A LETTER FROM THE MAYOR

To the Flagstaff community,

Thank you to all our community members that helped to develop Flagstaff’s first community-wide Climate Action and Adaptation Plan. Climate change is one of the greatest challenges we will face in the next century, and I am proud of Flagstaff for taking initiative to prepare for that change.

We know the climate is changing. In future years, we will see warmer winters and increasing threats to the Ponderosa pine ecosystem. We’ve heard stories from community members about the changes they see in their own lives, from warmer summer days, to more mosquitos and javelina sightings, to increases in housing demand pressures and costs to keep ballfields green.

Flagstaff is an incredible place to live. This Plan recognizes the value of our community, our thriving economy, our neighborhoods, and our people. To protect what we love about this town, we need to ensure that we are prepared for change. The benefits of planning ahead are innumerable: we see that value through forest treatments that help us avoid catastrophic wildfire and flooding, as well as through investments in services that keep our vulnerable community members safe.

This Plan was made by and for the Flagstaff community. Hundreds of residents contributed through open houses, online surveys, and Coffee and Climate conversations. The members of the Steering Committee represented a broad spectrum of viewpoints and areas of expertise. Thank you for helping to make sure that this Plan reflects Flagstaff and protects what we love, while preparing for climate change.

Now the work truly begins! I look forward to your involvement as we work to implement this Plan, collaborate with partners to tackle climate challenges, and celebrate action by individuals, businesses, neighborhoods, and the municipal organization. Flagstaff can be both a climate leader and a wonderful place to live.

Sincerely,

Mayor Coral J. Evans
ACKNOWLEDGMENTS

The goals, strategies, and indicators presented in this plan were developed through collaboration with residents of Flagstaff, City of Flagstaff staff, and City Council members.

City Council Members

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
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<tbody>
<tr>
<td>Coral Evans</td>
<td>Mayor</td>
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<tr>
<td>Jamie Whelan</td>
<td>Vice-Mayor</td>
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<tr>
<td>Celia Barotz</td>
<td>Council member</td>
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<tr>
<td>Jim McCarthy</td>
<td>Council member</td>
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<tr>
<td>Charlie Odegaard</td>
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<tr>
<td>Scott Overton</td>
<td>Council member</td>
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<tr>
<td>Eva Putzova</td>
<td>Council member</td>
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CAAP Steering Committee Members

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
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<tbody>
<tr>
<td>Amanda Acheson</td>
<td>Sustainable Building Program, Coconino County</td>
</tr>
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<tr>
<td>Jeff Hall</td>
<td>Lowell Observatory</td>
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<tr>
<td>Deb Harris</td>
<td>Southside Community Association</td>
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<tr>
<td>Brad Hill</td>
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</tr>
<tr>
<td>George Koch</td>
<td>Center for Ecosystem Science and Society, Northern Arizona University</td>
</tr>
<tr>
<td>Dave McIntire</td>
<td>Community Investment Division, City of Flagstaff</td>
</tr>
<tr>
<td>Matthew Millar</td>
<td>Flagstaff Fire Department, City of Flagstaff</td>
</tr>
<tr>
<td>Rick Moore</td>
<td>Grand Canyon Trust</td>
</tr>
<tr>
<td>Kate Morley</td>
<td>Northern Arizona Intergovernmental</td>
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<td></td>
<td>Public Transportation Authority (NAIPTA)</td>
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<tr>
<td>Amanda Ormond</td>
<td>The Ormond Group, LLC</td>
</tr>
<tr>
<td>Brian Petersen</td>
<td>Geography, Planning, and Recreation, Northern</td>
</tr>
<tr>
<td></td>
<td>Arizona University; City of Flagstaff Sustainability Commission</td>
</tr>
<tr>
<td>Daisy Purdy</td>
<td>Ethnic Studies and Applied Indigenous Studies, Northern Arizona University</td>
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<tr>
<td>Brian Wallace</td>
<td>Arizona Public Service Electric Company (APS)</td>
</tr>
<tr>
<td>Jed Westover</td>
<td>Loven Contracting</td>
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Sincere gratitude to the Flagstaff community for their time and dedication to this process.

City of Flagstaff Staff
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Andy Bertelsen Public Works Division
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Prepared for the Flagstaff Community by
Cascadia Consulting Group

Andrea Martin Senior Associate
Nora Nickum Director
Olivia Ashmoore Project Assistant
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Executive Summary
The Executive Summary provides a high level overview of the Climate Action and Adaptation Plan.

Introduction
The Introduction explains why and how the Climate Action and Adaptation Plan was developed and provides foundational information that informed the plan's goals, strategies, and actions.

Implementation Strategy
The Implementation Strategy section details steps the City and community will take to ensure successful plan implementation.

Strategies and Actions
The Strategies and Actions section presents the near- and long-term actions for meeting plan goals, organized by focus area.
The climate is changing.

Climate change will affect all facets of the Flagstaff community. Anticipated impacts in Flagstaff include:

- Greater risk of wildfires in our local forests
- Longer and hotter summers
- Less snowpack
- More severe drought conditions
- Increased risk of heat-related and mosquito-borne illnesses

What is Flagstaff going to do about it?

This Climate Action and Adaptation Plan will guide the Flagstaff community in preparing for climate risks, reducing greenhouse gas emissions, and protecting the wellbeing of residents for decades to come.

OUR GOALS

- Reduce greenhouse gas emissions by **80%** by 2050, compared to the 2016 emissions baseline.
- Make sure that our neighborhoods, resources and economy are more resilient to climate change impacts.
- Address climate change impacts in a manner that prioritizes those most impacted.

To meet these goals, we are taking action across sectors:

- Natural Environment
- Water
- Energy
- Transportation & Land Use
- Waste & Consumption
- Public Health & Safety
- Prosperity & Recreation

The Climate Action and Adaptation Plan will be updated every 5 years.
EXECUTIVE SUMMARY

WHY DO WE NEED A PLAN?

Climate change is bringing changes in temperature, snowpack, water availability, and wildfire risk to Flagstaff. These changes threaten Flagstaff’s natural resources, economy, infrastructure, and quality of life. This Climate Action and Adaptation Plan (Plan) is a strategic roadmap to guide the Flagstaff community in preparing for climate risks, reducing greenhouse gas emissions, and protecting the wellbeing of residents for decades to come.

CLIMATE CHANGE RISKS

Anticipated climate change impacts in Flagstaff include the following:

**Hotter temperatures**
- Longer and hotter summers
- Difficulty for sensitive populations and those without air conditioning
- Increased risk of disease or illness from mosquitoes and other pests

**Less snowpack**
- More rainfall instead of snowfall
- Increased flooding of infrastructure and buildings from more intense rainstorms
- Increased risk of post-wildfire floods

**Less healthy forests**
- Increased wildfire risk for local forests
- Increased damage from forest pests due to hotter temperatures and drought-stressed trees

**Drier conditions**
- More severe drought conditions as temperatures rise
- Lower water quality of reservoirs
FLAGSTAFF CLIMATE ACTION AND ADAPTATION PLAN

Executive Summary

FLAGSTAFF’S CONTRIBUTION TO CLIMATE CHANGE THROUGH GREENHOUSE GAS EMISSIONS

Transportation and building energy consumption combined make up nearly 90% of Flagstaff’s greenhouse gas emissions. Residential-owned vehicles account for most of the transportation emissions. The consumption of electricity and use of natural gas in homes, businesses, and industrial buildings account for most of the energy emissions. Solid waste disposal, water and wastewater treatment, and fugitive emissions (e.g., from leaks) make up relatively smaller portions of Flagstaff’s emissions.

Forecasts estimate that Flagstaff’s overall emissions will increase 34% by 2050 compared to a 2016 baseline in the absence of climate action. This Climate Action and Adaptation Plan is designed to move us towards a more sustainable future with lower emissions.

DEVELOPMENT OF THIS PLAN

This Plan was written with the community, for the community, through an extensive year-long community and stakeholder engagement process that included:

» Six public open houses attended by over 300 community members.
» Three online surveys taken by over 250 community members.
» Meetings with local organizations and neighborhood groups and collaborations with Coconino County representatives.
» A 15-member citizen steering committee that provided input and feedback throughout the planning process.
» Workshops and meetings with technical experts, including 30 City staff across divisions, to vet and evaluate plan targets, strategies, and actions.
VISION FOR 2050

Our vision for the future is that the Flagstaff community proactively preserves the natural environment, works towards carbon neutrality, and enhances the quality of life for all residents while ensuring equity, self-sufficiency, and climate resiliency.

OVERARCHING GOALS

This Plan is designed to achieve the following climate goals:

» Reduce greenhouse gas emissions by 80% by 2050, compared to the 2016 emissions baseline. We have interim targets of a 15% reduction by 2025 and a 30% reduction by 2030.

» Prepare the city’s neighborhoods, systems, and resources to be more resilient to climate change impacts

» Address climate change in a manner that prioritizes those most impacted and ensures that the costs and benefits of climate adaptation and mitigation are equitably distributed.
STRATEGIES

This Plan recommends the following strategies to achieve City of Flagstaff’s overarching climate goals.

**Natural Environment**

**STRATEGY 1.** Protect existing forests, resources, and meaningful open spaces.

**STRATEGY 2.** Improve forest management through collaboration with regional partners.

**STRATEGY 3.** Educate the public on forest health risk and fire prevention.

**STRATEGY 4.** Encourage diverse native plant ecosystems in the built environment.

**STRATEGY 5.** Proactively manage for expected ecosystem transitions, including the potential threats to ponderosa pine forests.

**Water Resources**

**STRATEGY 1.** Improve water infrastructure and expand water reuse.

**STRATEGY 2.** Improve ecosystem management for protection of water resources.

**STRATEGY 3.** Continue to support water conservation efforts across the Flagstaff community.

**STRATEGY 4.** Maximize passive and active community rainwater infiltration.

**Energy**

**STRATEGY 1.** Improve energy efficiency in all sectors.

**STRATEGY 2.** Expand renewable energy generation and use.

**STRATEGY 3.** Manage energy demand and consumption in residential, commercial, and industrial sectors, to reduce greenhouse gas emissions.

**Transportation and Land Use**

**STRATEGY 1.** Advance land use planning that minimizes the distance people have to travel by car and that increases community resiliency.

**STRATEGY 2.** Prioritize, incentivize, and promote transportation by biking, walking, and transit.

**STRATEGY 3.** Support the use of clean, energy-efficient vehicles.

**STRATEGY 4.** Encourage efficient driving practices.

**STRATEGY 5.** Manage transportation demand and reduce the frequency with which people drive alone.

**STRATEGY 6.** Increase the supply of housing that is affordable to Flagstaff residents and located in areas that support biking, walking, and transit access to goods and services.
Executive Summary

Waste and Consumption

**STRATEGY 1.** Increase waste diversion.

**STRATEGY 2.** Support sustainable and accessible production and consumption.

**STRATEGY 3.** Optimize collection and disposal systems to minimize greenhouse gas emissions.

**STRATEGY 4.** Improve data collection on consumption, waste, and diversion.

**STRATEGY 5.** Increase local food production through partnerships and policies.

Public Health, Services, Facilities and Safety

**STRATEGY 1.** Identify and target support for at-risk populations.

**STRATEGY 2.** Adequately fund services for disaster preparedness.

**STRATEGY 3.** Increase community awareness of climate change risks and impacts and improve community capacity to respond to new or expanding risks to public health.

**STRATEGY 4.** Improve the resiliency of public infrastructure.

**STRATEGY 5.** Prepare for changing risks to public health due to climate change.

Economic Prosperity and Recreation

**STRATEGY 1.** Accelerate the transformation to a low-carbon economy that minimizes emissions and can effectively adapt as the climate changes.

**STRATEGY 2.** Protect natural areas and ecosystem services that are most vulnerable to the impacts of increased visitation and climate change.

**STRATEGY 3.** Plan for changes to recreation and respond to the impacts of climate change on current Parks and Recreation facilities and operations.

ANTICIPATED EMISSIONS REDUCTIONS

The suite of strategies, taken together, will result in a 60% reduction in community greenhouse gas emissions. While this falls short of the 80% reduction goal, it represents significant progress and an important first step for climate action and adaptation by the City of Flagstaff. The Plan represents an ongoing and iterative process; it will be updated and adjusted in regular increments as the 80% goal and target date nears.
IMPLEMENTATION

The Flagstaff City Council will be responsible for oversight of the Climate Action and Adaptation Plan and will make policy decisions to support implementation of the Plan. City staff will integrate Plan goals and strategies into City operations and decision-making and report back on progress.

Achievement of our climate goals will require that staff throughout the City of Flagstaff, community members, business leaders, as well as students and institutions all take action. City staff will work to support community members in taking climate action and involve residents in implementation decisions.

Because climate change most negatively affects vulnerable communities, implementation of this Plan will strive to advance equity while addressing climate change. Nine equity considerations will guide the implementation of climate actions and ensure that participation in climate action is accessible to the entire Flagstaff community. Staff will work to establish partnerships with underserved communities, build capacity for climate leadership across the community, and involve diverse community voices from the start of any program.

FUTURE UPDATES

The 2018 Climate Action and Adaptation Plan represents the beginning of an ongoing and iterative conversation between the City of Flagstaff and the community it serves. The City will work with the community, local partners, and technical experts to update the Plan every five years, so that we can respond to changing circumstances and learn from implementation challenges and successes.
INTRODUCTION

With clean air, a cooler climate, and beautiful natural areas, Flagstaff is a great place to live and visit. Residents and visitors enjoy the many amenities Flagstaff has to offer—from the Flagstaff Urban Trails System (FUTS) of bike and pedestrian paths to the Grand Canyon to the unique biodiversity of surrounding forests. Home to Northern Arizona University and world-class research centers, Flagstaff residents are informed, passionate, and engaged in issues concerning their community.

Global greenhouse gas (GHG) emissions are changing the climate in ways that threaten Flagstaff’s unique amenities and way of life. Projected changes in temperature, snowpack, water availability, and wildfire risk exacerbate existing challenges and introduce new challenges to Flagstaff’s natural resources, economy, infrastructure systems, and quality of life. While we can work to reduce Flagstaff’s contributions to those climate changes, preparing for inevitable impacts of these changes in Flagstaff is necessary.

By taking action now to reduce the community’s emissions and prepare for climate risks, the City of Flagstaff can better protect the wellbeing of its residents for decades to come. There are many community benefits to climate action, while the cost of inaction is incredibly high.

This Climate Action and Adaptation Plan (Plan) creates a vision and strategic roadmap for the Flagstaff community to address these risks by reducing greenhouse gas emissions and adapting to a changing climate. It was written by the community, for the community—building on our knowledge of projected local climate changes, sources of greenhouse gas emissions, and community vulnerabilities, priorities, ideas and concerns. It focuses on activities that achieve the greatest emission reductions or do the most to increase our community preparedness and in the most cost-effective and equitable manner. The entire community—Flagstaff businesses, residents, and visitors—all have a role in both implementing the Plan and enjoying its benefits.

Adaptation versus Mitigation

Climate “mitigation” refers to actions that reduce greenhouse gas emissions, which contribute to climate change.

Climate “adaptation” refers to actions that increase the ability to withstand, respond to, or cope with climate change impacts.
Climate Change and Flagstaff

Climate change is a shift in the long-term, average weather pattern.

When climate changes over thousands of years, plants and animals often adapt. When climate changes rapidly over hundreds of years, drastic changes including mass extinctions have occurred. Our climate is changing rapidly. Decades of burning fossil fuels and other human activities have released dangerous levels of heat-trapping gases into the atmosphere. These greenhouse gases—carbon dioxide, methane, nitrous oxides, and others—are driving abrupt changes in our climate.

This section presents the context of climate change in Flagstaff, including an overview of anticipated climate changes and associated impacts and an introduction to the sources of greenhouse gas emissions produced by the Flagstaff community. More information on anticipated climate changes can be found in Appendix A. Climate Profile for the City of Flagstaff.
Climate Change Impacts

Climate change threatens to destabilize global weather patterns and ecosystems, impacting Flagstaff and communities globally. Coconino County is already experiencing climate changes, and many of these changes are projected to worsen in the future. Key changes include the following:

- **Hotter temperatures**
  - Longer and hotter summers
  - Difficulty for sensitive populations and those without air conditioning
  - Increased risk of disease or illness from mosquitoes and other pests

- **Less snowpack**
  - More rainfall instead of snowfall
  - Increased flooding of infrastructure and buildings from more intense rainstorms
  - Increased risk of post-wildfire floods

- **Less healthy forests**
  - Increased wildfire risk for local forests
  - Increased damage from forest pests due to hotter temperatures and drought-stressed trees

- **Drier conditions**
  - More severe drought conditions as temperatures rise
  - Lower water quality of reservoirs

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**Ponderosa Pines in Jeopardy**

As climate change leads to drier conditions in Flagstaff, the iconic ponderosa pine forest that surrounds the city will face several threats. Warmer temperatures will result in unfavorable growing conditions that will decrease the ability of ponderosa pines to re-establish after large, stand-replacing fires. Drier conditions will increase tree susceptibility to beetle infestation, while declines in forest health will contribute to increased wildfire risks. These changes mean that ponderosa pines will have greater difficulty surviving at Flagstaff’s elevation of 7,000 feet, beginning a transition to a shrubland or grassland ecosystem, resembling the nearby, lower elevation landscapes of Northern Arizona. By 2100, widespread losses of pinyon and ponderosa pine forests are projected.

Climate Change is Here

Temperatures have been increasing in Coconino County. The average temperature from 1895 to 2017 was 52.3 degrees Fahrenheit, as indicated on by the grey horizontal line in the graph below. Since the 1980s, we have seen a fairly consistent increasing trend in annual temperatures in the County. While year-to-year changes in temperature are natural and expected, almost every year since 1985 has seen average annual temperatures above the long-term average. These above-average years are represented by orange lines in the graph below.

Climate change is not an abstract, future event. It is something Coconino County is beginning to experience today.
Climate Vulnerability Assessment

To better understand the extent to which these climate changes will affect Flagstaff, the Plan includes a Flagstaff-specific climate vulnerability assessment. The assessment identified key climate-related risks to Flagstaff’s resources, systems, and populations. This section summarizes outcomes from the vulnerability assessment.

What is Climate Vulnerability?

Flagstaff’s vulnerability to climate change is a function of its exposure, sensitivity, and adaptive capacity:

![Vulnerability Diagram]

Flagstaff’s climate vulnerability assessment looked at how key resources and sectors could be impacted by identified climate risks:

- Water supply, quality, and infrastructure
- Land use, infrastructure, and affordable housing
- Forest health and wildfire
- Public health, safety, and emergency services
- Tourism and recreation
- Wildfire
- Hotter Temperatures
- Drought
- Flooding

...could be affected by these climate risks and their associated impacts.
What is at Risk?

Flagstaff’s climate vulnerability assessment ranked the relative climate vulnerability of several resources and sectors. The table below summarizes the outcomes from that assessment. One-page summaries by focus area are also detailed in the Strategies and Actions section of the Plan.

<table>
<thead>
<tr>
<th>Within these resources and sectors...</th>
<th>..the following populations and systems are at varying risk levels in Flagstaff due to climate change:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest health and wildfire</td>
<td>LOW: Forest health and wildfire&lt;br&gt;MEDIUM: Damage from post-fire flooding&lt;br&gt;HIGH: Wildfires, Pests, invasive species, Declining forest health</td>
</tr>
<tr>
<td>Water supply, quality, and infrastructure</td>
<td>LOW: Water quality&lt;br&gt;MEDIUM: Utilities, public transportation, buildings, Cost of living, Open space&lt;br&gt;HIGH: Water supply, Water infrastructure</td>
</tr>
<tr>
<td>Land use, infrastructure, and affordable housing</td>
<td>LOW: Regional growth&lt;br&gt;MEDIUM: Utilities, public transportation, buildings, Cost of living, Open space&lt;br&gt;HIGH: Water supply, Water infrastructure</td>
</tr>
<tr>
<td>Public health, safety, and emergency services</td>
<td>LOW: People with:&lt;br&gt;- Allergies&lt;br&gt;- Mental health issues&lt;br&gt;- Other diseases&lt;br&gt;MEDIUM: People sensitive to:&lt;br&gt;- Poor air quality&lt;br&gt;- Heat- and cold-related illness&lt;br&gt;HIGH: Winter recreation and tourism</td>
</tr>
<tr>
<td>Tourism and recreation</td>
<td>LOW: Summer recreation and tourism&lt;br&gt;MEDIUM: Water quality&lt;br&gt;HIGH: Winter recreation and tourism</td>
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</table>
Climate and Equity

Climate change impacts some groups more than others.

Existing advantages and disadvantages will be exacerbated by climate change stresses and hazards. Public health, housing security, and socioeconomic conditions may all be impacted by predicted changes in weather and migration. Already, low-income residents, communities of color, and tribal nations disproportionately experience environmental harm and health impacts of pollution. This plan incorporates strategies to advance environmental justice and social equity while addressing climate change.

Considering social equity when addressing climate adaptation involves looking at communities’ existing disadvantages and ensuring those most at risk are protected. For example, communities already facing housing insecurity may be displaced by climate-induced migration. This plan proposes proactively taking action to protect communities at risk of displacement. To address social equity when implementing climate change mitigation strategies, it is necessary to consider if the strategy inadvertently creates new burdens to disadvantaged groups and consider if all communities have opportunities to reduce emissions. For example, when expanding public transit, it is imperative to ensure public transit is financially and physically accessible to disadvantaged communities. The Implementation Strategy section of this plan details steps the City and community should take to ensure that these equity considerations are integrated throughout the Plan implementation process.

Who is More Vulnerable to the Impacts of Climate Change?

While all populations are at risk of being impacted by climate change, certain groups are more vulnerable. The very young and very old, outdoor workers, those with pre-existing illnesses or weak social ties, those living on the street, and low-income communities may be especially sensitive to climate change related health impacts. This Plan considers all these communities when discussing vulnerable communities and equity.

Inequity in our society means that some individuals are better able to respond to change—or stressors—than others. For example, those with lower incomes may have to make difficult choices between paying for heating or meeting other basic needs, and may not have access to quality healthcare. In Flagstaff, low-income communities are disproportionately communities of color, specifically Hispanic and Native American households. The elderly, undocumented migrants, or people from families with mixed immigrant status are less likely to leave their homes to seek aid. This Plan seeks to identify and support disadvantaged communities that may have more trouble adapting to change.
Flagstaff’s Greenhouse Gas Emissions

Activities in Flagstaff release greenhouse gas emissions when fossil fuels are burned for transportation and energy, when solid waste breaks down, and when water and wastewater are produced and treated.

To avoid the most dangerous impacts of climate change, the international community came together to ratify the Paris Agreement, which recognizes the need to reduce greenhouse gas emissions to keep global temperature rise below 2 degrees Celsius.¹

Flagstaff has committed to meeting the intentions of the Paris Agreement. This plan sets an ambitious target to reduce greenhouse gas emissions by 80% below baseline by 2050. To track progress on implementing climate and sustainability strategies, Flagstaff has been tracking community-wide greenhouse gas emissions since 2009. In 2016, community-wide emissions were 787,315 metric tons carbon dioxide equivalent (MTCO₂e).

In October 2018, the Intergovernmental Panel on Climate Change (IPCC) released a report highlighting the need to contain global temperature to 1.5 degrees Celsius, and the extraordinary measures needed to achieve this goal.

WHERE DO OUR EMISSIONS COME FROM?

In 2016, Flagstaff’s greenhouse gas emissions were primarily from transportation and energy use, with solid waste, water and wastewater treatment, and fugitive emissions (e.g., from leaks) making up small portions of Flagstaff’s total inventory.

Energy consumption accounts for almost half of Flagstaff’s total greenhouse gas emissions. These emissions come from residential, commercial, and industrial buildings consuming electricity and burning natural gas.

- **Residential Energy**: 17%
- **Industrial Energy**: 6%
- **Commercial Energy**: 20%
- **Water and Wastewater**: 5%
- **Solid Waste**: 11%
- **Transportation and Mobile Sources**: 40%
- **Process & Fugitive Emissions**: 1%

Emissions from the transportation sector made up 40% of Flagstaff’s overall greenhouse gas emissions in 2016. Local, on-road transportation of passengers in residential-owned vehicles accounts for the majority (98%) of these transportation emissions in Flagstaff.

The treatment and conveyance of Flagstaff’s water supply and wastewater also emit considerable greenhouse gas emissions, contributing 5% to overall emissions.

The disposal of solid waste contributed 11% to Flagstaff’s 2016 greenhouse gas emissions footprint.
Not all emissions are currently reflected in Flagstaff’s inventory

While Flagstaff’s community inventory accounts for emissions released directly within the city or from closely related community activities, consumption-based emissions convey the upstream greenhouse gas impacts of consuming household products. Global economic trade results in the U.S. importing many of the goods that homes consume. As a result, the U.S. has essentially exported greenhouse gas emissions related to manufacturing. Consumption-based emissions inventories approximate upstream impacts so individuals can understand how to reduce their personal carbon footprints, taking into account the emissions associated with manufacturing and transporting the goods and services they consume. The figure below represents an estimated profile of one household’s consumption-based emissions in Flagstaff.¹

The components of the profile that are currently covered in Flagstaff’s greenhouse gas inventory are shown in grey. City of Flagstaff will begin incorporating consumption-based emissions to reflect the other components in future updates.

A business-as-usual (BAU) forecast provides an estimate of potential future emissions, assuming that Flagstaff takes no further action. It considers the influence of external factors on Flagstaff’s emissions, such as population growth, changes in the regional electricity fuel mix, and energy demand.

The business-as-usual forecast for Flagstaff is presented below. Key assumptions for Flagstaff’s business-as-usual forecast are as follows:

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Estimate</th>
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<tbody>
<tr>
<td><strong>35%</strong> forecasted Flagstaff population growth by 2050.</td>
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<tr>
<td><strong>Residential electricity demand</strong> expected to grow by <strong>60%</strong> by 2030.</td>
<td></td>
</tr>
<tr>
<td><strong>Commercial electricity demand</strong> expected to grow <strong>50%</strong> by 2030.</td>
<td></td>
</tr>
<tr>
<td><strong>Industrial electricity demand</strong> expected to grow <strong>1%</strong> by 2030.</td>
<td></td>
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<tr>
<td><strong>Electricity carbon intensity</strong> expected to change at the same rate as national electricity carbon intensity, <strong>declining 37%</strong> by 2050.</td>
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<tr>
<td><strong>50% growth</strong> in vehicle miles traveled by 2040.</td>
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3 Ibid.
4 Ibid.
The forecast estimates that Flagstaff’s overall emissions will increase 34% by 2050 compared to a 2016 baseline—equivalent to a 2% per capita increase over that time period.

This scenario conveys the need for ambitious climate action to meet the City’s short- and long-term emission reduction goals.
Benefits of a Climate Action and Adaptation Plan

Implementation of the Flagstaff Climate Action and Adaptation Plan will realize many benefits beyond addressing climate change.

In addition to the societal benefits from equitable and inclusive climate action, many actions in the Flagstaff Climate Action and Adaptation Plan will enhance quality of life for Flagstaff residents. For example, the introduction of energy-saving equipment and behaviors not only addresses climate goals but can also lower energy costs. This plan prioritizes these “win-win” solutions that benefit both the climate and other facets of the Flagstaff community. Some co-benefits include the following:

**Support for low-income and disadvantaged communities.** When implemented carefully and correctly, actions such as local green job training and subsidy programs for energy efficiency upgrades can be especially helpful for low-income and disadvantaged communities.

**Public health.** Some actions that reduce greenhouse gas emissions also promote healthier lifestyles, such as supporting more people walking and biking and eating less carbon-intensive foods.

**Quality of life and well-being.** Many climate actions can also improve quality of life for Flagstaff residents, such as benefits from green jobs to the local economy and creation of more comfortable and inviting homes through energy efficiency improvements.

**Local habitat, recreation, and aesthetics.** In addition to enhancing ecosystem resilience, minimizing heat impacts, and storing carbon, actions that improve natural habitat can also enhance natural beauty and provide recreation opportunities for visitors and residents.

**Economic stability.** Looking ahead can help the Flagstaff community prepare for potential shifts in both climate and visitation. Climate action can help existing businesses be more resilient amidst change, while emerging businesses capitalizing on the need for climate solutions can create high-quality jobs.

Tensions between Climate Action Goals and Other Community Priorities

While there are strong benefits to climate action, there are also areas where climate action goals may conflict with other community priorities. Challenges range from the search for street lighting that protects our dark skies while conserving energy, and balancing the need for mixed use buildings that help residents drive less with the desire to preserve community character.

This Plan seeks to transparently identify these tensions and start discussions about how to both meet the need for climate action and advance other community goals. Each focus area of the Plan contains a case study weighing these questions and discussing possible solutions. Find these case studies on pages 72, 81, 87, 102, 112, 120, and 127.
Plan Overview

The Plan presents goals, targets, strategies, and actions for mitigating and adapting to climate change. It is organized into seven focus areas:

**Natural Environment** refers to ecosystem health, environmentally sensitive lands, plants, soils, and wildlife in the context of natural systems worthy of conservation and protection. This focus area also includes open spaces that protect environmental quality and biodiversity, support tourism, and protect historic and cultural resources.

**Water Resources** refers to surface water, groundwater, and reclaimed water that serves our residential, commercial, industrial, recreational, and agricultural needs. It includes 100-year water supply planning, diversification of the water supply portfolio, and conservation to sustain our water supplies and quality for future generations.

**Energy** refers to community energy consumption and efficiency, clean and renewable energy sourcing, and a more climate-resilient energy grid. It includes strategies for renewable energy sources and efficient building standards.

**Transportation and Land Use** refers to the form and function of transportation systems, including ways to reduce greenhouse gas emissions through design and clean and efficient transportation systems.

**Waste and Consumption** refers to the lifecycle of goods and materials, including opportunities to reduce emissions associated with manufacturing, use, and disposal.

**Public Health, Services, Facilities, and Safety** refers to facilities and services focused on community health, safety, security, and emergency response.

**Economic Prosperity and Recreation** refers to community and economic health, including opportunities to reduce emissions and prepare the community’s tourism and recreational sectors for climate change.

Where shown, this icon refers to items that span two or more of the focus areas described above.
For each focus area, this document tells the story of Flagstaff’s climate goals, related activities, strategies, and actions for achieving those goals. The strategies and actions are presented in order of priority as articulated by the Flagstaff community, City staff, and Steering Committee. Each focus area is organized in the following manner:

**Goals, Targets, and Indicators** provide metrics for assessing progress towards achieving the focus area vision.

**Strategies** represent thematic groupings of actions that all work toward a specific goal. Strategies within each focus area are ordered by priority.

**Priority Actions** are actions within a strategy that were prioritized from a broader set of potential actions through an evaluation of cost, effectiveness, feasibility, and co-benefits. These actions are ordered from highest to lowest priority as identified through the evaluation process, and these actions are also included in the Implementation Strategy.

**Other Actions** are opportunities that were identified as potential actions but were not considered high-priority through the community and stakeholder engagement process. These actions will be revisited in future plan updates.
A LIVING DOCUMENT

To ensure that the Plan reflects the voice of the Flagstaff community, the plan was developed through an extensive year-long community and stakeholder engagement process that included:

- **Nine public open houses**, attended by over 350 community members.
- **Four online surveys**, taken by over 250 community members.
- **Regular meetings with a 15-member citizen steering committee**, who provided input and feedback throughout the planning process.
- **Workshops and meetings with technical experts**, including 30 City staff across divisions to vet and evaluate plan targets, strategies, and actions.
- **Meetings** with local organizations and neighborhood groups and collaborations with Coconino County representatives.
Strategies in this plan were developed to be actionable, achievable, and impactful. Actions focus on mechanisms or “levers” that the City or community can use to affect change, including:

- **Inspiring voluntary action** through information, outreach, and technical assistance.
- **Sending price signals** to encourage or discourage behaviors.
- **Making public investments** to visibly demonstrate government commitment to climate action and influence decision-making.
- **Mandating change** to stimulate comprehensive, community-wide adjustment.

This foundational Plan represents the beginning of an ongoing and iterative conversation between the City of Flagstaff and the community it serves. The goals, strategies, and actions presented herein reflect the community’s priorities and needs as articulated by City staff, residents, and organizations who participated in the plan development process. As the community’s priorities shift, technologies change, and new knowledge is revealed, the Plan will undergo a continual process of monitoring, evaluation, and evolution to keep pace with changing needs.
Overarching Vision

The Flagstaff community proactively preserves the natural environment, works towards carbon neutrality, and enhances the quality of life for all residents while ensuring equity, self-sufficiency, and climate resiliency.
Overarching Goals and Targets

The Climate Action and Adaptation Plan centers on achievement of the following overarching goals.

1. **REDUCE Flagstaff’s contribution to climate change** by reducing community greenhouse gas emissions.

2. **PREPARE the city’s communities, systems, and resources** to be more resilient to climate change impacts.

3. **ADDRESS climate change** in a manner that prioritizes those most impacted and ensures the costs and benefits of climate adaptation and mitigation are equitably distributed.
## Greenhouse Gas Reduction Targets

The Climate Action and Adaptation Plan sets an overarching and per-capita reduction target for community greenhouse gas emissions.

**OVERARCHING TARGET:** An 80% reduction in GHG emissions by 2050 compared to 2016 levels.

**PER-CAPITA TARGET:** An equivalent reduction to the overarching target given anticipated population growth. This reduction equates to an 85% reduction in GHG emissions by 2050 compared to 2016 levels. The per-capita target needs to be more ambitious (85% per person) than the community-wide target for an 80% reduction from baseline because of estimated population growth.

<table>
<thead>
<tr>
<th>Key Performance Indicator</th>
<th>Baseline (2016)</th>
<th>2025 Target</th>
<th>2030 Target</th>
<th>2050 Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual communitywide greenhouse gas emissions</td>
<td>787,315 (MTCO₂e*)</td>
<td>669,218 (MTCO₂e)</td>
<td>551,121 (MTCO₂e)</td>
<td>157,463 (MTCO₂e)</td>
</tr>
<tr>
<td>Annual per-capita communitywide greenhouse gas emissions</td>
<td>11.0 (MTCO₂e / person)</td>
<td>8.3 (MTCO₂e / person)</td>
<td>6.5 (MTCO₂e / person)</td>
<td>1.7 (MTCO₂e / person)</td>
</tr>
<tr>
<td>Estimated population</td>
<td>71,617</td>
<td>81,044</td>
<td>84,795</td>
<td>95,088</td>
</tr>
</tbody>
</table>

*Metric ton carbon dioxide equivalent (MTCO₂e) serves as a standard unit for greenhouse gases, indicating the impact of different greenhouse gases in terms of the amount of CO₂ that would create the same amount of warming. For example, methane has 28 times the impact of carbon dioxide in the atmosphere, so 1 metric ton of methane would equal 28 MTCO₂e.*
COSTS OF INACTION

This Plan makes an investment in the preparation and adaptation of the entire Flagstaff community to climate change. Preparation is far less costly than response. While we do not know the exact cost of not taking action now, we can estimate. For example, the Flagstaff Watershed Protection Project—a local example of a climate adaptation project—is funded by a $10 million bond and is expected to prevent $573 million to $1.2 billion in costs associated with expected future fires and resulting floods.1 Last year was the most expensive disaster year in U.S. history, costing nearly 400 billion dollars.2 We also know that disasters like those experienced in 2017 are expected to continue and strengthen in the future.3

In addition to the cost savings of preparation, many programs and actions in this plan also have a high return on investment. For example, renewable energy is now cost-competitive with non-renewable energy and brings other benefits to the community such as reduced emissions of dangerous air pollutants, reduced reliance on imported energy, and reduced sensitivity to price fluctuations. When these other societal benefits are taken into account, the return on investment is even higher.


THE SOCIAL COST OF CARBON

Purchasing and burning fossil fuels contributes to impacts that have real economic consequences, such as infrastructure damage from flooding, fires, or extreme storms. Despite the very real nature of these costs, the market price of fossil fuels does not include these societal cost “externalities.” The failure of markets to account for climate risk in the price of fossil fuels has spurred research into quantifying the economic impact of each new metric ton of carbon emitted into the atmosphere. This estimate is called the social cost of carbon. The social cost of carbon is a policy tool to estimate future economic impacts of climate change and allow entities to calculate the actual costs and benefits of various options to guide decision-making.

The U.S. Environmental Protection Agency (EPA) estimates a range of possible social costs of carbon depending on the year and discount rate applied to the future. These range from $36 per metric ton of carbon dioxide equivalent (MTCO₂e) in 2015 to $69 per MTCO₂e in 2050.1 However, the EPA acknowledges current modeling does not include all important damages; estimates by other agencies and researchers are far higher. Some recent estimates have determined the social cost of carbon could be as high as $100-$200 per ton of emissions.2

BUILDING ON A FOUNDATION

Flagstaff has already made notable progress toward reducing both its community emissions and its vulnerability to the potential impacts of climate change.

Flagstaff has a variety of plans, policies, programs, and studies that are connected to the needs and solutions for addressing climate change issues and challenges. Some things the community is already doing to address climate change include the following:

- The City tracks and reports on its greenhouse gas emissions inventory annually.¹
- The Greater Flagstaff Forest Partnership, an alliance of environmental, governmental, and business organizations, works on forest ecosystem restoration in and around Flagstaff.
- The community participates in ongoing invasive weed removal events on Flagstaff Open Space properties.
- The City of Flagstaff has been using reclaimed water for irrigation since 1971, expanding reclaimed water use to offset potable water use by 20%.
- Flagstaff voters approved a $10M bond to support the Flagstaff Watershed Protection Project - a partnership effort between the State, City, and Coconino National Forest to reduce the risk of devastating wildfire and post-fire flooding in the Rio de Flag and Upper Lake Mary watersheds.
- The City of Flagstaff provides home energy efficiency, water efficiency, and rainwater harvesting tank rebates for residents.

¹ Reports can be found on the City website at this link: http://flagstaff.az.gov/3625/Greenhouse-Gas-Emissions-Reporting. More information on other City sustainability activities can be found here: http://www.flagstaff.az.gov/1605/Sustainability-Section.
The City’s Water Services Division has conducted energy audits of their water and wastewater treatment facilities to identify ways to reduce energy consumption and has been proactive at replacing aging inefficient equipment with more energy efficient equipment.

Several local companies are installing residential and commercial rooftop solar systems throughout Flagstaff.

In 2018, a six-month pilot program brought bike sharing to the City of Flagstaff and the Northern Arizona University campus, making bike trips possible for more residents.

The City is exploring an adaptive reuse incentive program to encourage infill and the reuse of existing structures.

The Azulita Project, a local non-profit, is partnering with local businesses to eliminate the use of plastic straws and other single-use plastic.

The Flagstaff Master Recycler program provides training to community members on waste prevention and composting practices.

The Ready Set Go campaign encourages residents to be more informed about potential emergencies and prepared to evacuate.

Through the Woods Watch program, the City of Flagstaff, Coconino County and the U.S. Forest Service partner with residents to monitor for careless fire behavior on forested lands to protect the community from wildfire.

The Sustainable Economic Development Initiative promotes sustainable economic prosperity in Northern Arizona.

The Innovate Waste Challenge is incentivizing businesses to discover new ways to convert waste into marketable products.

The Mountain Line bus system has recently added a weekend bus route to Snowbowl to serve both residents and tourists who ski and snowboard.
THE CITY OF FLAGSTAFF’S EXPANDING COMMITMENT TO CLIMATE ACTION

This Plan builds on a foundation of climate leadership by the Flagstaff City Council. A few significant highlights:

<table>
<thead>
<tr>
<th>Year</th>
<th>Action</th>
</tr>
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<tbody>
<tr>
<td>2006</td>
<td>Through Resolution 2006-59, the City of Flagstaff adopted the U.S. Mayors Climate Protection Agreement.</td>
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<tr>
<td>2007</td>
<td>The City of Flagstaff Sustainability Section was established. The Sustainability Commission was established by Ordinance 2007-27.</td>
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<tr>
<td>2008</td>
<td>Resolution 2008-32 required all new municipal buildings be constructed to earn a minimum of Leadership in Energy and Environmental Design (LEED) silver certification.</td>
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<tr>
<td>2010</td>
<td>Resolution 2010-16 committed the City to increase energy efficiencies and renewable energy production and purchase for City facilities and properties.</td>
</tr>
<tr>
<td>2012</td>
<td>Resolution 2012-22 adopted the 2012 City of Flagstaff Resiliency and Preparedness Study.</td>
</tr>
<tr>
<td>2014</td>
<td>Resolution 2014-09 requires all occupied City-owned new construction, major renovations and large additions to achieve LEED, Green Globes, or Living Building Challenge certification.</td>
</tr>
<tr>
<td>2017</td>
<td>City Council set a 2017-2019 term to take meaningful climate action. Flagstaff became Arizona’s first city to call for national revenue-neutral carbon fee and dividend legislation, urging the U.S. Congress to assess a steadily increasing fee on carbon at the point of fossil fuel extraction; return the net revenue to American households on an equitable basis; and incorporate a border adjustment that levels the playing field for trade with countries without an equivalent tax. Mayor Coral Evans joined with over 200 other U.S. Mayors in committing to adopt, honor, and uphold the landmark Paris Climate Agreement.</td>
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</tbody>
</table>

The 2012 City of Flagstaff Resiliency and Preparedness Study

In 2012, the City of Flagstaff conducted the Resiliency and Preparedness Study to better understand how the impacts of local climate changes will directly affect City operations. The study assessed the level of vulnerability, the degree of risk, and the potential impacts of 115 of the City’s critical operations. Completed by a team of City staff and regional partners, the study recommends an overarching policy to increase protection and resilience within government operations to hazards including fire, severe winter storms, drought and floods.
Relationship to Other City Plans

The list below presents other City plans that inform or could be informed by the Climate Action and Adaptation Plan. Some of these documents already emphasize climate solutions described in this plan, while others will need to be updated to integrate climate change and climate action. Where linkages are clear, this plan highlights “levers” in existing plans and programs and brings them together to address a common goal.

- **The Rethink Waste Plan** outlines initiatives toward achieving the City’s waste prevention and recycling goals.
- **The High Occupancy Housing Plan** encourages higher-density housing that is more compatible with existing neighborhoods.
- The City is currently developing a **Water Conservation Strategic Plan** to set water conservation targets and identify and prioritize actions to achieve those targets.
- **The Flagstaff Regional Plan 2030** presents a comprehensive, long-term plan for the Flagstaff community.
- **The Sustainability Section Strategic Plan** establishes detailed strategies for accomplishing sustainability program area goals.
- **The Management Plan for Legally-Designated Open Space Properties** seeks to restore watershed health, forest structure, native plant communities, and rare habitat types, among other goals.
- **The Coconino County Multi-Jurisdictional Hazard Mitigation Plan** includes an assessment of drought, flood, and wildfire risks and strategies to reduce those risks.
- **The Coconino County Emergency Operations Plan** is a guide for disaster response activities and includes hazards such as floods, flash floods, severe weather, and wildfire.
Ties to the Flagstaff Regional Plan

This document builds upon goals outlined in the current *Flagstaff Regional Plan 2030* and informs potential priority areas for the next regional plan update. Reducing greenhouse gas emissions and adapting to climate change will improve the local economy, support public health, and benefit ecosystems. There is strong overlap between the goals of the *Regional Plan* and the Climate Action and Adaptation Plan.

The following *Regional Plan* goals are furthered by the Climate Action and Adaptation Plan strategies:

- **Goal E&C.2.** Reduce greenhouse gas emissions.
- **Goal E&C.3.** Strengthen community and natural environment resiliency through climate adaptation efforts.
- **Goal E&C.6.** Protect, restore, and improve ecosystem health and maintain native plant and animal community diversity across all land ownerships in the Flagstaff region.
- **Goal E&C.10.** Protect indigenous wildlife populations, localized and larger-scale wildlife habitats, ecosystem processes, and wildlife movement throughout the planning area.
- **Goal OS.1.** The region has a system of open lands, such as undeveloped natural areas, wildlife corridors and habitat areas, trails, accesses to public lands, and greenways to support the natural environment that sustains our quality of life, cultural heritage, and ecosystem health.
- **Goal WR.1.** Maintain a sustainable water budget incorporating regional hydrology, ecosystem needs, and social and economic well-being.
- **Goal WR.2.** Manage a coordinated system of water, wastewater, and reclaimed water utility service facilities and resources at the City level and identify funding to pay for new resources.
- **Goal WR.5** Manage watersheds and stormwater to address flooding concerns, water quality, environmental protections, and rainwater harvesting.
- **Goal WR.6** Protect, preserve, and improve the quality of surface water, groundwater, and reclaimed water in the region.
- **Goal LU.8.** Balance future growth with available water resources.
- **Goal E.1.** Increase energy efficiency.
- **Goal E.2.** Expand production and use of renewable energy.
- **Goal LU.1.** Invest in existing neighborhoods and activity centers for the purpose of developing complete, and connected places.
- **Goal LU.2.** Develop Flagstaff’s Greenfields in accordance with the *Regional Plan* and within the growth boundary.
- **Goal LU.5.** Encourage compact development principles to achieve efficiencies and open space preservation.
- **Goal LU.6.** Provide for a mix of land uses.
- **Goal LU.10.** Increase the proportion of urban neighborhoods to achieve walkable, compact growth.
- **Goal LU.18.** Develop well designed activity centers and corridors with a variety of employment, business, shopping, civic engagement, cultural opportunities, and residential choices.
- **Goal NH.3.** Make available a variety of housing types at different price points, to provide housing opportunity for all economic sectors.
- **Goal T.1.** Improve mobility and access throughout the region.
- **Goal T.2.** Improve transportation safety and efficiency for all modes.
- **Goal T.5.** Increase the availability and use of pedestrian infrastructure, including FUTS, as a critical element of a safe and livable community.
- **Goal T.6.** Provide for bicycling as a safe and efficient means of transportation and recreation.
- **Goal T.7.** Provide a high-quality, safe, convenient, accessible public transportation system, where feasible, to serve as an attractive alternative to single-occupant vehicles.
- **Goal T.9.** Strengthen and support rail service opportunities for the region’s businesses and travelers.
PROJECTED EMISSIONS REDUCTION FROM PLAN IMPLEMENTATION

This graph indicates the greenhouse gas emissions reductions that are possible if the City implements the strategies and actions in this Plan, as laid out in the following section. Flagstaff’s projected emissions with no action—business as usual—are represented by the top black line. Projected emissions with climate action implementation are represented by the dark orange line, which moves downward each year. Each color band represents the impacts of a different strategy that reduces emissions below our current trajectory.

By reducing transportation emissions, transitioning to renewable energy, maximizing energy efficiency, and reducing waste, Flagstaff can reduce its greenhouse gas emissions 60% below the 2016 emissions baseline by 2050. This represents significant progress toward the 80% by 2050 goal and it demonstrates the substantial impact that local climate leadership can have on emissions.

Additional reductions may be possible if national, state, and global action impact the community’s carbon footprint. Furthermore, as technology improves and policies change, emissions may be reduced in ways that are currently unforeseeable. In the coming years, the City will take advantage of new technologies and emerging opportunities. To address this gap between projected emissions reductions and the 80% goal, the City will revise Plan strategies during regular updates to ensure it will achieve the 80x50 target.
Community Open Houses asked Flagstaff residents for their input at every stage of Plan development. At the first Community Open House in January 2018, residents described why they are proud of Flagstaff and their concerns about climate change.