 2011, the first Energy & Sustainability Work Plan became the guiding document to lower emissions and combat climate change. Those foundational task force discussions shaped Knoxville’s trajectory for much of the

past decade.

While operational emissions (-32%) continue to improve, community emissions have increased over the same time (+8%) as Knoxville continues to grow. There are many successes to celebrate despite that trend. Since 2011, weatherization programs like KUB’s Round It Up, TVA’s Home UpLift, and the 2016-2017 Knoxville Extreme Energy Makeover (KEEM) reduced energy use and lowered energy costs in more than 1,800 homes in the Knoxville area.

## Celebrating Success

Since the first work plan, the City and a multitude of community partners have worked to establish Knoxville as a regional and national sustainability leader. City employees have: avoided approximately \$1 million in annual utility costs by investing in building performance; reduced streetlighting costs by an additional \$2 million; optimized fleet use to minimize fuel waste; and improved bus service while reducing emissions.



Solar panels on top of the Knoxville Convention Center

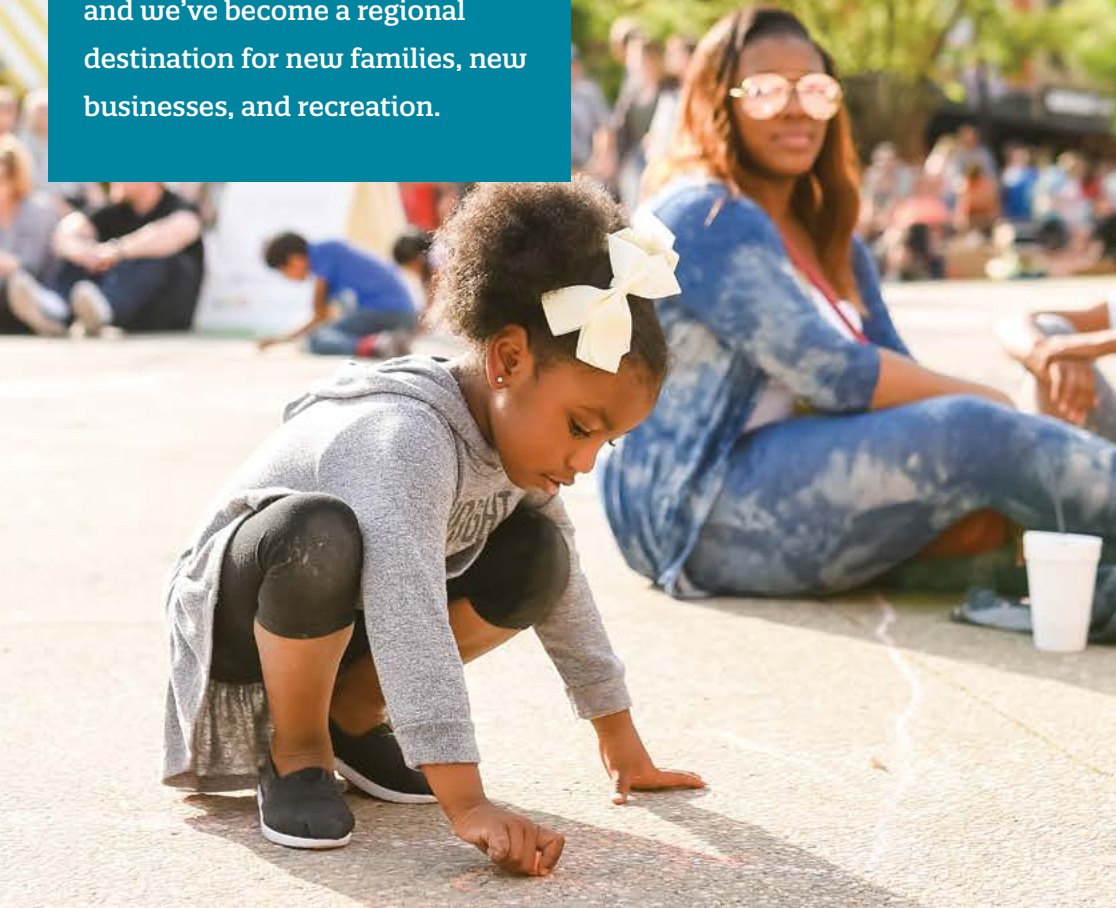
Knoxville has changed quite a bit since the original emissions benchmark of 2005. Knox County's population has grown by more than 16% in that time, and we've become a regional destination for new families, new businesses, and recreation.

## Re-evaluating Priorities

In 2020 to re-evaluate our priorities, the City launched the Mayor's Climate Council. This new task force brings fresh perspective to past successes, priorities and lessons learned from other communities. Mayor Kincannon convened more than 65 local experts to discuss effective strategies to reduce community emissions and meet the 80% by 2050 goal.

The scale of change required to drive emissions down goes well beyond the boundary of the City of Knoxville and will require leadership at all levels (local, regional, and national).

To assess the potential impact of various emission reduction strategies, the Office of Sustainability took the feedback from the Mayor's Climate Council and technical experts and used modeling tools to project potential emissions reductions.



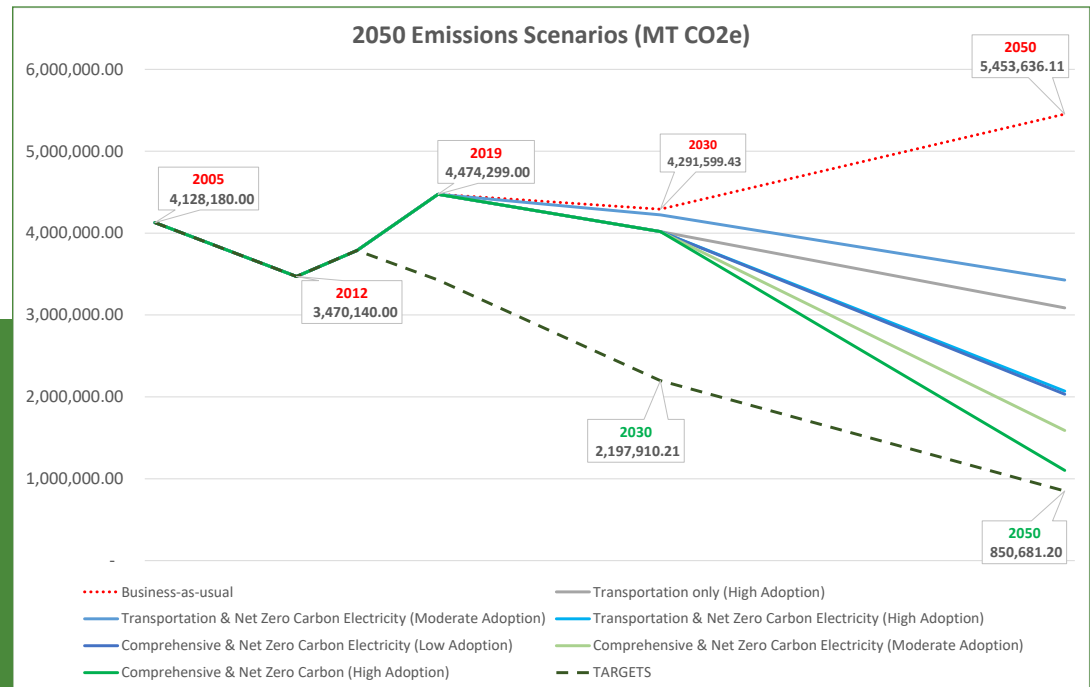


*“The 2021 Sustainability Work Plan will refocus on community priorities to drive greenhouse gas emissions down and identify new metrics to evaluate long-term success.”*

These scenarios, shown below, project both estimated growth (e.g. population, energy use, waste generation, and transportation) and the potential of various strategies to reduce greenhouse gas emissions.

The 2021 Sustainability Work Plan will refocus on community priorities to drive greenhouse gas emissions down and identify new metrics to evaluate long-term success. These priorities are not specific, shovel-ready projects; rather, they are multi-year priorities to direct the Office of Sustainability and other city departments in aligning projects with desirable community outcomes. In other words, how can we advance climate goals while also supporting the specific needs of the most vulnerable in our community?

Embedded in the selection of these new priorities was an emphasis on strategies that are also likely to advance equity outcomes.



The Climate Council’s Equity Working Group screened strategies by considering subject matter expertise, lived experiences, and community surveys. Office of Sustainability staff used the Equity Working Group rankings and special considerations to identify the focus areas for emissions reduction priorities reflected in the subsequent sections.





59%

***“Transportation emissions make up approximately 59% of our community emissions profile.”***

# Transportation

## Overview

Knoxville, like most communities across the nation, observed increased emissions related to transportation, which increased the sector share of community emissions over the past decade. The increase in traffic volume is a byproduct of population growth and a strong economy (GDP +46.8%). Unfortunately, average vehicle fuel economy has not significantly increased since 2012. Emissions attributed to transportation have become a larger share of emissions profiles as building codes have led to increased energy efficiency, and utilities increasingly invest in lower carbon renewable electricity.

### Focus areas

The City has promoted the use of public transit and increased route efficiency, while improving and expanding infrastructure

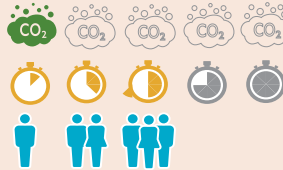
for bikes, pedestrians, and the adoption of electric vehicles. The Office of Sustainability oversees 21 free public EV charging ports across City parks and downtown garages. Operationally, the City is working to further diversify its fleet and ensure that we're optimizing lower carbon fuel sources as much as possible. The City is also actively exploring ways to modernize transportation infrastructure in order to accommodate new technologies and improve local transportation systems.

Strategies prioritized for transportation were ranked for their potential to directly reduce greenhouse gas emissions and their community benefits. Vehicle electrification strategies also benefit community health by reducing ground-level particulate matter and other pollutants. Investments to improve

## Transportation Priorities

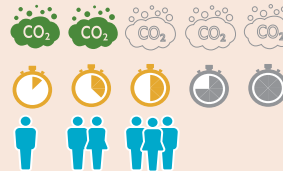
Expand and improve bicycle and pedestrian facilities, connectivity, convenience, and/or safety in a manner that significantly increases the number of trips taken by walking or biking

**Measuring success:** Miles of improvement, mapping corridors of connectivity, estimating pedestrian and bicycle trips



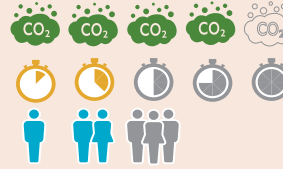
Make public transit investments that significantly enhance coverage, service quality, frequency, and/or speed

**Measuring success:** Number of trips, average route frequency, number of bus stop improvements, Community VMT



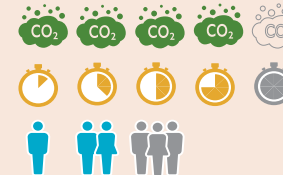
Significantly accelerate community adoption of electric vehicles

**Measuring success:** Number of EV registrations, number of EVSE by level of service, EVSE distribution



Partner with major local commercial fleet operators to transition to electric vehicles

**Measuring success:** EVSE on commercial property, EV registrations



and expand public transit, as well as bicycle and pedestrian infrastructure, improve connectivity to the places we work, live, shop and play.

### Legend

Greenhouse Gas Potential

Timeframe

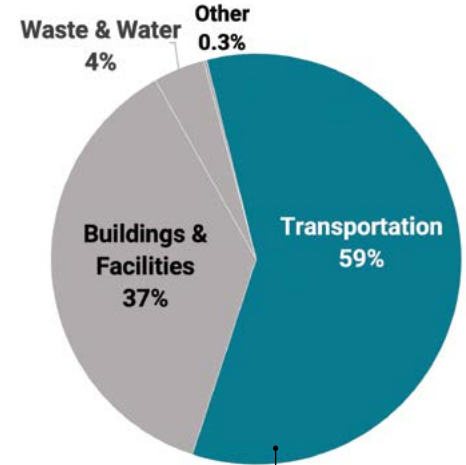
Community Benefit Potential

Likely to advance outcomes

Somewhat likely to advance outcomes

Less likely to advance outcomes

## Community-Wide Emissions Profile 2019



Offroad Air/Rail/Water Fuel, 7%

On-Road Diesel, 28%

On-Road Gasoline, 65%



# Buildings & Energy

## Overview

In Knoxville, energy use in buildings makes up approximately 37% of all community-wide emissions, which come from the natural gas and electricity we use in our homes and workplaces. Greenhouse gas emissions from buildings are more than 29% lower than in 2005. That reduction has been driven by utility investments in lower carbon electricity. Approximately 60% of all energy use in buildings is electricity, and investments in clean energy have been able to outpace the increase in overall energy use in our growing community.

### Focus areas

Wasting energy means wasting money. Because much of our energy comes from fossil fuels, wasting energy also creates unnecessary negative impacts on the environment. The Office of Sustainability champions efforts by City departments,

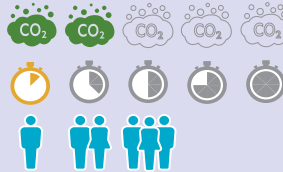
partners and contractors to minimize and reduce energy waste across buildings, parks and roadways, advance clean energy investment opportunities, and promote policies and programs that improve building efficiency.

Strategies prioritized for addressing buildings and energy were ranked for their potential to directly reduce greenhouse gas emissions in addition to their community benefits. Investments in energy efficiency, especially in homes, is a valuable strategy to address housing affordability through lower energy expenditures. Common practices employed by major weatherization programs (e.g. KUB's Round It Up) such as air sealing combined with updated HVAC can not only improve comfort, affordability, and reduce emissions, but they can also improve indoor air quality.

## Buildings & Energy Priorities

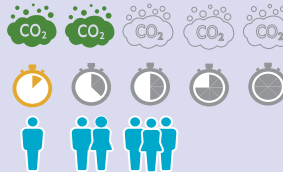
Create voluntary large, commercial, and multi-family energy upgrade program(s) (eg. incentives, technical assistance) that achieve deep energy savings (~25%+) in ~20%+ of buildings

**Measuring success:** Permits for improvements in commercial buildings, tracking average energy intensity, participation in incentive programs



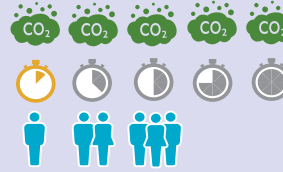
Amplify and opportunistically expand voluntary home energy upgrade program(s) that will achieve deep energy savings (~25%+) in 20% of homes

**Measuring success:** Participation in existing assistance programs, report on energy savings results of programs relative to target



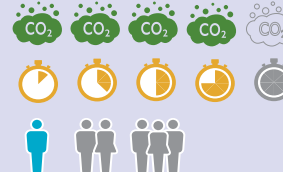
Develop or amplify opportunities to invest in renewables at scale. Including community solar and in-valley investments

**Measuring success:** Total solar generation, TVA energy mix, participants in community solar programs, participants in other renewables programs



Research and develop strategies to promote opportunistic electrification (eg. replacement of fossil fuel-fired furnaces with electric heat pump technologies) in existing buildings over time

**Measuring success:** Total energy share by fuel source, average use by service type



### Legend

Greenhouse Gas Potential

Timeframe

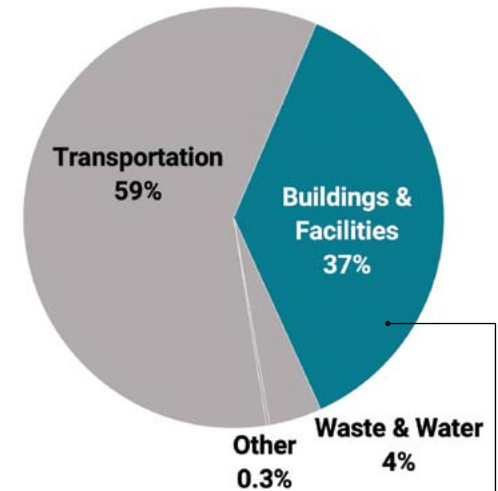
Community Benefit Potential

Likely to advance outcomes

Somewhat likely to advance outcomes

Less likely to advance outcomes

## Community-Wide Emissions Profile 2019



Industrial Natural Gas, 11%

Industrial Electricity, 18%

Commercial Natural Gas, 8%

Commercial Electricity, 37%

Residential Natural Gas, 5%

Residential Electricity, 22%



# Waste

## Overview

Emissions from Knoxville's waste stream make up approximately 4% of all local emissions. Most emissions in our waste stream come from methane that results from the breakdown of organic materials in wastewater treatment and our solid waste stream. Common organic materials in our garbage are paper, cardboard, food waste, and yard waste. Overall reduction in waste is the best approach to reducing emissions, but ensuring we have robust solutions to divert organic waste through opportunities like recycling and backyard composting are essential to minimizing those emissions.

### Focus areas

Working with Knox County and other community partners, the City has strengthened its waste management practices. The City has worked to reduce the amount of methane-emitting items in our waste stream by adopting backyard

composting standards, expanded recycling services, and engaging businesses to reduce organic waste in the waste stream.

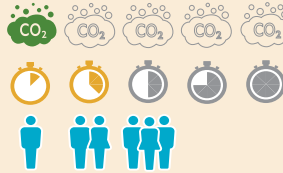
Strategies prioritized for addressing waste emissions are highlighted for their potential to directly reduce greenhouse gas emissions in addition their community benefits. The Equity Working Group of the Mayor's Climate Council highlighted opportunities to improve engagement as ways to improve services, better understand nuisances, and boost civic engagement.

***“Common organic materials in our garbage are paper, cardboard, food waste and yard waste.”***

## Waste Priorities

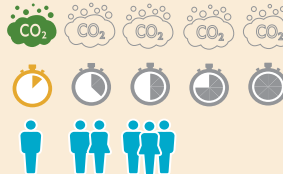
Pursue food waste reduction and collection programs that capture ~80%+ of organic waste from all high-volume locations (eg. restaurants)

**Measuring success:** Number of private collection programs, number of participants, research audit of waste composition



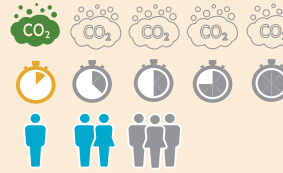
Increase residential recycling through community engagement and education strategies

**Measuring success:** Participants, number of presentations, number of participating households



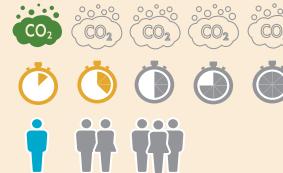
Promote consumption-reduction approaches such as sharing and re-use through education campaigns

**Measuring success:** Participants, number of presentations

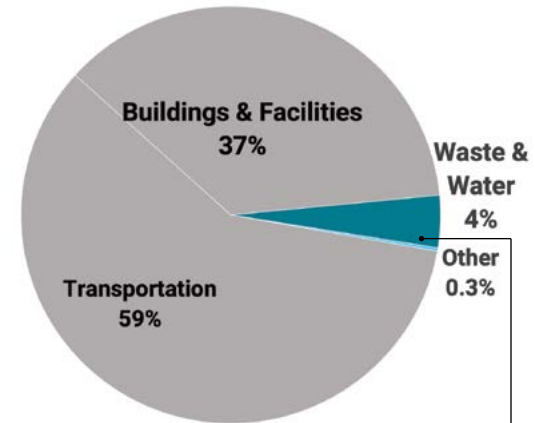


Research pathways to offer organics (food/yard waste) collection for single-family and multi-family residential properties

**Measuring success:** Number of private collection programs, number of participants, research audit of waste composition



## Community-Wide Emissions Profile 2019



### Legend

Greenhouse Gas Potential

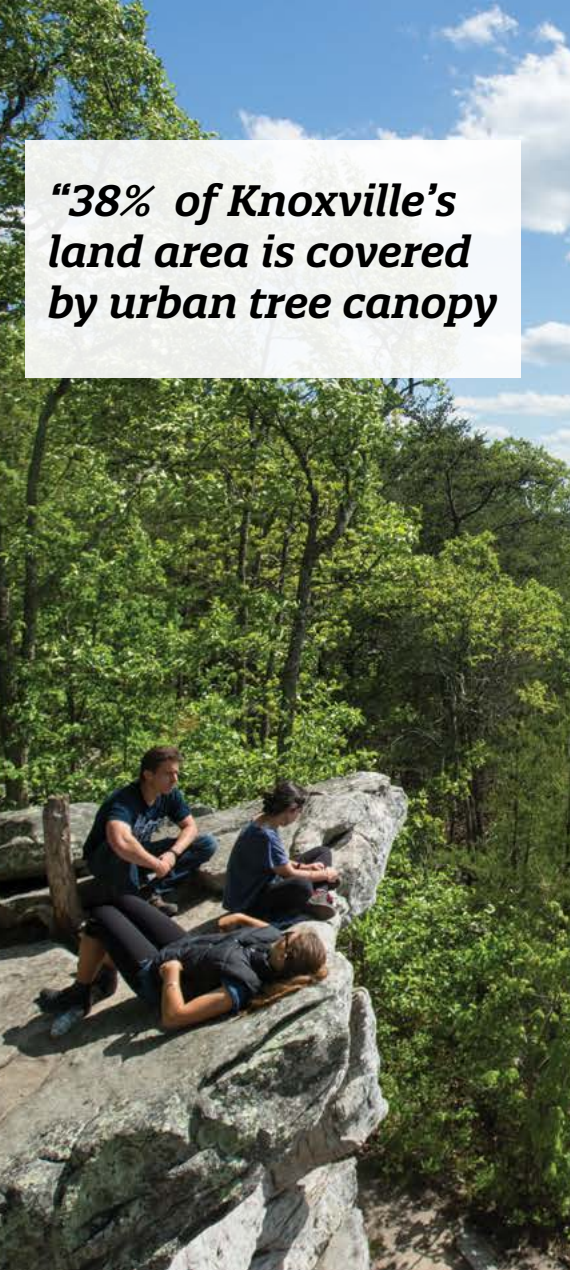
Timeframe

#### Community Benefit Potential

Likely to advance outcomes

Somewhat likely to advance outcomes

Less likely to advance outcomes



***“38% of Knoxville’s land area is covered by urban tree canopy***

# Resilient Communities

## Overview

East Tennessee is known for its beautiful and scenic open spaces. Knoxville has rapidly emerged as a leader in outdoor recreation and tourism, with its sprawling outdoor parks and trail systems located just a short ride from the heart of downtown. These lush spaces are not only an economic asset but a tool to sequester carbon and reduce environmental problems that plague urban environments such as localized flooding and urban heat island effect.

The City promotes resilience in the community by embedding support for low-impact design and investing in infrastructure to handle the demands of increased localized flooding events. The Multi-Jurisdictional Hazard Mitigation Plan, identifies the myriad environmental risks that face residents. In the most recently

adopted edition from 2017, the document incorporated forward-looking changing severity of impacts of climate change, including extreme temperatures, leveraging technical expertise from Oak Ridge National Laboratory.

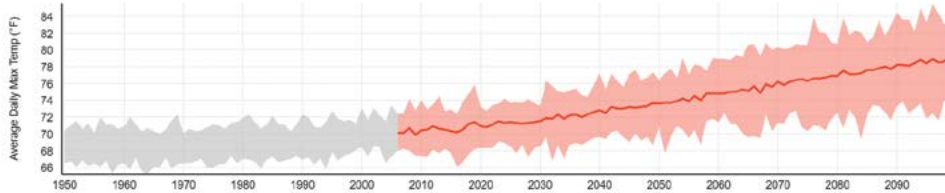
### Sustainable Landscapes

#### *Green Infrastructure*

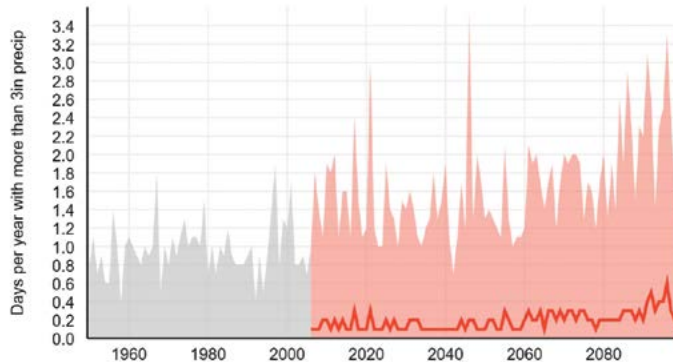
City of Knoxville Engineering oversees dozens of water quality and green infrastructure projects per year on both public and private property. Public projects like wetland construction at Fountain City Lake, the permeable parking lot at the City’s new Public Works Service Center, and infiltration islands on Dale Avenue are critical to mitigating the damages caused by stormwater and increasing high-intensity rainfall events



## High Emissions Projections of Average Daily Max Temperature for Knoxville, Tenn.



## High Emissions Projections of Rainfall Events >3" for Knoxville, Tenn.



Source: The U.S. Climate Resilience Toolkit and Climate Explorer

### Trees

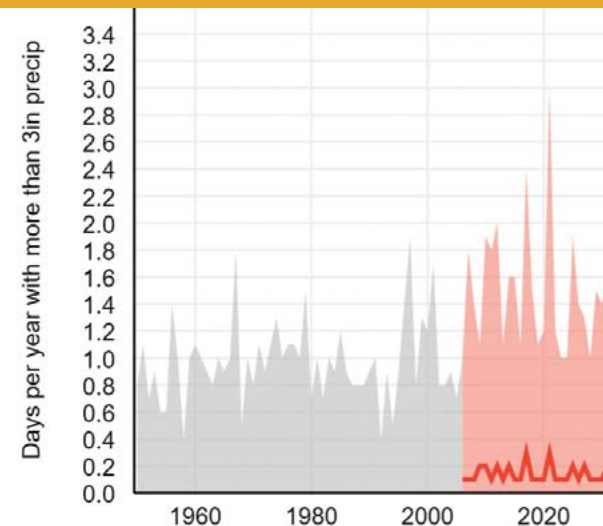
Trees are a valuable, understated public asset in cities. Trees can reduce cooling costs by shading buildings, sequester carbon from the atmosphere, reduce stormwater runoff and help mitigate urban heat island effect. The City of Knoxville has approximately 24,252 acres of tree cover.

Those trees store an estimated 760,000 tons of carbon and sequester 21,000 tons annually. The City's Urban Forestry Division works to maintain a healthy urban tree canopy and seeks opportunities to increase the coverage of these valuable assets.

### Heat Islands

Heat islands are urbanized areas that experience higher temperatures than outlying areas. Structures such as buildings, roads, and other infrastructure absorb and re-emit the sun's heat more than natural landscapes such as forests and water bodies. Urban areas, where these structures are highly concentrated and greenery is limited, become "islands" of higher temperatures relative to outlying areas. Daytime temperatures in urban areas are about 1–7°F higher than temperatures in outlying areas and nighttime temperatures are about 2–5°F higher.

<https://www.epa.gov/heatislands>





### Knoxville awarded

Platinum Certification in TVA's "Sustainable Communities" program

Mayor Rogero appointed to World Council on State, Local, and Tribal Leaders' Commission on Climate Preparedness & Resilience

### Mayor Rogero establishes Office of Sustainability

**Knoxville Convention Center** becomes first convention center in the state to achieve LEED certification

2013

2012

### City releases

the first Energy & Sustainability Work Plan

2010

### Mayor Haslam

appoints the City's first Energy & Sustainability Task Force

2007



2008  
selected as one of 25 DOE Solar America Cities



### Knoxville Sustainability

staff co-founds the Southeast Sustainability Director's Network

2011

2012  
**Knoxville wins** IBM Smarter Cities Challenge grant and launches the Smarter Cities Partnership to improve home comfort, quality, and affordability through energy efficiency



one of the top 10 cities by the



### City of Knoxville designated

a "Best Workplaces for Commuters"

### TVA awards Knoxville

\$15 million for the Knoxville Extreme Energy Makeover Program



### Knoxville recognized as

one of 25 international finalists for a 2017 C40 Cities Bloomberg Philanthropies Award

### Mayor Indya Kincannon

convened the Mayor's Climate Council

2015

2017

2020



2014

2017

2019

2021

### Knoxville named

one of 16 Climate Action Champions by the White House and Department of Energy

### Mayor Rogero named

co-chair to national Climate Mayors network

### Knoxville City Council adopted

new emission reduction goals: 50% by 2030 municipal and 80% by 2050 community

### Updated Sustainability Work Plan Released

### Knoxville designated

National Wildlife Federation Certified Wildlife Community (the first municipal certification in Tennessee)



City of Knoxville  
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