The Flagstaff Carbon Neutrality Plan

An evolving framework for action

Revised December 2022

Table of Contents

Cover image: Flagstaff students protest for climate action in the fall of 2018. Photo credit: Jake Bacon.

The Carbon Neutrality Plan is revised annually. This is the second version, adopted on December 6, 2022.

Letter from the Flagstaff City Council

June 15, 2021

To the Flagstaff community,

Thank you. Flagstaff's climate action is rooted in the efforts and energy of the community members that hold us to the climate leadership goals we set for ourselves. Community members initiated the Climate Emergency Declaration, which is the foundation for this document. The community helped to develop the Flagstaff Carbon Neutrality Plan and will be integral in achieving Flagstaff's climate goals.

This document represents Flagstaff's hopeful, ambitious, and necessary approach to climate action. It is Flagstaff's contribution to the international effort to restore a safe climate, protect the earth's diversity of culture and life, and prioritize vulnerable communities. This Plan outlines fifteen target areas and accompanying strategies to proactively reduce emissions, build a stronger community, and prepare for coming change.

We take on this work with the knowledge that climate change will challenge Flagstaff and will negatively affect Flagstaff's vulnerable community members, including low-income families, communities of color, and the elderly. Equity and climate justice will be foundational elements of our work, to avoid harm to underserved groups and to ensure the benefits of climate action are fairly distributed.

The path to carbon neutrality will require leadership, bold action, perseverance and creativity. Each step closer to carbon neutrality offers hope for a healthy, prosperous, and equitable future for the Flagstaff community—and the world.

We invite all community members to remain involved as we work to achieve the goals of this Plan. Community voices will be needed to assist in our efforts – to create creative partnerships, to bring more residents into the conversation, to ensure we act equitably, and to help us remain accountable to our goals. Residents can receive assistance in home energy retrofits, join a neighborhood clean-up, review our greenhouse gas emissions reports, or learn how to talk to their neighbors about climate change. Find out more ways to get involved at www.flagstaff.az.gov/CNP.

In partnership,

The Flagstaff City Council

KEY TERMS

Climate terms used throughout this Plan are defined below to clarify their meaning in the context of Flagstaff's work.

The fundamentals of climate action:

- **Climate change:** A shift in long-term, average weather patterns fueled by increased greenhouse gas emissions into the atmosphere. Globally, climate change is leading to increased temperatures and instability in the atmosphere, causing extreme weather events like drought, rising sea levels, and catastrophic wildfires.
- **Greenhouse gas emissions**: Greenhouse gas (GHG) emissions include carbon dioxide, methane, nitrous oxide, and fluorinated gases that are released into the atmosphere naturally or through human activities. The increased concentration of GHG emissions in the atmosphere causes climate change. GHG emissions are often standardized and reported in metric tons of carbon dioxide equivalent (MT CO2E).
- **Carbon neutrality**: A state where an entity has achieved a net zero GHG emissions footprint. This is achieved by balancing every ton of human-caused GHG emissions produced with an equivalent amount of GHG emissions removed from the atmosphere, on an annual basis.

There are three central objectives of climate action:

- **Adaptation**: Actions that increase the ability to withstand, respond to, or cope with climate change impacts.
- **Mitigation**: Actions that decrease GHG emissions, which cause climate change.
- **Equity**: The just distribution of the benefits of climate protection and alleviation of unequal burdens created by climate change.

These terms represent growing areas of climate action:

- **Carbon dioxide removal (CDR)**: Refers to techniques and processes that remove carbon dioxide from the atmosphere.
- **Clean electricity**: Electricity generated from sources that do not produce GHG emissions.
- **Fuel switching**: Converting appliances, machines, and systems that rely on fossil fuels like natural gas, oil, or coal to another power source. This includes electrification, which is switching fuels to electricity.
- **Electric mobility**: The use of modes of transportation that are fueled by electricity instead of fossil fuels, including electric buses, electric bikes, small electric devices like scooters and hoverboards (electric micro-mobility), and electric vehicles (EVs).
- **Resilience**: The capacity of a community, business, or natural environment to prevent, withstand, respond to, and recover from a disruption.

I. TAKING ACTION

Climate change, accelerated by human-caused greenhouse gas emissions, is disrupting global weather patterns and threatening communities across the world. While climate shifts have occurred in the past, current climate change is happening at a faster rate than any recorded in history. If the increasing amount of greenhouse gases in the atmosphere is not reduced, life as we understand it will be altered irreversibly. On June 23, 2020, the Flagstaff City Council declared a climate emergency, calling on each of us to do all we can to protect the earth's diversity of culture and life. See page 153 for a copy of the Climate Emergency Declaration.

The Flagstaff Carbon Neutrality Plan (**the Plan**) establishes a vision for how Flagstaff will create a carbon-neutral future. Achieving this goal will require reducing our greenhouse gas emissions through drastic shifts in how we heat and power our buildings, travel from place to place, and manage our waste. These shifts must occur at multiple levels within our community, as well as across the state, our country, and the world. This Plan includes fifteen target areas for reducing our community's emissions, each with specific strategies to guide Flagstaff's work. This Plan replaces the 2018 Flagstaff Climate Action and Adaptation Plan (CAAP) and builds upon its goals of adaptation and equity.

Climate action can create a stronger Flagstaff and reduce the negative economic, social and environmental costs of climate change – reducing the amount of global warming will pay dividends for generations. Yet our work to reduce emissions and prepare for change isn't just about avoiding costs – it is about improving life here in Flagstaff. Climate action can have co-benefits ranging from lower home energy costs and air that's easier to breathe, to healthier forests, neighbors who can rely on each other, and more enjoyable ways to get to work.

The voice of the Flagstaff community will provide critical guidance to the City of Flagstaff as we work together to reach carbon neutrality. The path to carbon neutrality will not be easy: it will require perseverance and creativity. Yet each step closer to carbon neutrality offers hope for a healthier, safer, and more prosperous future for the Flagstaff community—and the world.

VISION FOR THE FUTURE

The Flagstaff community takes ambitious action to reduce greenhouse gas emissions and build community resilience, resulting in a higher quality of life for all residents. This transformation involves the entire community, is supported by collaborations with regional and tribal partners, provides opportunities, and centers disproportionately impacted communities in an equitable transition towards carbon neutrality.

Overarching Goals

Goal One: **Achieve carbon neutrality by 2030.**

Flagstaff will arrive at carbon neutrality, also known as net-zero community greenhouse gas emissions, by 2030. Carbon neutrality will be achieved through a combination of emissions reductions and carbon dioxide removal (CDR) initiatives. For more information on carbon neutrality, see the Approach Chapter starting on page 18.

Mitigation target: Reduce greenhouse gas emissions by 44% by 2030, from the business-as-usual emissions projection.

Flagstaff will reduce greenhouse gas emissions as much as possible: this Plan aims to reduce Flagstaff's annual community emissions by 44% compared to the business as usual (BAU) scenario - our predicted emissions if we took no climate action.

Carbon dioxide removal (CDR) target: Balance any remaining greenhouse gas emissions with carbon dioxide removal, to achieve carbon neutrality by 2030.

To achieve carbon neutrality, we will measure the emissions produced each year by the Flagstaff community on an annual basis, and then balance those emissions with an equivalent amount of carbon dioxide removal (CDR). In 2030, Flagstaff will need to remove approximately 471,000 tons of carbon dioxide from the atmosphere – equivalent to our 2030 emissions.

Goal Two: **Prepare Flagstaff's communities, systems, and resources to be more resilient to climate change impacts.**

Climate changes have already taken place in northern Arizona; natural and societal shifts will continue to occur. The Flagstaff community must begin to respond to climate change through adaptation, or preparing for change and strengthening our community's social, economic, and infrastructure systems. Adaptation actions will ensure Flagstaff is better equipped for and can thrive amidst both short-term disruptions and long-term change.

Goal Three: **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.**

Climate change disproportionally impacts certain communities like older adults, people of color and low-income neighborhoods. As we act, we must consider how both climate change and climate action can affect people differently. The City of Flagstaff will center equity in its climate action decisions to ensure all communities in Flagstaff can benefit from a carbon neutral future.

Our Path to Carbon Neutrality

To reach carbon neutrality, we will take action in 15 target areas, grouped into four priorities:

Neighborhoods

- Community Resilience
- Equitable Systems
- Decreased Dependence on Cars
- Housing for All
- Inclusive Recreation

Energy

- Electric Mobility
- Clean Electricity
- Building Fuel Switching

Consumption

- Reduced Building Energy Use
- Sustainable Consumption
- Water Security

Commitments

- Healthy Forests and Open Spaces
- Health and Safety
- Economic Prosperity
- Carbon Dioxide Removal

TARGET AREAS AND STRATEGIES

Flagstaff will achieve carbon neutrality by taking action in the following target areas, which are detailed starting on page 47.

- Community Resilience
- Equitable Systems
- Decreased Dependence on Cars
- Housing for All
- Inclusive Recreation
- Electric Mobility
- Clean Electricity
- Building Fuel Switching
- Reduced Building Energy Use
- Sustainable Consumption
- Water Security
- Healthy Forests and Open Spaces
- Health and Safety
- Economic Prosperity
- Carbon Dioxide Removal

1. PRIORITY ONE: WE WILL STRENGTHEN OUR NEIGHBORHOODS

Community resilience

- **CR-1** Ensure all mitigation actions improve Flagstaff's ability to adapt to the future.
- **CR-2** Strengthen existing community systems to create resilience to both short-term shocks and long-term change.

Equitable systems

- **ES-1** Incorporate equity as a foundational element of every climate action the City develops and implements.
- **ES-2** Proactively engage community members on an ongoing basis.
- **ES-3** Design targeted climate policies and programs to serve disproportionately impacted communities first.
- **ES-4** Actively seek to recognize past harms, repair trust, and build deeper relationships with community members.

Decreased Dependence on Cars

- **DD-1** Encourage vibrancy, appropriate density, and attainability in existing neighborhoods, so that more residents live within walking distance of their daily needs.
- **DD-2** Create inclusive networks for walking and biking that are continuous, attractive, safe, comprehensive, and convenient for people of all ages.
- **DD-3** Encourage Flagstaff residents and visitors to walk, bike, roll and take the bus.
- **DD-4** Transform transportation policies and planning to incorporate greenhouse gas emissions analysis and reduce dependence on driving.
- **DD-5** Invest in comprehensive and equitable transit.
- **DD-6** Proactively invest to protect Flagstaff's clean air status.

Housing for All

- **HA-1** Create housing options for households at all income levels and family sizes occupied by local residents.
- **HA-2** Connect people to equitable housing solutions.
- **HA-3** Preserve affordable housing.
- **HA-4** Protect people from housing discrimination and remove housing barriers.

Inclusive Recreation

- **IR-1** Protect natural areas and ecosystem services that are most vulnerable to the impacts of increased visitation and climate change.
- **IR-2** Ensure equity, accessibility, and inclusion across all City of Flagstaff Parks and Recreation facilities, helping all members of the Flagstaff community to meet their health and wellness needs.
- **IR-3** Plan for changes to recreation, reduce emissions, and respond to the impacts of climate change on current Parks and Recreation facilities and operations.

2. PRIORITY TWO: WE WILL CLEAN OUR ENERGY SOURCES

Electric Mobility

- **EM-1** Advance the electrification of buses across Flagstaff.
- **EM-2** Welcome electric micro-mobility devices as legitimate, healthy, affordable, and low-carbon modes of transportation.
- **EM-3** Support residents, businesses, and institutions in the transition to electric vehicles.

Clean electricity

- **CE-1** Produce 100% renewable electricity to cover all City of Flagstaff municipal electricity needs.
- **CE-2** Increase renewable energy installations and usage in new buildings.
- **CE-3** Support solar installations on existing residential and commercial buildings.

Building Fuel Switching

- **FS-1** Reduce or remove natural gas usage in municipal buildings
- **FS-2** Encourage new buildings to rely on the electric grid as their main energy source.
- **FS-3** Support fuel switching in existing residential and commercial buildings.
- **FS-4** Provide training and education on fuel switching.

3. PRIORITY THREE: WE WILL MANAGE OUR CONSUMPTION

Reduced Building Energy Use

- **BE-1** Achieve net zero energy City of Flagstaff facilities.
- **BE-2** By 2030, require new homes in Flagstaff to be net zero energy homes.
- **BE-3** Reduce energy use in existing buildings.

Sustainable Consumption

- **SC-1** Manage emissions from the Cinder Lake Landfill.
- **SC-2** Encourage sustainable consumption.
- **SC-3** Divert more waste from the landfill.
- **SC-4** Reduce organic waste going to the landfill and reduce food insecurity.

Water Security

- **WS-1** Improve water infrastructure and expand water reuse.
- **WS-2** Improve ecosystem management for protection of water resources.
- **WS-3** Continue to support water conservation efforts across the Flagstaff community.
- **WS-4** Maximize passive and active community rainwater infiltration.

4. PRIORITY FOUR: WE WILL UPHOLD OUR COMMITMENTS

Healthy Forests and Open Spaces

- **HF-1** Protect existing forests, resources, and meaningful open spaces.
- **HF-2** Restore and maintain the natural fire-adapted structure and pattern of the forests of the greater Flagstaff region through collaboration with partners.
- **HF-3** Educate the public on forest health and wildfire risk reduction.
- **HF-4** Support innovation in the forest health and wildland fire sectors.
- **HF-5** Encourage diverse native plant ecosystems in the built environment.
- **HF-6** Proactively manage for expected ecosystem transitions, including the potential threats to ponderosa pine forests.

Health and Safety

- **HS-1** Identify community health impacts from climate change and target support to assist at-risk populations in adapting to change and protecting their health.
- **HS-2** Prepare for changing risks to public health due to climate change and increase collaborations across agencies to improve health and climate awareness, preparedness, and resilience.
- **HS-3** Adequately fund services for disaster preparedness.
- **HS-4** Improve the resilience of public infrastructure and City facilities.

Economic Prosperity

- **EP-1** Accelerate the transformation to a low-carbon economy that minimizes emissions and spurs innovation.
- **EP-2** Support the adaptation efforts of local businesses as the climate changes and the economic landscape shifts.

Carbon Dioxide Removal

- **CD-1** Develop a portfolio of local and regional carbon dioxide removal initiatives to meet Flagstaff's commitment to carbon neutrality.
- **CD-2** If local carbon dioxide removal projects are insufficient, obtain high-quality carbon offsets and CO2 Removal Certificates (CORCs).

THE PATH TO CARBON NEUTRALITY STARTS WITH A 44% REDUCTION IN EMISSIONS

Achieving carbon neutrality involves two core actions:

- First, a community must reduce emissions as much as possible,
- and then balance the remaining emissions with carbon dioxide removal.

The City's carbon neutrality strategy starts with significant emissions reductions. Without action, we project that the Flagstaff community will produce approximately 846,000 metric tons of greenhouse gas emissions in 2030 – this is called the **business-as-usual scenario**. **The strategies and outcomes envisioned by this Plan will lead to a 44% reduction in emissions** compared to the business-as-usual scenario. While this reduction is significant, our community will still produce an estimated 471,000 tons of greenhouse gasses in 2030 (MTCO2e).

To achieve carbon neutrality, Flagstaff will need to pursue carbon dioxide removal initiatives at an equivalent scale. If 471,000 tons of greenhouse gasses are still produced over the course of a year, then 471,000 tons will need to be removed.

The two graphs below, Figures 1 and 2, display these emission reductions in different ways. This Plan uses 2016 as the 'base year' for its greenhouse gas emissions inventory – it is the benchmark against which the City compares current and future emissions. This Plan also uses the business-as-usual scenario to set goals and targets. For updated greenhouse gas emissions inventory for Flagstaff's emissions, see page 156.

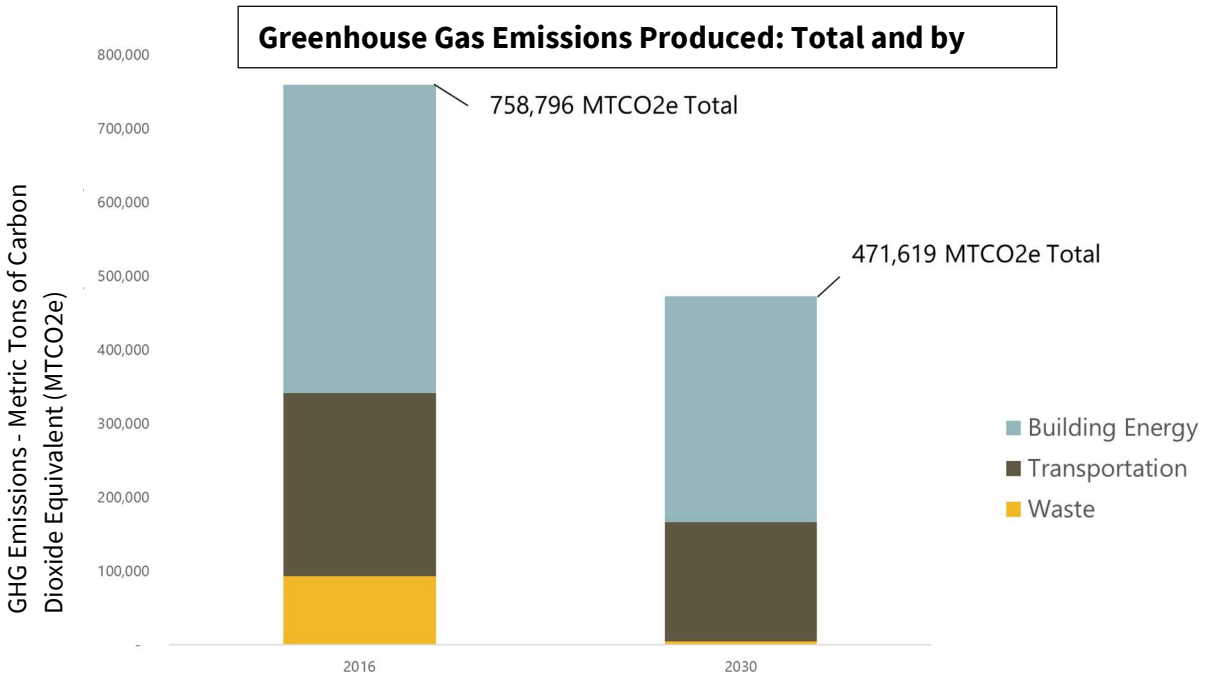
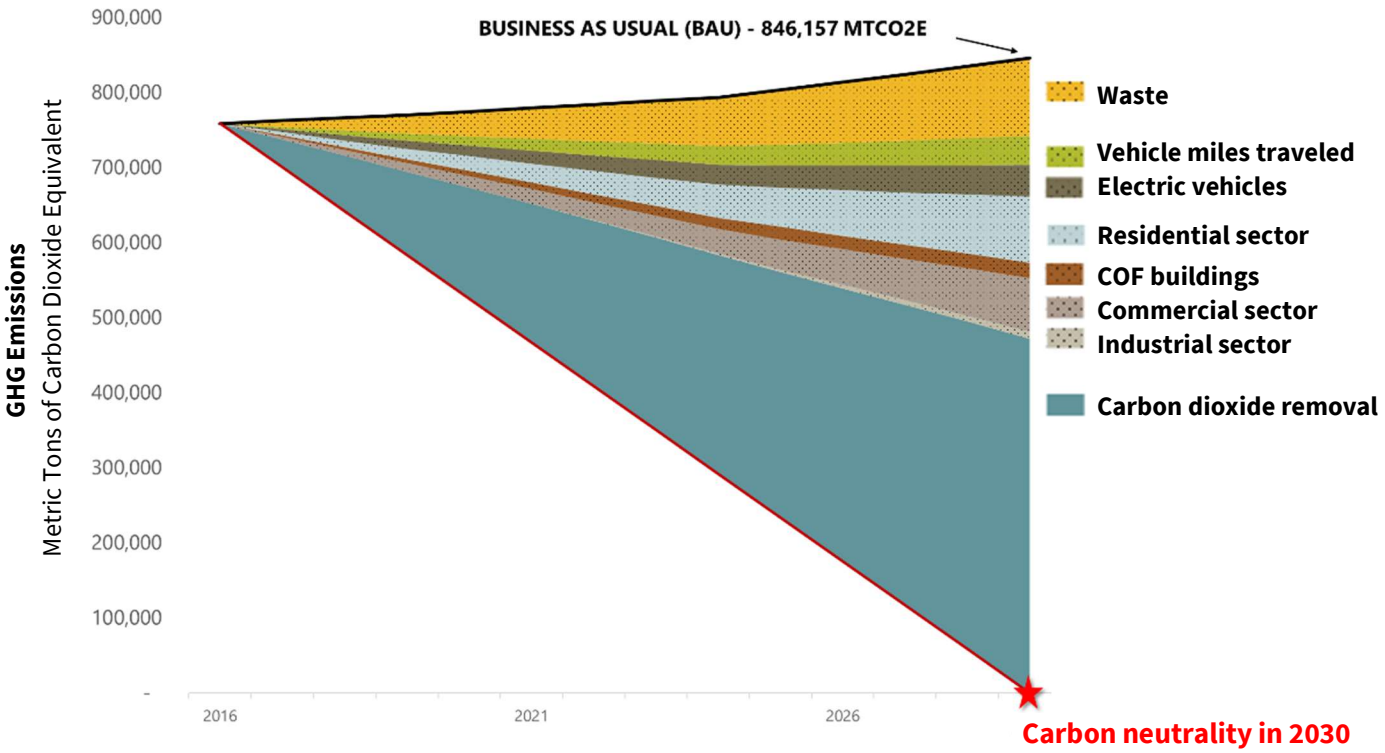


Figure 1: Remaining emissions still produced in 2016 (measured) and 2030 (projected). This bar graph only considers the emissions produced and does not consider the net impact that carbon dioxide removal (CDR) initiatives would have.



Reductions from waste
Flaring and diversion

Reductions in vehicle miles traveled (VMT)
Maintain 2019 VMT levels

Reductions from electric vehicles
30% of vehicle miles will come from electric vehicles

Reductions from residential sector
43% reductions in total energy use. 62% reduction in emissions from natural gas. 72% of electricity is zero-emissions.

Reductions from COF Buildings
28% from reductions in total energy use. 60% reduction in emissions from natural gas. 100% renewable electricity.

Reductions from commercial sector
11% reduction in total energy use. 20% reduction in emissions from natural gas. 69% of electricity is zero-emissions.

Reductions from industrial sector
68% of electricity is zero-emissions.

Carbon dioxide removal
471,619 MTCO2e

Figure 2: Wedge graphic of carbon neutrality. This graph shows the emissions reductions and carbon dioxide removal required to achieve net-zero emissions by 2030.

GETTING TO NET-ZERO: KEY SHIFTS TO REACH CARBON NEUTRALITY

Flagstaff needs to commit to substantive change in our community to reach carbon neutrality. We will need to collectively and individually take big and bold actions on an aggressive timeline. The table below describes some of the outcomes Flagstaff will need to reach.

Significant reductions in the miles we travel by passenger vehicles	- Vehicle **Miles Traveled (VMT).** Hold internal VMT measured steady at 2019 levels, even amidst community growth. Internal VMT = trips that start and end within the Flagstaff community.
	- 30% of our internal VMT will be in **electric vehicles** (or have zero tailpipe emissions).
Rapid solar energy development	- **2,000 new home solar systems** are installed by 2030 - **15 Megawatts (MW) of new solar** on commercial and industrial buildings/lots
Extensive building retrofits and electrification	- **Retrofit ~50% of existing homes** (12,500 total residential retrofits) to reduce energy use and electrify homes. - 25% of all commercial buildings get a **deep energy efficiency retrofit**. - 15% of commercial buildings **fully electrify**.
City of Flagstaff: Renewable energy + energy use	- **100% renewable electricity** for the municipality by 2025. - Energy efficiency and fuel switching in **municipal buildings**.
Low-impact new buildings	- By 2030, ensure new buildings use **net-zero energy**, meaning they contribute to the creation of as much energy as they use.
Carbon dioxide removal	Removing approximately 471,000 tons of carbon dioxide from the atmosphere per year by developing and supporting a **portfolio of carbon dioxide removal initiatives.** Potential projects include biomass, bioenergy or biochar initiatives on City land and Open Space.

For a progress update on these key outcomes, see www.Flagstaff.AZ.Gov/CNP.

What is a megawatt?

A megawatt is how we measure large amounts of power. One megawatt (MW) = 1,000,000 watts. For reference an LED lightbulb uses about 8 watts. A typical home rooftop solar system is about 5 kilowatt (kW) in size. One MW is equivalent to 200 typical home systems. The solar array at the Flagstaff City Hall is 150 kW in size – so to get 15 MW we would need about 100 additional systems of this size.

About this Plan

What this Plan does

This Plan will guide the City of Flagstaff as it works to achieve carbon neutrality and respond to the climate emergency.

This Plan sets a vision, overarching goals, and specific strategies to reach carbon neutrality and other elements of Flagstaff's Climate Emergency Declaration. This Plan will guide the City of Flagstaff's decisions about policies, funding, investments, and program development.

This Plan is also a communication tool, to help Flagstaff community members understand the City's goals, strategies, and potential actions. This Plan identifies areas for action by individuals, opportunities for collaboration with businesses, and how these issues are interconnected.

The science is clear

As the climate changes, Flagstaff will continue to experience warmer temperatures, an increase in aridity or dryness, lower snowpack levels, and increased wildfire risk.

These changes will have cascading impacts on Flagstaff's natural environment, residents, and community systems. Just a few of the impacts include:

- The forests surrounding Flagstaff will become drier and more stressed, increasing their vulnerability to severe wildfire and disease.
- Visitation and tourism to Flagstaff will change. Snow in winter will become less predictable, and the Phoenix metro area will see increasingly extreme summer temperatures. This will have impacts on Flagstaff's economy, infrastructure, housing systems, and land use.
- Flagstaff will experience more days with temperatures above 90 degrees, increased allergens, and more days with poor air quality due to smoke, negatively impacting residents with health vulnerabilities.

All Flagstaff residents will need to adapt to these and other changes. Some changes will bring opportunity and others will bring challenges, particularly for disproportionately impacted community members like older adults, families with low incomes, or communities of color.

For more information on the anticipated changes to Flagstaff's climate and resulting impacts on its community: See Appendix A of this document, or find even more detail in the Flagstaff Climate Profile, available through the City of Flagstaff Climate website: www.flagstaff.az.gov/climate.

Systemic change versus individual action

In conversations about climate action, there tends to be extensive conversation around the value of systemic and individual change. This Plan utilizes both! As a municipality, the City of Flagstaff works on systemic, structural changes to decrease greenhouse gas emissions and improve quality of life. However, these systemic changes help make individual action easier! Think about transportation, for example. If you live in a walkable neighborhood, you're more likely to leave your car at home, since the system and infrastructure is set up for you to make that choice more easily. Systemic change and individual action are not mutually exclusive. Instead, they complement and support one another.

How this document relates to the 2018 Climate Action and Adaptation Plan

The Flagstaff Carbon Neutrality Plan builds on progress of the 2018 Climate Action and Adaptation Plan – also known as the CAAP.

The 2018 CAAP was developed over a year and a half of community conversations to create the first climate plan for Flagstaff. It was adopted unanimously, and was the first community-wide climate plan in Arizona. It established broad goals for reducing emissions, preparing for change, and ensuring that we act equitably, prioritizing our most disproportionately impacted community members.

The 2018 CAAP aligned with the best available science that formed the foundation for the Paris Climate Agreement. One month before the CAAP adoption, the Intergovernmental Panel on Climate Change (IPCC) published a report: Global Warming of 1.5° C, stating that urgent action was needed across the globe to hold warming to 1.5° C, which is equal to 2.7° F. When the Flagstaff City Council adopted the CAAP in late 2018, the CAAP acknowledged that this was a first step and that community conversations around this IPCC report were needed.

When adopted in 2021, the Carbon Neutrality Plan focused on mitigation and updating the greenhouse gas emissions goals of the 2018 CAAP. In December 2022, the Carbon Neutrality Plan was revised to incorporate the adaptation-related target areas of the 2018 CAAP. The following target areas were updated and migrated from the 2018 CAAP to this Carbon Neutrality Plan:

- Inclusive Recreation
- Water Security
- Healthy Forests and Open Spaces
- Health and Safety
- Economic Prosperity

As a result of the December 2022 revision, the Carbon Neutrality Plan represents Flagstaff's current mitigation, adaptation and equity goals. The 2018 CAAP is no longer a current document needed for reference purposes.

How this document relates to the Flagstaff Regional Plan 2030

The Flagstaff Carbon Neutrality Plan supports the vision, goals, objectives and policies of the Flagstaff Regional Plan 2030: Place Matters (Regional Plan). The Regional Plan sets forth a vision for a Sustainable Flagstaff, connecting development decisions to environmental impact and the need to plan for the future. It envisions active stewardship and vitality for both the current population and future generations – ideals that are supported by reducing greenhouse gas emissions, resilience-building and support for marginalized community members. This document builds upon the climate change and adaptation goals originally outlined in the Regional Plan.

- Major Amendment to the Regional Plan for carbon neutrality

In December 2021, the Flagstaff City Council adopted a major amendment to the climate change and adaptation goals and policies of the Flagstaff Regional Plan 2030 – revising pages IV-11, IV-12, and X-19. This amendment aligned the Regional Plan climate action section with the Flagstaff Carbon Neutrality Plan, closing the 'ambition gap' between the Regional Plan's broad goal of reducing greenhouse gasses and this Plan's commitment to carbon neutrality. The revised climate change and adaptation goals and policies of the Regional Plan are:

Goal E&C.2. Achieve carbon neutrality for the Flagstaff community by 2030.

- Policy E&C.2.1. Encourage the reduction of energy and material consumption.
- Policy E&C.2.2. Promote investments that create a connected and efficient community, decrease emissions from transportation and building energy, and strengthen climate resiliency.
- Policy E&C.2.3. Review and revise existing regulations, standards, and plans (codes, ordinances, etc.) to reduce community greenhouse gas emissions.
- Policy E&C 2.4. Promote developments that help the community achieve carbon neutrality through strategies that reduce the project's emissions from transportation, energy, and consumption.

Goal E&C.3. Prepare Flagstaff's community systems and resources to be more resilient to climate change impacts, and 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.

- Policy E&C.3.1. Develop and implement a comprehensive and proactive approach to prepare the community for and to minimize the impacts of climate change induced hazards.
- Policy E&C.3.2. Review and revise existing regulations, standards, and plans (codes, ordinances, etc.) to reduce the community's vulnerability to climate change impacts and reduce the disproportionate impacts on vulnerable communities.

- Policy E&C.3.3. Invest in forest health and watershed protection measures.
- Policy E&C.3.4. Increase the region's preparedness for extreme climate events.
- Policy E&C.3.5. Improve the ability of vulnerable community members to adapt and thrive amidst the pressures of climate change.
- Policy E&C.3.6. Attempt to equitably distribute the burdens and benefits of climate action policies and investments to all segments of the community.

Goal E&C.4. Integrate available science into policies governing the use and conservation of Flagstaff's natural resources.

- Policy E&C.4.1. Assess vulnerabilities and risks of Flagstaff's natural resources in the context of anticipated climate changes and resulting changes to Flagstaff's systems.
- Policy E&C.4.2. Develop water use policies that attempt to integrate current best projections of climate change effects on the Colorado Plateau's water resources and emphasize conservation.

- Support for other Regional Plan goals and policies

This document also furthers many other goals of the Regional Plan, such as but not limited to:

- 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 connected places.
- 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 NH.3. Make available a variety of housing types at different price points, to provide housing opportunity for all economic sectors.
- 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 systems, where feasible, to serve as an attractive alternative to single-occupant vehicles.

The Flagstaff Carbon Neutrality Plan will also inform potential priority areas for the next update to the regional plan.

II. OUR APPROACH

This document is a framework for action; it outlines broad strategies for how to achieve carbon neutrality. The principles below illustrate the approach the City will take as it works within the community to achieve its carbon neutrality goals.

OUR WORK IS INFORMED BY THE FOLLOWING PRINCIPLES:

Carbon neutrality is:

- 1. Community-driven
- 2. Motivated by urgency
- 3. Prescriptive
- 4. A commitment to accountability
- 5. An investment in our future
- 6. Supported by market leaders

Flagstaff will:

- 7. Be a leader
- 8. Embrace the Big Shift
- 9. Balance community tensions and create opportunities
- 10. Center equity and adaptation

Climate action in Flagstaff will:

- 11. Produce co-benefits
- 12. Rely on partnerships
- 13. Prioritize incentives
- 14. Iterate and adapt continuously

Carbon neutrality is …

- **Community-driven**
- **Motivated by urgency**
- **Prescriptive**
- **A commitment to accountability**
- **An investment in our future**
- **Supported by market leaders**

1. CARBON NEUTRAILTY IS COMMUNITY-DRIVEN

On September 20th, 2019, Flagstaff community members gathered on the City Hall lawn for the Global Climate Strike. At the gathering, community activists and organizers gathered signatures for a citizen petition, calling on Flagstaff City Council to declare a climate emergency. This Citizen Petition was submitted to the City Council on September 24th, 2019. Hundreds of Flagstaff community members organized into coalitions from farmers and doctors to students and grandparents. At the January 28th, 2020 City Council Meeting, they provided over three hours of public comment requesting a Climate Emergency Declaration and urgent action. On June 23rd, 2020, the Flagstaff City Council unanimously adopted the Climate Emergency Declaration.

Community organizers and residents led the creation of the Climate Emergency Declaration, and their involvement has continued throughout the development process. This Plan was created based on technical analysis, best practices from peer cities, and feedback from Flagstaff community members. A Steering Committee of community members was formed to guide Plan development and incorporate resident voices from the start.

Over the course of 10 months in 2020 and 2021, more than 2,500 residents engaged and contributed to the development of this Plan. Community members contributed to six surveys, attended 12 virtual open house forums, and contributed videos for the Climate Emergency Open House website. City staff made 50 carbon neutrality presentations to City Commissions and community groups. Community partners played an integral role in advising the Plan and inviting their networks to provide input.

2. CARBON NEUTRALITY IS DRIVEN BY URGENCY

The climate emergency is causing change in Flagstaff today and threatens to cause catastrophic events across the world in the coming decades. Urgent and bold action is necessary to take advantage of a small window of opportunity to avoid the worst effects of irreversible climate change. The IPCC's Special Report: Global Warming of 1.5°C states that limiting warming to 1.5 degrees Celsius (which equal to 2.7 degrees Fahrenheit), compared to 2 degrees Celsius, will allow 10 million people to avoid the health impacts of sea level rise, save the world approximately $30 trillion in damages, and avoid up to 2,000 heat-related deaths annually.

The severe impacts of climate change and the need to keep global warming below 1.5°C was a vital driving principle behind the June 2020 Climate Emergency Declaration, available on page 153.

Local governments are first responders to the climate emergency, like most other emergencies. Thus, local governments across the world have a responsibility to prepare for this looming threat, to reduce the potential harm, and to protect disproportionately impacted communities.

Like other emergencies, action must be swift, decisive, collaborative, and effective, while being rooted in community values and priorities.

3. CARBON NEUTRALITY IS PRESCRIPTIVE

To restore a safe climate for future generations, communities across the world must drastically reduce the amount of fossil fuels used in buildings, transportation, and consumption. Within the United States, getting to carbon neutrality looks similar across all cities undertaking this goal, and relies on several common strategies:

- Reducing the energy we use for buildings, transportation and consumption.
- Creating energy from renewable and clean sources.
- Switching buildings and vehicles to run on clean electricity or other renewable sources.

In this way, carbon neutrality is prescriptive: there is an agreed upon course of action to achieve the emission reductions necessary. These actions may be re-packaged or reframed from city to city, but the necessary high-level strategies are known. Flagstaff is no different – the necessary actions are pre-determined by where our emissions come from. We still rely on national best practices to dramatically reduce emissions from our buildings, transportation, and consumption.

Because there are only minor deviations from the standard pathway to achieve carbon neutrality, Flagstaff's actions will be similar to all other cities striving for carbon neutrality. There is still ample opportunity for creativity and innovation in *how* Flagstaff achieves these goals: policies and programs will be developed to meet Flagstaff's unique characteristics, population, economic drivers and climate.

4. CARBON NEUTRALITY REQUIRES ACCOUNTABILITY

Carbon neutrality is a framework of accountability. To be carbon neutral, each year we will measure the emissions produced by the Flagstaff community – those we were not able to avoid through emissions reductions (mitigation). We must then remove an equal amount of carbon dioxide from the atmosphere in order to arrive at carbon neutrality, or net-zero emissions.

In this way, the carbon neutrality framework has a built-in accountability feature: regardless of the City's success at reducing emissions, the City can still meet the goal of carbon neutrality through carbon dioxide removal (CDR). The City must use a combination of emissions reductions and carbon dioxide removal to get to net-zero emissions, balancing both sides of the scale, as seen below in Figure 3. If we fail to meet our emissions reduction goals, then our removal obligation will increase proportionately. Similarly, if we exceed our emissions reduction goals, then our removal obligation will decrease. Read more about our plans for CDR on page 147.

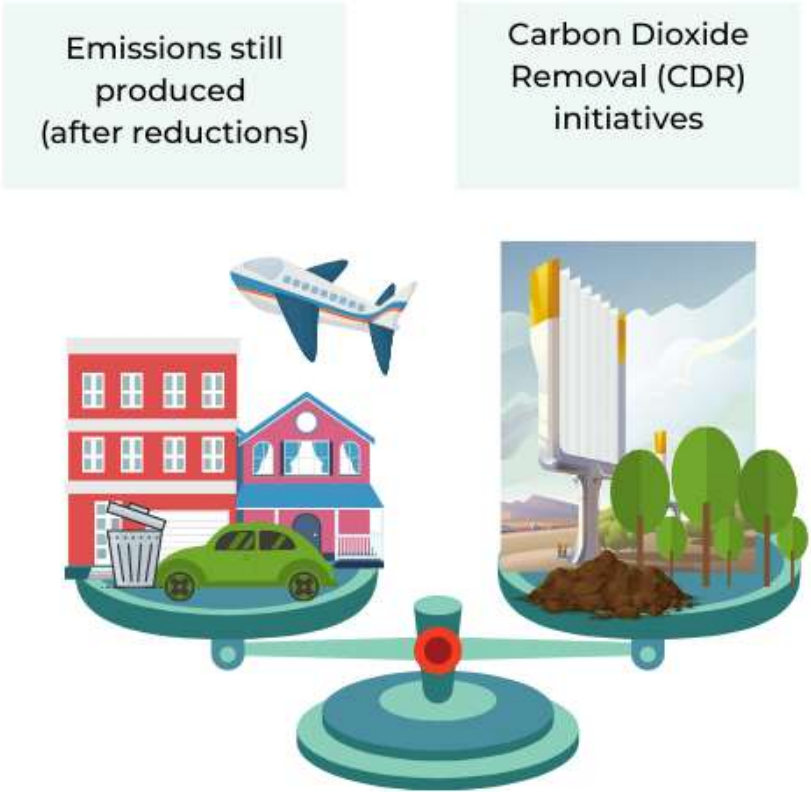


Figure 3. The two sides of the carbon neutrality scale: On the left side are the remaining emissions still produced (after reductions). On the right side is carbon dioxide removal. The two sides of the scale must balance out to achieve carbon neutrality. (Note: the mechanical tree illustration on right side of scale is courtesy of the Arizona State University Center for Negative Carbon Emissions.)

5. CARBON NEUTRALITY IS AN INVESTMENT IN OUR FUTURE

Taking climate action and avoiding the worst impacts of climate change makes sense economically and morally. Action is far less expensive and far more beneficial than inaction. Like forest health measures taken to avoid catastrophic wildfire, climate action is an investment in our future.

> In Flagstaff, forest protection provides a sobering example of the need for preparation: The 2010 Schultz wildfire and post-fire flooding had a total impact between $133 and $147 million.[1] By comparison, the phase one of the Flagstaff Watershed Protection Project (FWPP) required a $10 million investment from Flagstaff residents. This down payment on forest health will help Flagstaff avoid high-severity fires that could cause devastating flooding, and is projected to help the Flagstaff area avoid between an estimated $573 million and $1.2 billion in damages.[2]

Just as individuals prepare for retirement, climate action takes intentional preparation. It is said that the best time to start investing for retirement is 15 years ago, and the next best time is now. Like retirement, it may be helpful to approach the spending that will be required on climate action with an investment mindset. Investments require spending, but they also produce returns and benefits. The earlier someone starts investing, the easier and less expensive it will be for them to meet their retirement goals. The longer someone delays investing, the more difficult and expensive it becomes.

Investments in climate action are no different, and these investments produce returns for ourselves and future generations. The 2019 UN Gap Report shows that if governments worldwide had started 10 years ago, we could have made relatively modest and gradual investments to achieve annual emissions reductions of just 3.3%. Figures 4 and 5 show the reductions required based on different action timeframes.

Because of our collective delay, the necessary investments will need to be more significant and rapid to achieve the annual global reductions of over 7.6% per year that are now required.[3] That trend only continues with further delay. Indeed, one recent study concluded that if the U.S. starts investing now in efforts to reach net-zero emissions by 2050, the total spending required would be nearly half as much compared to delaying our investments until 2030.[4] When it comes to making investments to achieve goals, the amount of time remaining can be either the greatest asset or biggest liability. There may still be enough time to meet our climate stabilization and adaptation goals, but only if we accelerate our ambition and start making the necessary investment contributions.

It is said that an ounce of prevention is worth a pound of cure. Part of the investment mindset is evaluating both the cost of action as well as the cost of inaction. Choosing to avoid oil changes only appears to save a

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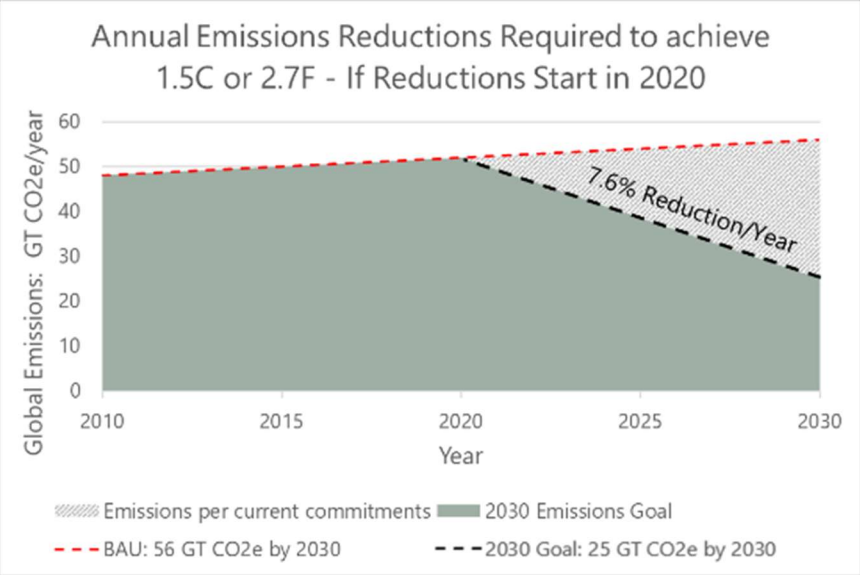
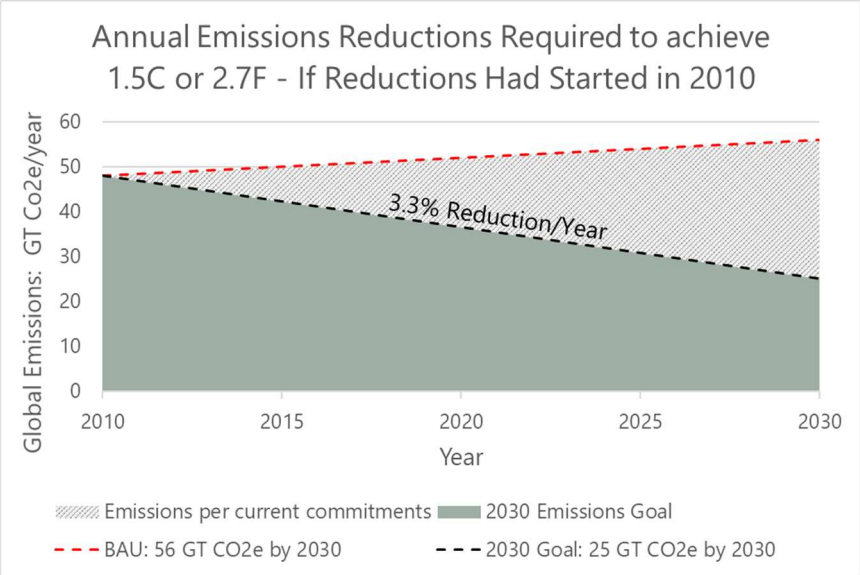
[1] Full Cost Accounting of the 2010 Schultz Fire: http://openknowledge.nau.edu/1282/1/Combrink_EtAl_2013_ERIWhitePaper_SchultzFullCostAccounting.pdf
[2] The Cost of Inaction: Flagstaff Watershed Protection Project Cost Avoidance Study: https://arizonastatelawjournal.org/wp-content/uploads/2016/04/Fox_Final.pdf
[3] https://www.unep.org/interactive/emissions-gap-report/2019/
[4] https://energyinnovation.org/wp-content/uploads/2021/01/Cost_of_Delay.pdf





Figures 4 and 5: Depictions of the worldwide greenhouse gas reductions needed to achieve 1.5C (2.7F). Graphs reproduced from 2019 UN Gap Report Interactive Dashboard

car owner money until their engine seizes. Likewise, avoiding investments in climate action only gives the appearance of saving money until it clearly, irreversibly, and perhaps quite suddenly, doesn't. While there is a high level of uncertainty about what the exact cost of the required level of climate action will be on a global scale, there is a high level of agreement that **the risks and cost of inaction will be far greater**.[5] This consensus on the cost of inaction comes despite the fact that there are many externalities that economic models often struggle to measure (See the Social Cost of Carbon section on page 44). The City's Climate Emergency Declaration recognizes that the time to invest in our future is now.

[5] https://policyintegrity.org/files/publications/Economic_Consensus_on_Climate.pdf

6. CARBON NEUTRALITY IS SUPPORTED BY MARKET LEADERS

The market is moving towards climate action. Private companies and institutions across the world are acting based on scientific data to protect their investments and ensure their own financial health into the future. Climate action can represent a financial opportunity – from electric cars to solar systems, new companies have already made a global impact and large profits from providing climate solutions.

Market conditions are changing quickly, and the cost of climate action is falling as investment ramps up. Solar panel technology represents a telling example. Investments and advancements have caused the price of solar to fall 82% from 2010 to 2018.[6] Just ten years ago, we could not have anticipated that solar would now be the least expensive form of energy in history, according to the International Energy Agency.[7]

Technology is rapidly advancing in electric vehicles, home electrification, and carbon dioxide removal, too. The market will assist in climate action in these areas, bringing down the cost of beneficial technologies that make climate-friendly investments the obvious choice, simply on short term return on investment scenarios.

These market trends have three central implications for this Plan:

- Advances in technology will continue to bring down costs for climate action, resulting in savings for governments, businesses, and residents.
- Developing cost estimates for strong climate action has significant uncertainty, due to the rapidly changing market conditions. Action may not be as expensive as it looks today, and it will certainly be less expensive than inaction.
- This Plan must be flexible to adapt to the changing market conditions and take advantage of new technology.

The global move towards climate action in the private sector will create opportunities for the City of Flagstaff and its residents. The City of Flagstaff will be ready to partner with local, regional and national businesses in taking climate action.

[6] https://www.pv-magazine.com/2018/01/13/8th-irena-assembly-report-finds-utility-scale-solar-lcoe-falls-73-since-2010/
[7] https://webstore.iea.org/world-energy-outlook-2020

Flagstaff will…

- **Be a leader**
- **Embrace the Big Shift**
- **Balance community tensions and create opportunities**
- **Center equity and adaptation**

7. FLAGSTAFF WILL BE A LEADER

Although climate change is one of the more important challenges the world has ever faced, the international community has not taken necessary action. Due to inaction, climate change will cause coastline loss, crop failure, mass migration, and famine. The consequences for the world's poor are dire.

Leadership is needed both worldwide and in Flagstaff. Flagstaff is a part of the global community of cities and so Flagstaff's actions, along with the actions of every other city, contribute to the global fight against climate change.

Flagstaff will see both negative impacts and opportunity from climate change – the coming climate changes and related impacts to our community are outlined starting on Page 154. We must make the investments needed to avoid the worst scenarios of global temperature rise, while preparing for a future in a changing climate.

Leadership in climate action will require courage, bold action, and investment to ensure a safe future. Leaders are needed throughout the Flagstaff community: we need leaders in the business sector, within regional public agencies, among developers, throughout our neighborhood organizations, and in our schools.

In 2021, examples of leadership could be found both near and far:

- In April 2021, **the federal government** established a goal to reduce greenhouse gas emissions from 2005 levels by 50% to 52% by 2030 – a goal that is strongly aligned with this Plan's mitigation goal. This goal reflects the need for urgent action and the benefits of acting on climate. It also provides significant opportunity for local governments who are ready to partner with the federal government to develop programs with local benefits.
- **Businesses** are reading the same reports, coming to the same conclusions, urging governments to set align their targets with the urgency that is needed this decade, and committing to climate action and investment themselves.
- The **We Mean Business coalition**, comprised of over 1,776 companies that "recognize the transition to a zero-carbon economy is the only way to secure sustainable economic growth and prosperity for all," sent an open letter to the Biden administration supporting the 50 to 52% reduction by 2030 goals, calling the target "ambitious and attainable."
- Over 1,300 businesses and investors joined 165 local and tribal governments, including Flagstaff, as part of the **America is All In** campaign to support the same national targets.

- **Arizona Public Service (APS)**, which is Flagstaff's electric utility company, has committed to transitioning to a 100% carbon-free electric grid by 2050. Salt River Project (SRP) recently committed to doubling its renewable electricity capacity by 2050, driven by demand from business customers.
- **Arizona Forward** has membership from over 150 public and private organizations across the state that recognize the need to "address the increasingly harmful climate impacts and shape Arizona's long-term future… This is why we focus on brining local businesses and municipalities together to work toward actionable solutions – because inaction is not an option."
- Over 545 companies have become signatories to the **Business Ambition for 1.5C** commitment.
- Numerous companies from all sectors of business are recognizing the need for innovation and investment in solutions this decade, to bring down the costs and bring up the volume of necessary strategies that are not yet mature. Many companies - from Stripe to Microsoft to Shopify and others - are **voluntarily putting their assets to work** to accelerate the development of these necessary technologies and approaches.
- Cities across the world are moving forward. **Tucson** recently declared a climate emergency and set a goal of carbon neutrality by 2030. **Phoenix** has a carbon neutrality goal of 2050. Over 80 U.S. cities have committed to 100% renewable energy, from Moab, Utah and Orlando, FL to St. Louis, MO, and Fayetteville, AR to Denver, CO and Norman, OK.

Flagstaff is well-positioned to lead in Arizona.

Flagstaff is on the forefront of climate action in Arizona. This leadership stance will require bold action, risk, and even discomfort as we challenge the status quo and chart new paths for small cities. Flagstaff's leadership can help to move the needle, opening the way for other communities to make strong commitments and taken aggressive action.

8. FLAGSTAFF WILL EMBRACE THE BIG SHIFT

The framework of carbon neutrality establishes the 'rules of the game' for our work. Going forward, our community and our leadership will need to continuously evaluate and determine the 'gameplan.'

As we began developing this inaugural Carbon Neutrality Plan, we asked what level of emissions reductions might be possible in Flagstaff, before relying on carbon dioxide removal initiatives. This question resulted in an initial maximum reduction scenario that suggested that Flagstaff might be able to reduce local emissions by as much as 80% if we committed to ambitious, transformative change, and if favorable supporting actions and policies were quickly implemented at the utility, State and Federal levels.

Many of the actions in this initial maximum reduction scenario might be framed as being 'technological substitutions' or 'behind the scenes' actions that are critical but not especially noticeable in terms of how they might impact someone's daily life. For example, when someone turns on the faucet and feels warm water, they cannot tell whether that water is heated by a fossil fuel like natural gas or by a clean energy source like renewable electricity. Likewise, an electric car is still a car, and the way that car functions on a

daily basis is not very different whether it is an electric vehicle (EV) or a car fueled with gasoline. These technological solutions don't cause much disruption to daily life in Flagstaff.

Other actions and outcomes in the initial maximum reduction scenario would be more noticeable, disruptive, and ultimately transformative. This sense of disruption can be especially heightened if thinking about the outcome taking effect today, overlooking the years-long transition and the supporting actions that have yet to be implemented. Many of the actions and outcomes related to the key strategy of decreasing dependence on cars are likely to be some of the most noticeable. Imagine being able to dramatically cut the total miles driven in Flagstaff while people are still able to socialize, shop, and otherwise meet all daily needs. This outcome can only be realized if we fundamentally shift our approach to neighborhood design and transportation. We would build our transportation corridors with various forms of micro-mobility as primary goal, rather than supporting the continued growth of automobile travel. We would build our neighborhoods so they are more connected and complete; people wouldn't have to travel across town as often because they can get most of what they need nearby. This would require increasing the housing options, density, and businesses or services available in and around our neighborhoods. These 'noticeable' actions that maximize local emissions reductions by changing aspects of our community design and transportation systems are what we call the "Big Shift."

This Plan involves elements of both technological substitution as well as the "Big Shift." While the initial maximum reduction scenario was deemed to be infeasible due to various constraints, this Plan envisions a 44% reduction in emissions before carbon dioxide removal. This Plan includes the goal of maintaining the same level of vehicle miles traveled (VMT) that Flagstaff drivers traveled in 2019. Historically, VMT has steadily increased over time, and given that the Flagstaff's population is expected to continue growing, flattening this metric over the next 9 years will be large undertaking that will require a new approach – The "Big Shift." **For more information on VMT and detailed actions required to make the Big Shift**, see the Decreased Dependence on Cars target area on page 57.

9. FLAGSTAFF WILL BALANCE COMMUNITY TENSIONS AND CREATE OPPORTUNITIES

Flagstaff, like other communities, faces a multitude of community challenges and competing priorities. While there are strong benefits to carbon neutrality, there are also areas where climate action goals may seem to conflict with other community priorities. To achieve carbon neutrality and create a stronger community, Flagstaff must acknowledge the tensions between issues and seek to find common ground and mutual benefit. Tensions can arise between seemingly innocuous issues – as the City searches for the best fit for lighting that achieves both dark sky preservation and energy efficiency, or as residents grapple with the need for more housing and less driving or changes to how our community looks.

The tensions between climate goals and other community priorities must be met with open dialogue, innovative thinking, and good faith that we can find creative solutions that help Flagstaff move forward a vision for a healthier, more inclusive community.

Flagstaff's housing crisis is one example of the complexity of community challenges. Affordable and additional housing in Flagstaff has been a documented need for more than 50 years and has reached a crisis level in recent years. In December 2020, the City Council declared a Housing Emergency, and set in

motion the need to make housing a leading priority for the City organization and Flagstaff community, similar to carbon neutrality. Balancing these priorities is achievable, when approached holistically.[8] In response to the Declaration of a Housing Emergency, the City developed the Flagstaff 10-year Housing Plan. See page 69 for extended information on that plan.

Diving deeper into this discussion, is building electrification. Building electrification is gaining attention as one of the most affordable and effective tools to reduce greenhouse gas emissions from homes and buildings. While electrification has promising benefits for residents, it must be pursued equitably. It will require intentional policymaking and a planned transition for Flagstaff residents to gain access to the major benefits of electrification, including cleaner air, healthier homes, good jobs and empowered workers, and greater access to affordable clean energy and energy efficiency to reduce monthly energy bills.

- Building electrification means eliminating use of fossil fuels for functions like heating and cooking and replacing gas appliances with alternatives that use electricity. In Flagstaff, 50 percent of our greenhouse gas emissions come from the buildings we live and work in. As our electric grid gets steadily cleaner, building electrification can play a big role in fighting climate change.
- Electrifying our homes also has major health benefits. Burning gas releases nitrogen oxides and particulates, which can have serious health consequences.

Building electrification must focus first and primarily on the goal of improving the health and resilience of the people rather than the goal of decarbonizing our building stock. To do so, programs that promote electrification must integrate with energy and non-energy programs alike. An equitable transition will meet people where they are. Instead of adding one more problem for families to solve, an equitable transition will position electrification as a solution to existing household difficulties —one that lowers bills, improves health, and makes homes more comfortable.

Renters Have Limited Control – In 2021, 55 percent of Flagstaff residents were renters. Even if they do not bear the direct cost of electrification, low-income renters, especially low-income renters, nevertheless face barriers to electrification because they lack the property rights to make the decisions required to electrify their homes, such as switching out water heaters, stoves, or other appliances and upgrading the building's electrical lines and panels. Even if these residents wish to live in healthier, cleaner homes, the decision to electrify their building is out of their control and is up to the property owner.

Owners Have Few Incentives to Invest When Renters Pay the Utility Bill - Improvements to energy use, like solar, energy efficiency, and building electrification, primarily produce benefits for the person paying the bills even though the cost of improvement falls to the owner. This creates a split incentive which requires countervailing incentives to correct. This effect is exacerbated by Flagstaff's ongoing housing crisis, in which the demand for housing outstrips the supply, giving landlords little incentive to make clean energy investments. Renters rightly fear that an upgrade could cause their landlords to increase their rent, or convert the property to a short-term rental that could be more lucrative for the property owner. Currently, no regulatory or statutory protections ensure that Flagstaff renters who live in building that receive energy

[8] https://greenlining.org/wp-content/uploads/2019/10/Greenlining_EquitableElectrification_Report_2019_WEB.pdf

upgrades can remain in their homes with no increased rents after the upgrades are performed, or require that rent for upgraded properties remain at a price affordable to low-income residents.

Electrification will be the most effective with a whole-systems building approach, prioritizing energy efficiency, electrification then on-site renewable energy systems.

There are no quick fixes, addressing our housing and climate emergencies require on-going collaboration, hard conversation, and collective action. See pages 117, 129, 138, and 146 for extended and topical discussions of these tensions.

10. FLAGSTAFF WILL CENTER EQUITY AND ADAPTATION

Equity and adaptation are two of the three core goals of this Plan. The importance of these principles was established in the 2018 Flagstaff Climate Action and Adaptation Plan, and their importance is maintained in our Carbon Neutrality work.

Adaptation and resilience

Adaptation refers to actions that increase the ability to withstand, respond to, or cope with climate change impacts.

As we work to reduce greenhouse gas emissions, Flagstaff must continue to prepare for climate change. Adaptation, or adapting to the changing climate and preparing for its impacts, is critical for any forward-looking organization. While we work to avoid the severe temperature changes that will cause irreversible damage to our ecosystem, we must accept that climate changes are already occurring and will continue to occur. Global action must be taken to reduce the amount the climate changes and lessen the catastrophic consequences. At this point change cannot be avoided.

For local governments, adaptation must be part of its emergency planning and hazard mitigation, its economic development forecasting, and its housing and land use planning.

For every mitigation action we take to reduce greenhouse gas emissions, the City and its partners must consider the adaptation impacts and opportunities. The City must not take actions that result in a reduced ability to adapt in the future or make it more difficult to thrive among the temperature and aridity changes that Flagstaff will see.

Adaptation is achieved by building **resilience** – strengthening community systems to create stronger networks, more connected community members, and flexible systems that are prepared for change. **This Plan will work to advance community resilience by analyzing all actions through** an adaptation lens, to ensure that the action is helping to increase resilience and will help residents thrive amidst future changes.

Specific strategies to advance adaptation are discussed in seven resilience-focused target areas:

- **Community Resilience** – page 50
- **Housing for All** – page 69
- **Inclusive Recreation** – page 76
- **Water Security** – page 111
- **Healthy Forests and Open Spaces** – page 119
- **Health and Safety** – page 130
- **Economic Prosperity** – page 139

Community Equity

The City of Flagstaff seeks to serve community members equitably through all of its work in the Flagstaff community, from ensuring children from low-income families can access recreational programming to filling gaps in the sidewalk network to serve more residents. Because climate change will cause such disproportionate impacts to underserved community members, it is even more important to act equitably.

Equity is defined as the just distribution of the benefits of climate protection and alleviation of unequal burdens created by climate change.

Climate change affects people differently. While all populations are at risk of being impacted by climate change, certain groups are more impacted than others. Factors that influence climate vulnerability include:

- Age
- Education level
- Gender and sexual orientation
- Health, ability, and disability
- Immigration Status
- Language abilities
- Level of housing security
- Neighborhood or physical location
- Race and ethnicity
- Social ties
- Socioeconomic status and income
- Technology and internet access
- Working conditions, including exposure to the elements

Inequity in our society means that some individuals are better able to respond to change or stressors than others. Currently, different groups in Flagstaff have different levels of resilience, or ability to withstand challenges like a power outage, school closure, or a medical emergency. One's financial security, housing security, social network, job flexibility, or access to internet might impact their ability to adjust to changes in circumstances. Already, low-income residents, communities of color, and Indigenous individuals disproportionately experience environmental harm and health impacts from pollution. Existing advantages

and disadvantages will be exacerbated by the stresses, hazards and long-term shifts that result from climate change.

While Flagstaff takes action to reduce emissions and prepare for climate change, it must consider disproportionately impacted communities and pre-existing inequities. Flagstaff must ensure that those most at risk are protected and avoid negative impacts that would increase inequities. Flagstaff must also ensure that the benefits of climate action are equitably distributed across all groups, and that all groups can access climate programs. The City will work to advance community equity by analyzing all actions through an equity lens.

Specific strategies to ensure equity are detailed in the Equitable Systems target area. See page 56 for more information.

Relationships among the three goals

The three overarching goals of this Plan - mitigation, adaptation, and equity - are deeply interconnected. Since the framework of carbon neutrality is specific and quantitative in nature, attention to the numeric mitigation impacts has been spotlighted. However, the focus on mitigation to satisfy the quantitative framework should not overshadow these other goals.

In many cases, actions that reduce emissions often have adaptation and equity co-benefits. This can be particularly apparent when mitigation actions serve disadvantaged communities first while also increasing individual, family, and community resilience. For example, a large-scale effort to retrofit homes of low-income residents has the following benefits:

- Reduced energy demand, leading to reduced emissions (**mitigation**),
- Increased resilience of the homes, the community, and the energy infrastructure to withstand shocks (**adaptation**), and
- Improvements in affordability for the occupants, through greater comfort and lower monthly operating expenses of the homes (**equity**).

Home retrofits offer obvious benefits for all three goals. However, some mitigation actions offer few adaptation and equity co-benefits. These actions, with minimal benefits to adaptation and equity, should be given less emphasis and fewer resources. For example, transitioning to electric vehicles (EV) is a piece of the puzzle for lower emissions from transportation. However, too strong an emphasis on supporting EV adoption by individuals can be a distraction from more impactful, equitable strategies that would be accessible to the larger community and not only those who can afford a new electric car. Rather than thinking about how to subsidize getting another car on the road, electric or not, the City's focus and resources should prioritize transforming our community with infrastructure and policy to support biking, walking, public transit, and other forms of micro-mobility. This guidance is reflected in the framing and actions within this Plan's Target Areas related to transportation: Decreased Dependence on Cars and Electric Mobility.

The goals of equity and adaptation were used to evaluate all proposed mitigation strategies; actions with a high level of co-benefits will receive greater emphasis and more resources in Plan implementation. Going forward, this Plan will be reviewed by an Equity Advisory Working Group, as will every subsequent annual update.

Climate action in Flagstaff will:

- **Produce co-benefits**
- **Rely on partnerships**
- **Prioritize incentives**
- **Iterate and adapt continuously**

11. CLIMATE ACTION IN FLAGSTAFF WILL PRODUCE CO-BENEFITS

In addition to reducing our emissions, carbon neutrality can lead to healthier air quality, more secure water resources, more accessible and affordable transportation options, and a more diverse and robust economy. A carbon neutral city is one where neighbors help neighbors, people have multiple options for getting around town, and families have access to clean air and healthy homes.

Climate action has extensive co-benefits that can improve quality of life in Flagstaff and strengthen our community. During Plan implementation, the City will prioritize actions that have multiple co-benefits, from resilience and equity to return on investment and improvements in health.

The table below describes some potential benefits of climate action:

Mitigation action	Benefits
A new FUTS path	Low-emissions ways to get to work Healthy ways to travel to the store or to see friends New opportunities for socializing and meeting neighbors
Energy efficiency retrofit in a local office building	Lower emissions from heating space and water Reduced energy costs Healthier indoor air quality
A new community garden	Lower emissions food Access to healthy and delicious food Mental, social and physical health improvement opportunities for neighborhood residents
Reduced parking requirements in a new apartment building	Less space dedicated to parking, leading to decreased stormwater impacts and increased walkability Reduced vehicle miles traveled Lower total cost of the apartment building construction, leading to lower cost of housing De-coupling of rent and parking fees, so that renters who do not need parking don't have to pay for it

12. CLIMATE ACTION IN FLAGSTAFF WILL RELY ON PARTNERSHIPS

This Plan illustrates what the City of Flagstaff will do to reach carbon neutrality. However, the City will not be able to achieve its goals without collaborating with residents, businesses, and organizations. The City will create high-quality and high-impact support for businesses and residents as we move towards carbon neutrality. Local, regional, federal, and state partnerships are necessary to move Flagstaff forward.

- The City will engage residents and partner with community organizations to change behavior and develop creative local projects, to complement work on systemic shifts and policy change.
- While this Plan's strategies focus on actions the City can take, it highlights areas where legislative change is needed, and where community engagement can lead to positive climate and resilience impacts. The City looks forward to working with the state legislature to capitalize on opportunities for action, investment and benefits for all of Arizona.
- The Federal Government will be an important partner in climate action. The U.S. Government has set a goal to reduce greenhouse gas emissions by 50% by 2030 and to achieve 100% renewable energy by 2035.[9] Due to this Plan and its carbon neutrality goal, the City will be well-positioned to take advantage of federal programming and opportunities for investment.
- Regulatory organizations will also play a key role in shifting energy sources from natural resources (e.g., coal, oil, natural gas) to renewable and more sustainable options (e.g., solar, wind, hydroelectric, electric).
- Local businesses will be perhaps the City's most important partners when transforming our systems. Climate action creates jobs, and local companies can assist with taking rapid action. Examples of projects already creating jobs in Flagstaff include home weatherization, appliance electrification, rooftop solar installations and native landscaping projects. Larger opportunities might include infrastructure improvements to prepare for increased flooding, innovations in forest products, new bike trails and pedestrian crossings, and net zero building construction.

Flagstaff's Regional Institutions are Taking Climate Action

Climate action is a team sport. In 2022, leading institutions across Flagstaff made commitments to climate action or initiated climate planning processes.

- In April 2022, **Northern Arizona University** established a commitment to achieve carbon neutrality by 2030. NAU buildings contribute to more than 10% of Flagstaff's building-sector emissions, and so NAU's efforts to reduce its emissions from campus operations and buildings will make it much easier for Flagstaff to achieve its goals.
- **Coconino County** has set an intention to develop a climate action and adaptation plan for the county.
- **Flagstaff Unified School District** will establish climate goals, a greenhouse gas emissions reduction target, and energy efficiency standards for new projects.

[9] https://www.reuters.com/business/sustainable-business/exclusive-white-house-pushing-80-clean-us-power-grid-by-2030-2021-04-26/

These climate commitments by pillars of our community will facilitate the achievement of Flagstaff's climate goals. Because of this leadership by our regional institutions, the City of Flagstaff will be able to focus funding and efforts on harder-to-decarbonize sectors like home retrofits, business support, and transportation.

The City of Flagstaff is working closely with these institutions to support their emerging climate action efforts. City staff serve on our partners' climate action committees, provide technical support, and share data and best practices. The City will continue to support our partners throughout each entities' climate action evolution and will work in lock step with them to capitalize on efficiencies, integrate efforts and encourage further community-wide climate leadership.

Climate Action Among Flagstaff Businesses

Economic health is an important aspect of climate action, and so collaboration with local businesses will be vital in implementing this Plan. City staff will provide support to businesses in decreasing their greenhouse gas emissions and adapting to expected climate changes, as well as creating a Business and Climate Working Group to improve communication between local businesses and the Sustainability Section, to ensure that the Section is appropriately providing support for local businesses.

Businesses across Flagstaff are taking climate action, and seeing results both in operational savings, community support and revenue. A few examples:

- Flagstaff is home to operations and retail locations of several national corporations that have goals to significantly reduce greenhouse gas emissions. Purina has corporate goals to achieve net-zero greenhouse gas emissions by 2050. REI and Walmart are part of the We Mean Business coalition working to reach net zero emissions by 2050, referenced on page 34.
- Rooftop Solar and Prometheus Solar, local Flagstaff companies, were selected by the Northern Arizona Solar Co-op to install solar for more than 80 households across Flagstaff, Sedona, and Coconino County. In partnership with the City, the Northern Arizona Coop was organized through Solar United Neighbors, a non-profit organization that seeks to increase the access and affordability of solar energy.
- Hotels across Flagstaff are taking climate action. The Flagstaff Drury Inn & Suites is the first LEED-certified hotel in Arizona. The DoubleTree by Hilton Flagstaff has already seen significant energy, water and waste savings from its environmental initiatives; Hilton , the global hospitality company, has committed to cutting its environmental impact in half by 2030, including a 60% reduction in emissions by 2030.
- W.L. Gore & Associates, a large Flagstaff employer, has set a corporate goal to reduce their greenhouse gas (GHG) emissions from manufacturing sites and offices by 60% 2030, and work towards carbon neutrality by 2050.

These are just a few examples of the many Flagstaff businesses working to reduce their impact and create climate solutions.

The City will work to partner with local businesses to learn about barriers and opportunities, and help them to ramp up their climate action efforts. The City will encourage businesses, institutions and even individual households to set their own carbon neutrality goals and create plans for how to get to net zero GHG

emissions. The City can lend support, share resources, create connections to help share lessons learned opportunities, and highlight success stories. A carbon neutral Flagstaff will be a community effort, buoyed by the efforts of residents, businesses and organizations all working on their own carbon neutral journeys.

13. CLIMATE ACTION IN FLAGSTAFF WILL PRIORITIZE EDUCATION AND INCENTIVES

The City of Flagstaff will not be able to reach carbon neutrality alone – as discussed elsewhere in this document, many actors are needed to reach our climate goals. The City will seek to encourage behavior change like it works to shape behaviors in many different areas, from water conservation to courteous driving to recycling and shoveling snow off sidewalks. The City supports community oriented behavior through multiple approaches – from, encouragement campaigns on social media, educational events, to incentives and mandated codes.

The City will fist provide educational resources, incentives, and behavior change programs to encourage community members to take climate action. In some instances, it may make sense to set minimum standards that provide wide community benefits, through City codes or ordinances. The City's pursuit of carbon neutrality will use education and incentives as a first step towards behavior change whenever possible.

Residential energy use provides an instructive example. Currently, the City works to reduce emissions and expenses from residential energy use through a multi-pronged approach:

- Encouragement via social media and public events.
- Education through tips and resources on the City's energy web site.
- Support through the free Home Energy Efficiency workshop series, which is offered both live and at-your own pace, and in both English and Spanish, and provides attendees with a free bag of supplies to make small changes in their own homes.
- Incentives for energy efficient appliance upgrades via the Home Energy Retrofit Rebate Program.
- Minimum energy efficiency standards through building codes for new buildings.

The City will use this multi-pronged model to develop programs that help residents and businesses reduce their emissions, relying first on education, engagement, and incentives to facilitate action and behavior change. When larger scale changes are needed that provide significant benefits to health, safety and welfare and build a stronger Flagstaff, the City will look to code changes and ordinances.

14. CLIMATE ACTION IN FLAGSTAFF WILL ITERATE AND ADAPT CONTINUOUSLY

The climate emergency is an evolving state, with the possibility for new challenges and opportunities. The pace of change is accelerating, and technologies are rapidly advancing. The coming years will see improved batteries and new approaches to carbon sequestration. Changes in federal and state policies can be expected, as well as shifts in markets and significant cost reductions. Conditions on the ground are changing as well: Flagstaff's monsoons are more variable, wildfire patterns are shifting, and our community is adjusting as housing, employment opportunities and tourism evolve.

Accordingly, the Carbon Neutrality Plan must be a **living document** – grounded in core principles but flexible in its approach. To reflect changing conditions and an expanding knowledge base, the Plan is a framework for action, not a detailed list of exact actions that the City of Flagstaff will take. This framework provides the broad strategies the City will undertake to achieve carbon neutrality: the strategies of decreasing dependence on cars and using clean electricity, for instance, illustrate the general direction that Flagstaff must go.

Achieving the target of climate stabilization has often been compared to the Moonshot target of the 1960s, though with considerably higher stakes. Similar to this effort, there was less than a decade to act and when President Kennedy declared in 1962 that "we choose to go to the moon this decade and do the other things…" Similar to this effort, when Kennedy made his speech it was acknowledged that "To be sure, we are behind, and will be behind for some time in manned flight. But we do not intend to stay behind, and in this decade, we shall make up and move ahead." Nobody at the time could say *exactly* how the goal would be achieved – it was known that we would need to learn things that were at the time unknown, that a preliminary plan would be developed but that the plan would need to constantly evolve. And while it may not have been known *exactly* how we would get there, setting and committing to the goal spurred the action, innovation and investment that was necessary to make it happen.

How will this living document work?

- The City will continuously work with the community during Plan implementation. There will be a continuous loop for feedback, development, refinement, and adjustment. City staff will regularly communicate with the City Council, the Flagstaff community, and local organizations to provide updates on our work and solicit feedback.
- This Plan will be available in an online format for easy review of its strategies and actions.
- This Plan will be updated on an annual basis to allow for shifts in tactics, capitalizing on new technologies, opportunities and creative partnerships to meet the City's goals. This annual process will provide for increased transparency so the public is informed of how the City's actions are evolving and can provide feedback to influence the City's work. Note: This document was updated in December 2022, as part of the inaugural revision process.

Carbon neutrality is a goal that will involve creativity, learning, and leadership, in addition to continual adjustment to adapt to new obstacles and opportunities. The City will keep the community involved in this iterative process, through regular communications, community conversations to assess priorities and address tensions, and annual reporting.

III. IMPLEMENTATION

IN THIS CHAPTER:

1. Flagstaff's mobilization will be guided by the Climate Emergency Declaration
2. Priority action steps: years one through three
3. City of flagstaff actions needed
4. Advancing state policy
5. Community actions
6. Community engagement and education
7. Accountability
8. Funding

FLAGSTAFF'S MOBILIZATION IS GUIDED BY THE CLIMATE EMERGENCY DECLARATION

The Climate Emergency Declaration outlines the following priorities for the mobilization of resources. These priorities will guide the implementation of this Plan.

The City of Flagstaff will:

- Dramatically increase its **ambition** to combat climate change through **bold action.**
- Ensure this mobilization effort is City-wide, spanning all sectors of the Flagstaff **economy and community.**
- **Prioritize appropriate funding** for the implementation of climate goals and action.
- **Engage and educate** our residents about the current climate emergency and inspiring action, **especially Flagstaff's youth**.
- **Strive for full community participation and leadership** by residents of Flagstaff, community organizations and other allies.
- Keep the concerns of **vulnerable and historically underserved communities** central to all climate emergency mobilization efforts and facilitate their active participation in this work.
- Develop and reinforce **respectful collaborations** with surrounding Tribal nations, traditional agricultural communities, regional governments, the State of Arizona, and the U.S. Government.
- Prioritize adaptation and mitigation **in all City decision-making processes**.
- Prioritize the creation of **high-quality, good-paying jobs** with comprehensive benefits for those who will be impacted by this transition.

PRIORITY ACTION STEPS: YEARS ONE THROUGH THREE

Below are initial action steps to implement this Plan.

Items that are bolded have received funding. Items with an asterisk (*) are items that have been applied for funding. The implementation of other actions will depend on funding and policy decisions in the next year.

Target Area	Initial action steps
Community Resilience	Expand the Flagstaff HEPA Purifier Program
	Expand the Resilient Neighborhoods Network
	Incorporate of adaptation elements into the CNP
	Support community-led resilience project through the Neighborhood Sustainability Microgrant Program
Equitable Systems	Launch a wood stove rebate program*
	Launch youth Advisory Committee
	Launch Equity Advisory Committee
	City leadership racial equity trainings
Decreased Dependence on Cars	**Adopt and implement the Active Transportation Master Plan**
	Launch the protected bike lane pilot
	Improve City of Flagstaff codes and regulations to allow for more infill housing and greater density
	Analyze and update City of Flagstaff street engineering standards to consider how street design affects travel choices and contribute to greenhouse gas (GHG) emissions
	Analyze and update the City of Flagstaff traffic impact analysis process to incorporate consideration of GHG emissions and transportation demand management analysis
	Policy changes to remove barriers and incentivize accessory dwelling units (ADUs)
	Analyze and reduce or remove parking requirements
	Adopt and implement the 2021-2031 Flagstaff Housing Plan
	Adopt an air quality protection ordinance for idling and loading zones
Electric Mobility	Facilitate an E-bike collective purchasing cooperative
	Launch new micro-mobility share program
	Provide 14 new EV charging stations at City of Flagstaff facilities
	Adopt a City of Flagstaff electric vehicle procurement policy
	Complete an audit of City of Flagstaff policies

Clean Electricity	**Facilitate a solar panel purchasing co-op for businesses and residents**
	Install solar and battery back-up power microgrids for Flagstaff fire stations*
	Develop and install a solar project at Red Gap Ranch
Fuel switching	Develop a building electrification information hub website
	Provide electrification incentives for homes and businesses
	Highlight businesses and residents successfully electrifying buildings
Reduced Building Energy Use	Launch a residential energy efficiency retrofit incentives*
	Refine and expand the residential energy rebate program
	Provide small business energy efficiency building retrofit incentives
	Launch a Building Code Advisory Group
	Complete an energy audit of City of Flagstaff buildings
	Implement energy retrofits and conservation projects identified by the energy audit
	Update the Sustainable Building Resolution for City of Flagstaff buildings
	Implement a City of Flagstaff electricity rate optimization program
Sustainable Consumption	**Launch the pay as you throw recycling and trash collection pilot**
	Launch Community compost drop-off pilot
	Expand the Neighborhood Sustainability Grant program
	Transition the Materials Recovery Facility (MRF) to a transfer station
Carbon Dioxide Removal	Carbon dioxide removal feasibility analysis
	Develop or support a pilot carbon dioxide removal project in Northern Arizona
Partnerships	Launch a Business Sector Advisory Committee
	Finalize the new NAU Climate Action Plan
	Design and deliver business support tools to assist with advancing climate action
	Recognize local businesses showing climate leadership
Internal City of Flagstaff actions	Develop and encourage a City of Flagstaff Remote Work Policy
	Develop a long-term investment plan for carbon neutrality goals and avoided cost for City Council consideration
	Consider developing a climate bond for voter approval

CITY OF FLAGSTAFF ACTION NEEDED

Flagstaff City Council

The success of this Plan is contingent on the Flagstaff City Council continuing to demonstrate leadership on climate action. Plan implementation also relies on continued public support for climate action.

The Flagstaff City Council will have oversight responsibility for this Plan. They will receive annual updates on Plan progress and make policy decisions, budgetary appropriations, and workplan approvals that will facilitate implementation.

Actions specific to the Flagstaff City Council include:

- Identify goals for the upcoming City Council term that will support Plan implementation.
- Identify City Council budget priorities to support Plan implementation.
- Identify state and federal legislative priorities that support the goals of the Plan and enable implementation of Plan strategies and actions.
- Create policies that reflect the ambition, urgency and need for transformative change required by Flagstaff's Climate Emergency Declaration and its carbon neutrality goal.
- Provide leadership in community conversations around the tensions among competing priorities. See the discussion of balancing tensions on Page 27.

City Leadership

For a city to achieve carbon neutrality, it is critical that every part of the municipal organization is involved in implementation. Leaders at the City of Flagstaff—from the City Manager's Office to division directors and individual supervisors—must proactively consider climate action when conducting City operations.

The City Manager's Office will actively support the Council's climate commitment by requiring the involvement of all City divisions in Plan implementation. Opportunities to incorporate climate action into internal decision-making processes include:

- The budget process
- Procurement decisions
- Division strategic planning
- Facility management

ADVANCING STATE POLICY

The Biden administration has committed to a historically ambitious climate agenda. This will likely result in a profound shift in U.S. federal climate policy, exemplified by the Inflation Reduction Act passed in 2022 – the single largest investment in climate action in U.S. This shift is critical, as it is not possible to address the climate challenge without federal leadership, and time is running out to avert catastrophic levels of global warming.

At the same time, state-level climate action will remain essential. History has shown that even an engaged U.S. federal government faces obstacles to progressive regulatory and legislative action. In the face of federal gridlock and inaction, state and local governments have played a crucial role in advancing climate action, reducing greenhouse gas emissions, and supporting the continued maturation of key low-carbon technologies.

Greater collaboration across Arizona is needed in order to advance local and federal climate commitments. The City will continue its work with Arizona cities and tribes to develop state-wide climate policies that ensure equitable access to resources, clean energy, climate related quality jobs, healthier air quality, more secure water resources, affordable transportation options, and a more diverse and robust economy.

COMMUNITY ACTION, ENGAGEMENT AND EDUCATION

Community organizing, leadership, activism and enthusiasm led to the Climate Emergency Declaration. Sustained community energy and action will be needed to achieve carbon neutrality in an equitable manner to build a stronger Flagstaff.

This Plan outlines actions that the City of Flagstaff will take to reach carbon neutrality. However, carbon neutrality will require transformational change across our community, and City actions alone will not be sufficient. Action by residents across the community will also be needed. To reach more people, the City will encourage and provide resources for those who are working in their own businesses, schools, and neighborhoods to take climate action as our community works to reach carbon neutrality. The City of Flagstaff will work with many different parties to encourage, support, and activate all segments of the Flagstaff community to take individual, daily actions that contribute to the goals of reducing community greenhouse gas (GHG) emissions, and increasing community resilience and equity.

The City will work with community partners to build capacity and encourage climate action in the community on a daily basis, through social media platforms, events, community conversations, volunteer opportunities, and training. Distinctive opportunities for action include:

- **Highlights of Climate Leaders**: The City will raise up local businesses, schools, and organizations that are taking climate action and developing their own plans to reach carbon neutrality. The City will support those who want to take climate action by providing resources and areas of action.

- **Ideas for Action**: The City will provide information to residents on the best ways to get involved in carbon neutrality. The City will provide extensive information on actions such as: electrifying home appliances, taking trips without personal vehicles, completing energy efficiency retrofits, and decreasing the amount of trash sent to the landfill.
- **Climate Education**: The City will continue designing and providing climate change curriculum for teachers to encourage youth participation in climate action. Additionally, the City will continue to provide and enhance climate-oriented educational programs, building off of the existing Home Energy Efficiency 1010 workshop, the Flagstaff Climate Ambassadors training, and the Sustainability Leaders program.

ACCOUNTABILITY

Accountability will be ensured through consistent and transparent reporting to the community and the Sustainability Commission, which will monitor implementation progress.

A living document

This section presents a structure for ongoing monitoring, evaluation and reporting on Plan progress. Investing in data collection and consistent reporting increases transparency and is a key aspect of implementation. City staff will regularly track and report on Plan indicators, greenhouse gas emissions and notable progress on implementing strategies.

Reporting

The City of Flagstaff has been annually monitoring and reporting both municipal and community greenhouse gas emissions since 2008. These inventories provide insight into Flagstaff's progress and trends in emissions. The City will continue to update the municipal and community greenhouse gas inventories on an annual basis.

Regular reporting will ensure transparency and continued progress. City staff will measure progress on key performance indicators and report to the community regularly. On an annual basis, the City Manager will request that City staff produce a Plan progress report that includes:

- Progress of each Plan strategy.
- Key performance indicator updates, including an annual greenhouse gas inventory.

Evaluation

The Flagstaff City Council and the Sustainability Commission will evaluate the progress of Plan implementation on an annual basis through review of the annual Carbon Neutrality Plan progress report. Informal progress reports will be provided by City Staff at regular Sustainability Commission meetings.

The Social Cost of Carbon

As discussed within the Climate Change in Flagstaff section (page 154), the recent acceleration of climate change is largely attributed to burning fossils fuels and the subsequent release of greenhouse gases into Earth's atmosphere. Climate change poses severe adverse long-term consequences for all sectors of society, including but not limited to disruption of the food supply, higher societal expense for human health, and broad environmental degradation. The damages caused by emitting greenhouse gases are not reflected in the price of fossil fuels or the products powered by them, thus creating externalities, or impacts that are external to any accounting within the economic system.

Climate change is a market failure that burdens society with the costs associated with greenhouse gas emissions while the benefits are accrued by those burning fossils fuels, including the City of Flagstaff. In order to address and correct this market failure, the social cost of carbon (SCC) can be utilized by the City. The social cost of carbon is an estimate, in dollars, of the damages that would result from emitting one additional ton of greenhouse gases into the atmosphere. The SCC puts the effects of climate change into economic terms to help policymakers and other decision-makers understand the economic impacts of decisions that would increase or decrease emissions. Emissions-related damages are expected to occur many decades into the future. However, those damages must be represented using present-day dollar values. The SCC therefore represents the present value of future harm, and the estimated dollar value must be discounted through a specific discount rate.

The City of Flagstaff can incorporate the SCC into its practices to better account for environmental and social concerns when making financial decisions. The prevailing trend for cities and states that move to consider and account for their greenhouse gas emissions is to incorporate a proxy carbon price into their decision making. A proxy carbon price includes the SCC as a hypothetical cost within large, highly-carbon intensive financial decisions. This shadow price will help the City identify and prioritize low carbon production methods, which ideally will become more cost-effective over time. If greenhouse gas emissions were priced to reflect their total cost to society, economic efficiency could be reached through the profit-maximizing behaviors of emitters and consumers. The proxy carbon price would also help the City of Flagstaff ensure that long-lived projects and procurements would become increasingly "future-proof" when it comes to potential future carbon legislation. By considering the social cost of carbon through a proxy carbon price, the City can future-proof their investments against future carbon prices, save money across the lifecycle, avoid locking in long-term emissions, alleviate the burdens of greenhouse gases placed unfairly onto society, and send a clear signal that the City takes efficiency and GHG emissions seriously.

FUNDING

Financial investments are necessary for Flagstaff to reach carbon neutrality. Investing in climate action throughout Flagstaff has many benefits, financial and otherwise. The benefits of adaptation include the costs we avoid by reducing or averting the negative local impacts of climate change, while mitigation helps us avoid damage from larger changes in the climate. Climate action can also be used to strengthen local businesses, support disproportionately impacted community members, and improve quality of life.

Funding for the implementation of Plan strategies will need to come from within the City budget, agency grants, and new revenue sources. Some actions in the Plan require capital investment in City infrastructure. Others will require increases in annual operating budgets. Some actions are potential candidates for state, federal, or foundation funding.

Funding options include:

- Increases to existing City fees on certain activities, such as increasing the Environmental Management Fee.
- A new sales tax that would have to be approved by voters, similar to how Cities pay for road projects, municipal buildings, and other large city investments.
- Bonds, a mechanism for the City to pay for large infrastructure projects.
- Grants and incentives from the federal government.
- Funding from community partners, private organizations or foundations.
- Allocation of City resources to climate-focused initiatives.
- Establishment of a local emissions reduction fund, to allow individual donations to fund emissions-reducing projects.

Community investment needed

To achieve the goals of this Plan – and to secure a safe climate for future generations – the Flagstaff region will need to invest in the future of our community.

The City of Flagstaff worked with national experts in climate financing to develop this investment estimate. The financial analysis quantified funding needs and considered the following aspects for each of this Plan's major emissions reduction initiatives:

- Metric Tons
- Carbon Dioxide Equivalent (MTCO2e)
- Investment required
- Cost per MTCO2e
- Revenue expected
- Net investment
- Net investment per MTCO2e

Investments to achieve carbon neutrality	
Projected **investment** to reduce 857,039 metric tons of carbon dioxide emissions (MTCO2e)	$ 600,000,000
Projected **community benefits**	$ 622,000,000
Net community benefit	$ 22,000,000

Key considerations for this projection:

Community investment

- The investment in carbon neutrality will be supported by many actors; financial resources may come from the federal government, the City of Flagstaff, or private funding sources. Multiple funding streams will be involved in incentivizing climate action across the community**.** While this $600M figure represents an initial estimate of the cost to the City of Flagstaff, it does not presume the sources of funding (i.e. federal funds from the 2022 Inflation Reduction Act). Furthermore, this cost could decrease due to third party programs that provide resources directly to residents and businesses, or other programs that support climate action without City involvement.
- This initial estimate is likely to change as the federal and state policy landscapes change, as technologies and financing strategies advance, and as the City fine-tunes its implementation plans.
- The investment projection includes projects that achieve many other community priorities:
  - Infrastructure defined in the Active Transportation Master Plan - $200 million
  - Landfill gas capture - $12 million
  - Improved recycling and expanded composting - $20 million
  - City fleet electrification - $3 million
- Large projects with positive economic and jobs impacts comprise more than half of the investment:
  - Clean energy projects - $39 million
  - Electrification rebates and bulk buys - $105 million
  - Deep energy retrofit programs - $157 million
  - Carbon dioxide removal - $47 million
- This estimate is similar to the carbon neutrality investments envisioned by Flagstaff's peer cities. For example, Ann Arbor, Michigan's A2Zero Plan for Carbon Neutrality is estimated to cost $1,056,000,000 to reduce 2,188,950 MTCO2e. Ann Arbor's cost per MTCO2e is lower than Flagstaff's due to legal limitations in Arizona – for example, community choice aggregation is a cost-effective strategy that is not available in Arizona due to state legislation.

Community benefits

- The community benefit figure is made up of projected **fiscal benefits**, or direct financial savings. Fiscal benefits include the monthly savings on utility bills due to energy efficiency – a return on investment that benefits the City (for municipal buildings), a business, or a homeowner.
- The numbers do not include **indirect benefits** such as public health improvements, greenhouse gas emissions reductions, home safety, equity, resilience, and livability.

IV. THE PATH TO CARBON NEUTRALITY

To reach carbon neutrality, we will take action in 15 target areas:

Neighborhoods

- Community Resilience
- Equitable Systems
- Decreased Dependence on Cars
- Housing for All
- Inclusive Recreation

Energy

- Electric Mobility
- Clean Electricity
- Building Fuel Switching

Consumption

- Reduced Building Energy Use
- Sustainable Consumption
- Water Security

Commitments

- Healthy Forests and Open Spaces
- Health and Safety
- Economic Prosperity
- Carbon Dioxide Removal

ABOUT OUR TARGET AREAS

This Plan defines fifteen target areas of action to reach carbon neutrality. The first two target areas – **Community Resilience** and **Equitable Systems** - reflect overall goals that need to be incorporated into all actions outlined in this plan.

Six target areas focus on reducing emissions through *prevention*: **Decreased Dependence on Cars**, **Clean Electricity**, **Building Fuel Switching**, **Electric Mobility**, **Reduced Building Energy Use,** and **Sustainable Consumption**.

Six target areas focus on adapting to climate change and building community resilience: **Housing for All, Inclusive Recreation, Water Security, Healthy Forests and Open Spaces, Health and Safety, and Economic Prosperity**.

The last target area, **Carbon Dioxide Removal**, aims to balance community emissions by *extracting and storing* carbon dioxide from the atmosphere.

These target areas are deeply interconnected, with some even being required to unlock the power of others. We will examine these connections further in the sections that follow

Target Area Structure

Each of the target areas follow the same structure:

- A "Flagstaff will" statement, describing our vision for action in this area.
- What it means
- How we'll get there
- Equity and Adaptation Considerations
- Goals
- Strategies
- Opportunities for action: these provide examples of how the City may achieve this strategy and contribute to the target area's goals. These are provided as EXAMPLES only, to illustrate what actions to active this strategy would look like.
- Legislative change: these areas provide information about legislative policy changes needed at the state or Federal level to support the achievement of the target area goals.

PRIORITY ONE: WE WILL STRENGTHEN OUR NEIGHBORHOODS

- Community Resilience
- Equitable Systems
- Decreased Dependence on Cars
- Housing for All
- Inclusive Recreation

Community Resilience

Flagstaff will increase our ability to anticipate, accommodate, and positively adapt to and thrive amidst changing climate conditions or hazard events while enhancing quality of life, reliable systems, economic vitality, and conservation of resources.

WHAT IT MEANS

Resilience is a community's ability to thrive amidst change. It involves a community's anticipation of and preparation for changing conditions, whether that is short term stressors like a wildfire or severe weather, or longer-term changes like declines in forest health or shifts in the Flagstaff housing market. Resilience requires that communities analyze their vulnerabilities against expected or possible changes, and then proactively adapt to these changing conditions or hazards in a way that actually *enhances* quality of life and builds reliable systems and economic vitality, social cohesion, and resource conservation. Resilience is often grouped with a similar concept, adaptation.

Resilience is reflected in this Plan's overarching adaptation goal:

Goal 2: **Prepare the City's communities, systems, and resources to be more resilient to climate change impacts.**
This preparation will help the City and its residents to be better equipped and prepared to handle both short-term shocks (such as flooding or a wildfire) and long-term change (such as rising housing prices or reduced snowfall). A resilient community is one that can bounce *forward* after a challenge, not only recovering but improving on the status quo.

HOW WE'LL GET THERE

Building community resilience is a long-term process that requires assessment, investment, and relationships building within communities. The City will work in the following areas to build adaptive capacity:

- **A vulnerability analysis** will help the City better understand the extent to which climate changes will affect Flagstaff and different community groups. The City will build off of the vulnerability assessment and climate profile completed for the 2018 Climate Action and Adaptation Plan.
- **Resilience planning** will work across broad stakeholder groups to address the vulnerabilities identified in the vulnerability analysis. This will involve work across City divisions and existing Plans.
- **Education** about the impacts of climate change is a vital aspect of community resilience. The Climate Emergency Declaration calls for education of all Flagstaff residents as well as a focus on youth education around the impacts of climate change and the actions we can take as a community.

- **Community workshops** with residents and businesses can help community members to better understand Flagstaff's vulnerabilities and risks, and how they can help strengthen their homes, businesses, and neighborhoods.
- **Partnerships** strengthen our community cohesion and capacity for response. There are a variety of opportunities for partnership on resilience initiatives. Other City of Flagstaff departments, like the Fire Department and Water Conservation, will be important partners in building community resilience. Additionally, community organizations and neighborhood groups provide interaction between residents that helps foster the sense of community needed in building resilience.

The activities above will help Flagstaff build capacity, sense risks, respond to disruption, learn and transform – all elements of a resilience engineering approach proposed by Erik Hollnagel – see Figure 6 below. Flagstaff will undertake resilience-building as an ongoing project, continually adjusting as conditions change and our knowledge grows.

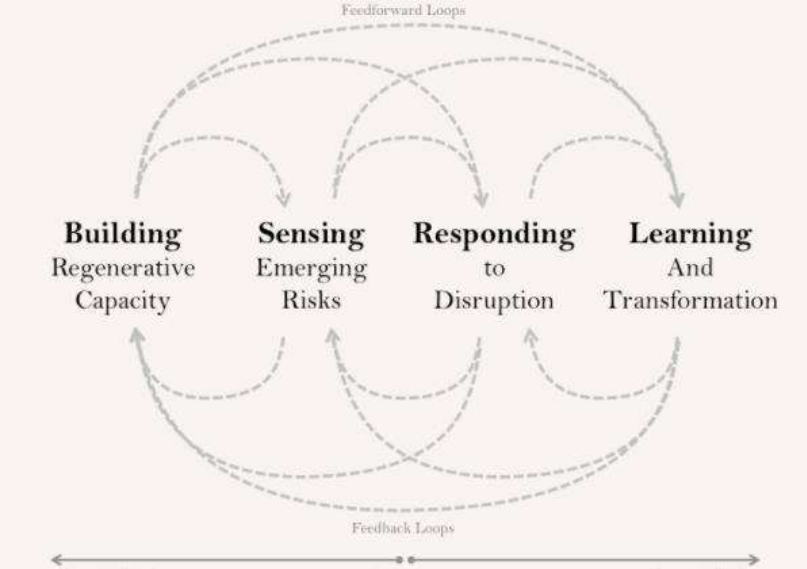


Figure 6: The feedback loops involved in resilience building. Image Credit: Erik Hollnagel

EQUITY AND ADAPTATION CONSIDERATIONS

Equity is interdependent with adaptation and resilience: an equitable community must be adaptable and resilient, in order to ensure well-being for residents through stressors and change. A resilient community must be equitable, because if some residents are disproportionately impacted or unable to thrive amongst change, the overall community suffers.

As the City works to increase resilience and prepare for change, the City must look to include residents from all groups. Disproportionately impacted communities often have less ability to adapt to sudden changes or stressors –low-income families may have little disposable income to use if evacuation is needed for wildfires, or a person whose disability prevents them from driving may have difficulty navigating the streets during severe storms. The City should analyze community vulnerabilities and how they relate to resilience and preparedness, and consider disproportionately impacted communities first for programs that improve our ability to thrive.

STRATEGIES TO ACHIEVE COMMUNITY RESILIENCE

CR-1: Ensure all mitigation actions improve Flagstaff's ability to adapt to the future.

Opportunities for action:

1. Analyze each climate action that the City takes through an adaptation lens, to ensure that mitigation actions do not decrease Flagstaff's ability to respond to stressors and thrive in the future.

CR-2: Strengthen existing community systems to create resilience to both short-term shocks and long-term change.

Opportunities for action:

1. Host community adaptation forums to discuss expected climate change impacts and how to prepare.
2. Implement and increase involvement in the Resilient Neighborhoods Network to encourage and reward neighborhood-level resilience building.
3. Expand the Flagstaff HEPA Purifier Program to increase resilience to smoke and low air quality, especially for the most disproportionately impacted.
4. Incorporate adaptation-oriented actions from the 2018 Flagstaff Climate Action and Adaptation Plan into this Carbon Neutrality Plan.
5. Incorporate climate change adaptation principles into various other City plans, like the Flagstaff Regional Plan and the Utilities Integrated Master Plan.

Six additional target areas discuss specific ways to further community resilience:

- Housing for All – page 69
- Inclusive Recreation – page 76
- Water Security – page 111
- Healthy Forests and Open Spaces – page 119
- Health and Safety – page 130
- Economic Prosperity – page 139

Equitable Systems

Flagstaff will ensure the fair and just distribution of the benefits of climate action and strive to reduce the unequal burdens created by climate change.

WHAT IT MEANS

Equity is defined as the just distribution of the benefits of climate protection and alleviation of unequal burdens created by climate change. This plan defines disproportionately impacted communities in Flagstaff within the Approach chapter of this Plan on page 30.

Acting equitably requires identifying disproportionately impacted communities, analyzing impacts on these communities, and proactively working to protect them from negative impacts of climate change. These communities contribute the least to greenhouse gas emissions but suffer the greatest effects of climate change and its turbulent impacts. Historical and political systems play a significant role in creating this disparity and will not be easily dismantled.

Equity is an overarching principle that must be integrated into the implementation of this Plan. These principles are located in the *Our Neighborhoods* action umbrella because the necessary changes are not limited to one sector. They must be community-wide, integrated throughout our neighborhoods and the way we do business.

Equity is reflected in the third overarching goal of this plan:

Goal 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.**
Climate change disproportionally impacts communities of color and low-income neighborhoods. These communities contribute the least to greenhouse gas emissions but suffer the greatest effects of climate change and its turbulent impacts.

HOW WE'LL GET THERE

Considering equity when implementing carbon neutrality goes beyond merely distributing resources equally. Providing equitable access requires meeting community needs in the context of existing vulnerabilities and inequalities. Equity is a guiding principle throughout the Plan implementation process through the following practices:

- Design policies and programs that serve disadvantaged communities first. Target policies and programs at communities experiencing high pollution burdens, low-income, poverty, health issues, and exposure to climate hazards.
- Engage with the community. Proactively engage community leaders on an ongoing basis.

- Use the "operationalizing equity checklist" of the 2018 Flagstaff Climate Action and Adaptation Plan when implementing actions.

Ensuring that participation in climate action is accessible to the entire Flagstaff community will require considering equity in policy, outreach, and infrastructure development. City staff will work to involve diverse community voices from the start of any new initiative and will track progress towards advancing equity.

The most effective climate initiatives achieve greenhouse gas emissions reductions, reduce vulnerabilities, and serve disadvantaged communities. Taking climate action can create opportunities for underserved communities and accelerate the development of market-based solutions. For example, some cities have begun selling used electric fleet vehicles to members of their communities to ensure lower-cost electric vehicles are available to a wider spectrum of the community.

It is also possible that climate action strategies may lead to adverse, unintended impacts. For example, improving bike lanes and adding open space could increase the speed of gentrification and displacement, while additional City fees could add new burdens for low-income communities. The potential for unforeseen impacts to the community will be considered during Plan implementation, and efforts will be made to anticipate and address any such impacts or burdens as they arise.

The City will rely on the concept of **targeted universalism** – defined as "setting universal goals pursued by targeted processes to achieve those goals. Within a targeted universalism framework, universal goals are established for all groups concerned. The strategies developed to achieve those goals are targeted, based upon how different groups are situated within structures, culture, and across geographies to obtain the universal goal. Targeted universalism is goal oriented, and the processes are directed in service of the explicit, universal goal."[10] Target universalism involves supporting the needs of specific groups, in order to achieve our overall goals. Flagstaff will use a targeted universalism approach to ensure that ALL groups can benefit from climate action, from the most underserved populations to the general population.

To further the goals of the Climate Emergency Declaration, the City will dive deep into equity and resilience over the next year. We will host conversations with the community about these elements of climate action, and how we can create systems of accountability as we implement our carbon neutrality goals.

EQUITY AND ADAPTATION CONSIDERATIONS

Adaptation is incredibly important to building equitable systems. Adapting to and preparing for climate change will make Flagstaff more equitable by decreasing the negative impacts of climate change for all residents, and especially for the most disproportionately impacted. If equity is advanced without consideration for future changes and setting the foundations for resilience, the gains in community equity could be lost during a short-term event or over time as the community faces widespread change.

[10] https://belonging.berkeley.edu/targeteduniversalism

STRATEGIES TO ACHIEVE EQUITABLE SYSTEMS

ES-1: Incorporate equity as a foundational element of every climate action the City develops and implements.

Opportunities for action:

1. Analyze each climate action through an equity lens, to ensure that mitigation actions (1) do not have detrimental effects on Flagstaff's underserved populations; (2) are targeted to serve vulnerable community members, and therefore are accessible to the larger community; and (3) distribute the benefits of climate action equitably.
2. Provide equity training opportunities for City staff and leadership.

ES-2: Proactively engage community members on an ongoing basis.

Opportunities for action:

1. Launch an equity advisory committee to provide feedback on the City's climate action programming and engagement strategies.
2. Host community conversations to identify and begin to address community vulnerabilities and how different groups are at risk as a result of climate change.
3. Engage the community in conversations to increase awareness of climate risks, climate impacts, and ways people can take action.
4. Support neighborhoods in strengthening relationships and resilience.
5. Support K-12 teachers in teaching climate change curriculum and provide in-school lessons on climate change and climate action.
6. Develop opportunities for youth engagement and leadership in climate action.

ES-3: Design targeted climate policies and programs to serve disproportionately impacted communities first.

Opportunities for action:

1. For each climate action, identify disproportionately impacted communities that the programming is targeted to serve, as well as any barriers to accessing both City programs and the benefits of the action.

ES-4: Actively seek to recognize past harms, repair trust, and build deeper relationships with community members.

Opportunities for action:

1. Build relationships with organizations and community leaders serving disproportionately impacted communities.
2. Identify areas where disproportionately impacted groups have already been affected by climate change, and where gaps in trust might exacerbate existing disparities in the community.

The Lived Black Experience in Flagstaff

In 2020, the Lived Black Experience CommUnity Coalition hosted a series of community dialogues to highlight the experiences of black residents of Flagstaff and create and to build a strategic framework for truth, justice, and racial reconciliation.

The Lived Black Experience Strategic Plan highlights the need for greater engagement and work to address the needs and concerns of Flagstaff's Black community. The Plan begins by recognizing past and current narratives:

> "Where does the story of Black Flagstaff begin? The answer to this seemingly simple question is complicated by decades of lost or forgotten history, conflicting narratives, and a marked lack of engagement with the stories of Black Flagstaffians whose legacies speak of the enduring capacity for hope, the richest pursuits of positive change and cultural unity among the poorest citizenry and oft-forgotten neighborhoods."[11]

This statement reflects the need for engagement with Flagstaff's underserved community members and community leaders. Community outreach and relationship building is a necessary part of climate action and achieving our goals. The City will work to incorporate the recommendations of the Lived Black Experience Strategic Plan into the implementation of this Carbon Neutrality Plan.

The City will look to build relationships with other underserved community groups and access similar resources to shape its policies and programming.

[11] Access the Flagstaff's Lived Black Experience Strategic Plan at https://www.southsideflagstaff.com/black-lived-experience-town-halls

Decreased Dependence on Cars

Flagstaff will transform our transportation and land use systems so that we depend far less on cars, reducing vehicle miles traveled (VMT) and shifting trips to walking, biking, and the bus.

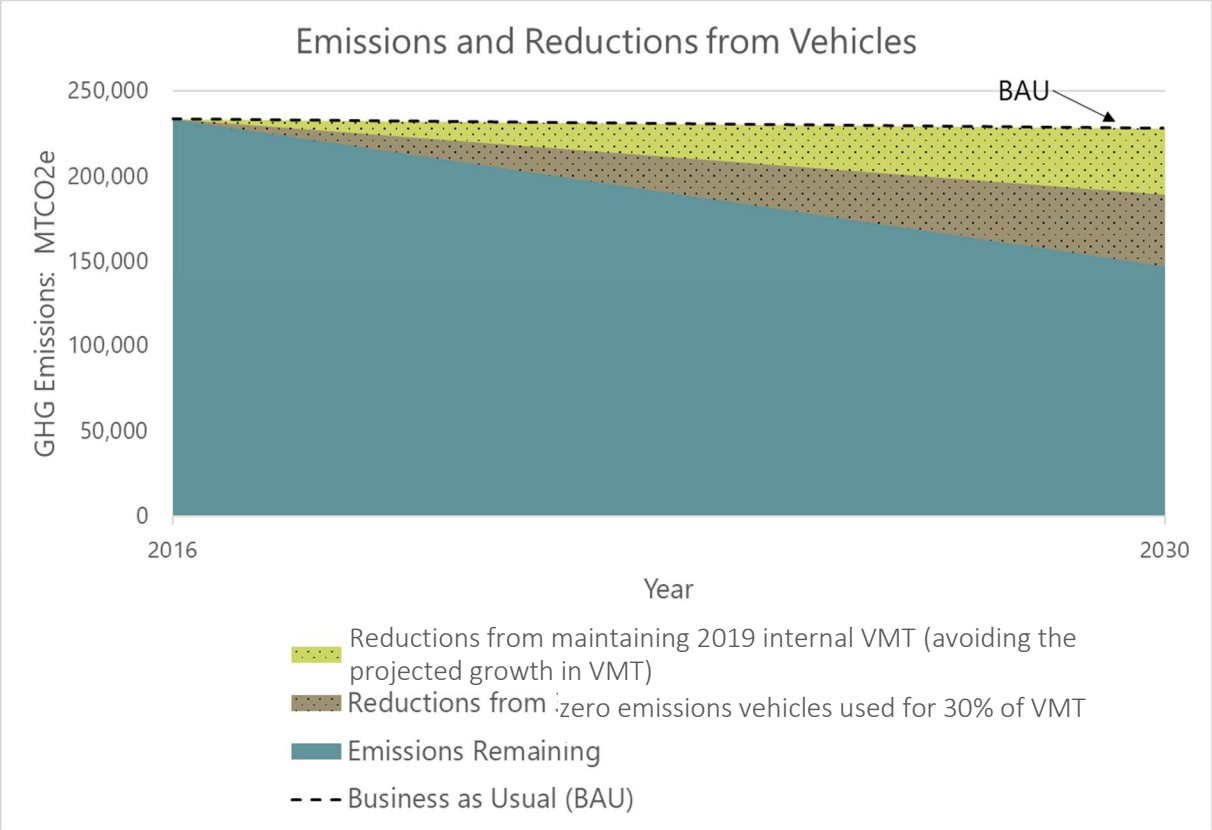


Figure 7: Projected emissions reductions from electric mobility and decreasing dependence on cars, compared to the emissions in the business as usual scenario..

WHAT IT MEANS

Reductions in greenhouse gas (GHG) emissions from the transportation sector will require enhancing community mobility and decreasing community-wide vehicle miles traveled (VMT) – or the miles Flagstaff residents travel in cars every day. This reduction in VMT must be simultaneously accomplished with a transition to clean, low- and zero-emission vehicles (see Electric Mobility Target Area on page 81). Because emissions from transportation account for around 30% of Flagstaff's community GHG emissions, reducing commuting miles and increasing equitable access to goods and services are essential to effective action.

How do we account for transportation by visitors? Or for through-traffic?

There are multiple types of car travel in Flagstaff: some trips are made by residents, going from home to a local store. Other trips are made through Flagstaff without stopping at all. The City accounts for these trips differently.

Starting with the 2019 Greenhouse Gas Inventory the City starting using the "internal vehicle miles traveled (VMT)" metric when quantifying emissions from vehicle travel in our community. This is different from the "total VMT" metric, which considers all vehicle miles travelled on our roads, including "through trips" – i.e. vehicles on I-40 that pass by Flagstaff on their way to other destinations. The "internal VMT" metric considers only trips that both start and end within the community boundary. Both the internal and total VMT metrics are determined each year by Metroplan Flagstaff.

The decision to use the "internal VMT" metric was based on considerations relating to the City's sphere of influence – the actions we can take to make our community more connected and less dependent on cars while in town will have little to no effect on the traffic simply passing through. Our community also has a unique form of "through trip" transportation in the 100+ BNSF trains passing through town daily. Finally, as a community with an economy that is largely based on tourism we want to welcome people to our City – and once here, tourists, like locals, will be able take advantage and utilize the systems put in place to make our town less dependent on cars for getting around during their stay.

HOW WE'LL GET THERE

Vehicle emissions are a result of a combination of factors: vehicle fuel efficiency, the carbon content of the fuel, and vehicle miles traveled (VMT). Gains in the first two areas may be potentially offset by losses in the third (VMT). Transitioning to electric vehicles (EVs) does not reduce transportation sector emissions enough in the near-term. Therefore, it is important that while Flagstaff adopts EVs, action is taken to simultaneously reduce VMT through climate-conscious land use planning and encouraging switching trips from single-occupancy to transit, walking, and biking.

Transportation costs are a significant expense for households. Car ownership can often be a burden for low-income families: AAA calculates that in 2020 car ownership cost $9,561 per year.[12] Promoting the adoption of personal single-occupancy electric vehicles does nothing to address these existing inequities. Land use decisions can also increase both transportation and housing costs. Transportation costs tend to be lower for those living in neighborhoods where it is safe and accessible to walk, bike, or take transit. Parking requirements add to the cost of housing, and single-family neighborhoods have an exclusionary history that in many ways continues today. Promoting these modes of transportation and reducing VMT both reduces emissions and is more equitable.

[12] https://magazine.northeast.aaa.com/daily/life/aaa/costs-more-than-ever-to-own-a-car/

The City can reduce dependence on cars on multiple fronts: prioritizing pedestrian and bicycle infrastructure development and enhancements can help make walking and biking an easy choice for many trips. This will happen through alignment with and implementation of the Active Transportation Master Plan, adopted by the Flagstaff City Council in November 2022. The City of Flagstaff will collaborate with Mountain Line, Flagstaff's transit agency, to maintain and enhance multi-modal transit services and related facilities, including better access to and from transit.

There are several transportation projects that are already considered in Flagstaff's transportation future, which will likely increase VMT. Road expansion projects and greenfield development, like the John Wesley Powell Boulevard extension, align with the goals of the most recent Regional Transportation Plan (2017), which projects VMT more than doubling over the next 70 years. Multiple new neighborhoods are planned on the edges of Flagstaff that are suburban in nature and will increase Flagstaff's VMT. These already-planned projects will increase the difficulty of holding VMT to 2019 levels. Flagstaff will need to balance these baked-in projects with its climate goals to envision a transportation and land use agenda for the coming decades. Two upcoming Plan processes, the Flagstaff 2040 Regional Transportation Plan and the Flagstaff 2040 Regional Plan will present opportunities for Flagstaff to weigh its carbon neutrality goals with other community priorities.

What would it take?

As part of the development of this Plan, we surveyed over 800 community members about what factors would convince them to choose biking, walking, or transit in favor of their single occupancy vehicle when they visit friends or go to work. There were common themes in these responses: shorter distances to travel, more robust and connected bicycle and pedestrian infrastructure, increased transit frequency, and increased feelings of comfort and safety when using the existing infrastructure. Some responses were from people who already bike, walk, and take the bus to do these things! Even those responses included improvements in infrastructure and shorter distances to get to daily needs.

These responses shaped the Decreased Dependence on Cars section; we know that more people will choose to leave their cars at home as infrastructure continues to improve and multi-modal transportation becomes more of a priority throughout Flagstaff. Most of these changes will require a big shift, especially in our infrastructure. To create more connected and robust bike and pedestrian infrastructure, lanes will need to be taken away from cars. To decrease the distance needed to travel for daily needs, we will need to increase density and mixed-use development. These actions will require a shift in priorities, and they are possible.

The Big Shift: Rethinking mobility

Flagstaff must commit to a fundamental shift in the way we think about our road systems and how we move around our community. This is necessary to both achieve our climate goals and to improve quality of life, health, and affordable living in Flagstaff.

The emphasis of our transportation planning must pivot from congestion mitigation to mobility improvement to improve the way community members move around town, outside of their cars. As Flagstaff grows, we have a choice: we can invest in building more roads and more lanes to attempt to reduce traffic, knowing that adding more vehicle lanes rarely improves traffic flow. Alternatively, we can manage demand, decreasing the demand for car trips and car infrastructure - thus helping people to choose active, healthy, enjoyable transportation while reducing the number of cars on the road. We must reimagine how our transportation can work, and shift our approach in the City's policies, processes, and plans, from the Regional Plan and the Regional Transportation Plan to our policies that currently encourage driving and parking.

At the same time, our community must better utilize our limited space by accepting and celebrating appropriate density in our neighborhoods and activity centers. In order to maintain the 2019 vehicle miles traveled (VMT) levels observed while our community grows, it is expected that actions will need to be taken to increase residential density by at least 20%.[13] Density reduces emissions from building energy use and transportation, while also contributing to more lively, welcoming, and diverse neighborhoods. Land use solutions are complementary to our transportation actions and impact our ability to achieve our transportation and emissions goals. Increases in density must be accompanied by efforts to make our neighborhoods more complete, reductions in the distance to transit stops, increases the frequency of transit buses, and the development of protected bike infrastructure and complete sidewalk networks.

Flagstaff is growing and will continue to do so. To welcome new neighbors to Flagstaff, we need to create homes for those who live here. To add more homes in our limited land area, we must increase the number of homes in our existing and new neighborhoods – from allowing backyard cottages to welcoming small and mid-sized apartment buildings and tall buildings where appropriate.

Flagstaff can learn from some of the most successful cities in the world, who are focusing on converting car space into more effective streets and public spaces that accommodate people outside of their cars, walking,

Flagstaff is Growing

Flagstaff is projected to grow significantly in the coming decades. We must prepare for greater than expected growth as the population center of Phoenix – now exceeding five million people – continues to grow, and as summers in central Arizona become hotter. We can expect visitation and migration to Flagstaff to increase, with domino effects on Flagstaff's housing market and land use.

[13] https://ww2.arb.ca.gov/sites/default/files/2020-06/Impacts_of_Residential_Density_on_Passenger_Vehicle_Use_and_Greenhouse_Gas_Emissions_Policy_Brief.pdf

biking, gathering, recreating, or shopping. Flagstaff's peer cities are also recognizing the high cost of parking, both in its contributions to housing costs as well as the way that it shapes our neighborhoods around cars. Cities across the country are allowing buildings to be built without parking or charging more for parking on the street and within buildings, making a trade-off between ample parking and a walkable and affordable community. Flagstaff can reduce the amount of space dedicated to parking and car storage in our community in order to improve affordability, better utilize limited space, and reduce automobile subsidies.

Flagstaff residents deserve what are called **15-minute neighborhoods**: places to live where you can meet most of your daily needs with a simple walk. Some of our neighborhoods already function this way: someone living in the Townsite neighborhood can reach office buildings, a grocery store, the post office, ten restaurants and even a park within a 15-minute walk. Sunnyside and Southside similarly have access to jobs, small neighborhood stores, dining, and community centers within their neighborhoods. Townsite, Southside and Downtown Flagstaff all were built before car dependence – meaning that they were built for a people to meet their needs without use of a personal automobile. While Sunnyside is a comparatively newer neighborhood, its street grid, flexible zoning and moderate density all contribute to walkability, vibrancy and a variety of businesses and retail establishments. Flagstaff can choose to allow our neighborhoods to evolve in ways that could mimic these traditional neighborhood designs, providing for a higher quality of life for Flagstaff residents.

The Big Shift to Decrease Dependence on Cars will require Flagstaff to change its policies to:

- Reduce or eliminate parking requirements across all building types.
- Increase density in residential neighborhoods by 20%.
- Increase the amount of accessory dwelling units in neighborhoods.
- Integrate density into residential neighborhoods through more flexible zoning codes that allow more housing options including duplexes, triplexes and potentially even small retail stores or apartment buildings.
- Convert some car lanes into micro-mobility zones.
- Allow neighborhoods to reclaim their streets through slow ‘safe and social’ zones that allow for play areas, socializing space, areas for businesses to operate, and safe travel for all modes.
- Prioritize transit over car movements in transportation operations and planning.
- Shift City transportation policies to actively manage transportation demand and reduce vehicle miles traveled.

These changes will require significant revisions to Flagstaff’s zoning codes, transportation engineering standards, and other policies. The City must invest in analysis and staffing to undertake this big shift. Through these changes, we will be better equipped to achieve deep reductions in greenhouse gas emissions from our transportation sector while improving livability, health, and community resilience in Flagstaff.

EQUITY AND ADAPTATION CONSIDERATIONS

Equity: Working to decrease our dependence on cars can help improve community equity. Owning a car is expensive. By offering robust, diverse transportation options at lower costs, low and middle-income residents will have more affordable mobility options.

The City will also consider how transportation policies will affect other groups: Due to disability, age, or other factors, some community members may be unable to walk, bike or take the bus; others are unable to drive. These factors will be considered when designing and implementing policies.

Adaptation: Density and robust, diverse transportation systems inherently increase community resilience by providing multiple transportation options, as opposed to designing around one mode – cars. By increasing density in areas that are less prone to flooding and fire, Flagstaff can be better prepared for an increase in these events.

TARGET AREA GOALS

Goal	Year
Hold vehicle miles traveled (VMT) in the community to 2019 levels. This is a 17% reduction from our business as usual projections in VMT growth.	2030
54% of all trips will be taken by biking, walking, or taking the bus.	2030
34% of all work commute trips will be taken by biking, walking, or taking the bus.	2030
Reduce vulnerability of new developments to fire and flooding, by encouraging development to locate in areas of lower vulnerability.	2030

STRATEGIES TO ACHIEVE DECREASED DEPENDENCE ON CARS

DD-1: Encourage vibrancy, appropriate density, and attainability in existing neighborhoods, so that more residents live within walking distance of their daily needs.

Opportunities for action:

1. Incorporate more flexibility and appropriate density into residential neighborhoods, such as accessory dwelling units, duplexes, triplexes, small apartment buildings and other housing options to provide more diverse and attainable housing opportunities, create vibrant neighborhoods, and decrease travel distances.
2. Lower or eliminate parking minimums for new developments to decrease housing costs, promote decoupling rent from parking costs, reduce impervious surfaces, and create more walkable neighborhoods.
3. Change City policies to increase transit-supportive density, redevelopment, infill development, mixed housing types, multiple story buildings, and mixed-use transit nodes throughout Flagstaff.
4. Encourage the rapid development of carbon-neutral Accessory Dwelling Units (ADUs) to increase the housing stock.

DD-2: Create inclusive networks for walking and biking that are continuous, attractive, safe, comprehensive, and convenient for people of all ages.

Opportunities for action:

1. Fund and implement the Active Transportation Master Plan (ATMP).
2. Fully fund bike and pedestrian infrastructure capital improvements to create complete and comfortable bike and pedestrian networks, safe routes to school improvements, and a complete and comfortable system of pedestrian crossings and sidewalks.
3. Convert appropriate streets to multi-modal and complete streets through road diets or creating multi-modal lanes. When right-of-way is limited, redistribute the available space to accommodate more users and better reflect climate priorities.
4. Create an integrated system of protected lands, the Flagstaff Urban Trail System, and trail corridors that support mode shift, public health, and affordable living.

In November 2022, the Flagstaff City Council adopted the Active Transportation Master Plan. This plan makes specific recommendations for strategies, actions, projects, and programs to improve the pedestrian and bicycle environment and implement the 'big shift.'

DD-3: Encourage Flagstaff residents and visitors to walk, bike, roll and take the bus.

Opportunities for action:

1. Significantly increase funding for programming to increase biking and walking, improve micro-mobility options, provide encouragement programming and infrastructure improvements in school zones, and increase transportation demand management (TDM) programming.
2. The City will improve support to incentivize City employees to commute by walking, biking, and transit, such as employee showers at work, benefits to employees for walking, biking and taking transit, or support for carpool coordination.
3. Reconsider how and where we allow pedestrian crossings to create safe and convenient crossings based on land use, activity centers, transit stops, and trails.

Investing in walking and biking

A one-time investment of $90 million is needed to build comprehensive walking and biking networks. These networks are necessary to get people to walk, bike and take the bus. We cannot ask people to change their behavior if those behaviors are not easy, safe, comfortable and even fun. To further support these choices, the City will need to provide $600,000 to $1,000,000 per year for programming.

While these investments seem large, from an infrastructure perspective creating these networks will cost similarly to a large roadway project. The recently approved Lone Tree Bridge over the railroad tracks will cost a projected $72 million, and simply designing a highway interchange can cost $3 million. We must invest in biking, walking and transit with the same level that we invest in supporting infrastructure for cars.

What is electric micro-mobility?

Micro-mobility technology is a rapidly-evolving category of light-weight individual transportation devices. Examples include electric bikes (e-bikes), electric scooters, Segways, electric skateboards, and hoverboards.

Electric micro-mobility provide easy and affordable transportation for many. These devices are a necessary part of our work to reduce VMT: people can easily substitute many short car trips with a trip on scooter or an e-bike. The City can encourage folks to use these devices to travel: benefits go beyond just the individual user's cost savings and health benefits, since these devices reduce the need for car parking, reduce air pollution, and reduce traffic on our roads. See the Electric Mobility Target Area on page 81 for more information.

DD-4 Transform transportation policies and planning to incorporate greenhouse gas emissions analysis and reduce dependence on driving.

Opportunities for action:

1. Incorporate transportation demand management (TDM) philosophy and policies into transportation and development engineering and planning processes, by changing internal policies and potentially hiring a TDM manager.
2. Evaluate the greenhouse gas emissions and vehicle miles traveled (VMT) of transportation capital infrastructure projects, transportation system operations, and new development planning, and update the Traffic Impact Analysis (TIA) process to incorporate greenhouse gas emissions impacts into the decision-making process.
3. Actively work to lower emissions and VMT created by new developments, shifting to mobility enhancement strategies rather than congestion reduction.
4. Require large new buildings and new neighborhood developments to submit carbon neutrality alignment statements, to increase collaboration between developers and the City and to communicate how developments contribute to the City's carbon neutrality goals and how the property will work to manage transportation demand.
5. Involve more stakeholders in City capital and infrastructure project planning by bringing projects to citizen commissions and interdepartmental staff review, enabling review through the lens of other community objectives including public health, sustainability, and economic vitality.
6. When working with developers on large new developments, analyze and balance community priorities when making requests for infrastructure improvements.

How Could We Account for Greenhouse Gas Emissions in Transportation Planning?

Municipalities across the country are beginning to incorporate greenhouse gas (GHG) emissions into transportation planning projects. Fully accounting for GHG emissions allows us to understand the true impact of transportation projects, which often lead to more driving.

Fortunately, accounting for GHG emissions can be simple – most transportation analyses include a consideration of vehicle miles traveled or how a project will increase car trips. These measures are proportionally related to greenhouse gas emissions – incorporating greenhouse gas emission analysis into a traffic impact analysis (TIA), for instance, can be as simple as applying a greenhouse gas co-efficient to the number of new trips we anticipate.

The City will work with transportation and development stakeholders to identify the best way to include greenhouse gas emissions in transportation planning and engineering processes and decisions.

What is Transportation Demand Management (TDM)?

Transportation demand management, often called TDM, is a well-established concept defined as a transportation policy approach that reduces demand for single-occupant vehicle use, while simultaneously encouraging use of more sustainable travel modes, including walking, biking, and transit. TDM is described in the Flagstaff Regional Transportation Plan Blueprint 2040 as follows: "TDM enhances the utilization of roads by reducing overall demand through mode shift from single occupant vehicles to other means of transportation that can equally or better meet their needs... With TDM serving as an organizing principle, physical transportation infrastructure and land use will be designed so that alternative transportation is naturally encouraged and the maximum efficiency of the transportation network is realized."

Why is TDM important? An efficient and equitable transportation system offers individuals multiple feasible options for moving around their community whether it be by biking, walking, public transit, driving, or another mode. Unfortunately, most U.S. transportation systems have been built centered around one mode of transportation above all others: single-occupancy vehicles. Many policies and land-use decisions often favor single-occupancy vehicles and deprioritize all other modes of transport. This is problematic as increases in use of single-occupancy vehicles are often associated with increases in roadway congestion, air pollution, greenhouse gas (GHG) emissions, and annual vehicle-related costs.

TDM can maximize traveler options. What if instead of continuing to build infrastructure that encourages the use of vehicles, our transportation planning focused instead on making alternate modes of transportation more desirable and feasible options? This is exactly what TDM strategies seek to do. Another way to think about TDM is maximizing traveler options or systematic mobility management. TDM helps to make our transportation systems function more efficiently in a way that is cost-effective and impactful in the long-term. More than a specific set of solutions, TDM is a philosophical approach that can be incorporated into decisions made related to city zoning, land-use, development, and much more.

TDM at work. TDM strategies can be numerous and diverse allowing every city the opportunity to focus on options that work best for their unique setting. Some examples of TDM include: increasing the amount and accessibility of information on local alternate modes of transport, creating successful rideshare and carpooling programs, disincentivizing driving by increasing parking costs, providing incentives for using transit or other alternate modes, or restricting the number of parking spaces new developments can build. Like most cities, Flagstaff is already implementing multiple actions that can be considered components of TDM; examples include the use of parking pricing downtown, provision of online maps and resources for the FUTS and other urban bike routes, and the ecoPASS program which offers annual bus passes at reduced rates. TDM actions become even more effective when centralized under a comprehensive TDM program with a designated workforce. Successful TDM programs already exist in many states and an increasing number of cities (such as the City of Tempe) are working to develop comprehensive programs of their own.

Potential for local implementation. One example of a highly effective TDM strategy that has potential for implementation in Flagstaff is unbundled parking. Oftentimes at residential rental properties, costs of parking are automatically added into tenant rental costs. An alternate option would be to "unbundle" parking and rental costs allowing tenants to choose exactly how many parking spaces they want to pay for. Having parking costs as a separate fee allows tenants to better conceptualize the costs associated with having a car or multiple cars. This strategy also disincentivizes developers from building an excess amount of parking, the cost of which would ultimately be placed on tenants. Unbundled parking is already being utilized in Arlington County, Virginia and has been highly successful at promoting alternate transportation options as reported in a 2018 Mobility Lab study. San Francisco, Berkeley, and Seattle are examples of other cities that have also made the move to unbundle parking costs from rent.

DD-5: Invest in comprehensive and equitable transit**.**

Opportunities for action:

1. Implement the transit-supportive recommendations of the Northern Arizona Intergovernmental Public Transportation Authority (NAIPTA) Five-Year Transit Plan for the Mountain Line to increase ridership and transit frequency on the permanent transit network.
2. Prioritize transit trips over car trips and the movement of buses over cars to improve bus operations on Flagstaff's road network, through mechanisms such as signal prioritization, bus slip lanes, and dedicated bus lanes.
3. Improve how the City incorporates transit needs and requests into the transportation analysis performed for large new developments.

DD-6: Proactively invest to protect Flagstaff's clean air status.

Opportunities for action:

1. Create a local ordinance to protect air quality and prevent National Ambient Air Quality Standards (NAAQS) non-attainment status and to support and fund mobility enhancement.
2. Incorporate greenhouse gas impact analysis, based on greenhouse gas emissions estimates, into Flagstaff area transportation strategic planning and routine analysis.
3. Create anti-idling loading zones to reduce congestion, maintain access to parking and allow public safety access.

What is NAAQS Non-attainment?

The State of Arizona monitors air quality for pollutants above the National Ambient Air Quality Standards (NAAQS), as outlined in the Clean Air Act. NAAQS non-attainment classification occurs when pollutants exceed the NAAQS standards.[14] Once a county receives reaches non-attainment classification, communities must make investments to reduce and control pollutants.

Coconino County is currently in attainment of the NAAQS. However, the Arizona Department of Transportation has noted that the expected growth of Coconino County could threaten Coconino's current attainment status.[15] Flagstaff can invest in keeping its air quality clean *now*, to avoid future regulation and mandates.

[14] Learn more about Arizona Departhttp://azdeq.gov/nonattainment_areas
[15] Air Quality Sustainability Program in Coconino County: https://www.flagstaff.az.gov/ArchiveCenter/ViewFile/Item/1501

Improvements in transit infrastructure, operations, and encouragement

Mountain Line provides transit service to the City of Flagstaff. Mountain Line and the City must partner to adequately fund improved transit infrastructure and operations in order to move more trips onto transit.

High-priority transit improvements include:

- Identify funding to double service on Mountain Line routes to create high-frequency bus lines that are more usable and attractive for riders. This would require $5 million in additional funding annually.
- Partner with Coconino County to increase transit service coverage and frequency in the greater Flagstaff area. Consider enhancing buses, vanpooling, and shuttle services for outlying communities such as Kachina Village and Bellemont.
- Develop transit services for visitors to Flagstaff, including to popular destinations such as Snowbowl, Twin Arrows, the Grand Canyon, and between Phoenix and Flagstaff.
- Focus on improving access to transit stations by helping riders to complete their 'first mile' and 'last mile' trips to get to stations.
- Consider eliminating bus ridership fees, encouraging organizations and businesses to purchase transit passes for their employees or provide in-house incentives for employees who switch from driving to public transit.

Housing for All

Flagstaff will create a vibrant and more livable community through increased housing options for residents at all income levels and family sizes.

Flagstaff's 10-Year Housing Plan – vision statement

This Target Area incorporates the goals and content of Flagstaff's 10-Year Housing Plan, developed in 2021 to respond to Flagstaff's Housing Emergency. The Flagstaff City Council unanimously adopted the 10-Year Housing Plan on February 15, 2022.

WHAT IT MEANS

Housing is a collective benefit

There is a strong and growing movement among Flagstaff community members, housing advocates, and City Council to ensure all Flagstaff residents have access to affordable housing. On December 1, 2020, City Council declared a Housing Emergency in Flagstaff, committing to prioritizing affordable housing within City operations to create safe, decent, and affordable housing opportunities for all community members.

The United States Department of Housing and Urban Development (HUD) defines affordable housing as spending no more than 30% of monthly gross income on housing costs. Households that spend more than 30% on rent or mortgage costs are considered "housing cost burdened"; households spending more than 50% are "severely housing cost burdened." Within the Flagstaff 10-Year Housing Plan, "affordable housing" is defined as households paying 30% or less of monthly gross income towards the home in which they reside, using HUD's definition.

In an expensive housing market like Flagstaff's, some form of subsidy is necessary for housing to be affordable for many lower income households. Housing subsidies come in many forms. Housing subsidy types include rental assistance, eviction prevention, and down payment assistance. Other forms include non-profit affordable housing, public housing, voucher programs, and some forms of co-operative and private sector housing. Throughout the Housing Plan, the term "housing subsidy" is defined as any form of financial assistance aimed towards decreasing housing costs.

The stories we hear from residents and local reports verify that a lack of affordable housing is not just an individual problem, but rather a community problem that has collective consequences that negatively impact Flagstaff. The Flagstaff 10Year Housing Plan demonstrates how the consequences of failing to create, preserve, and provide access to affordable housing in Flagstaff are linked to lasting negative effects on our neighborhoods, health, children, environment, and jobs. The Housing Plan provides a path forward for the next ten years and offers solutions to reducing Flagstaff's Housing Emergency.

Flagstaff Housing and Affordability Challenges: By the numbers

The statistics below were gathered in 2021 during the development of the Flagstaff 10-Year Housing Plan to illustrate the scope of Flagstaff's housing challenges.

- 47% of all households are low-income and 65% of all households are low to moderate income.
- Flagstaff is increasingly unaffordable. Since 2011, the median sales price of a home rose by 119%, while Area Median Income rose by only 16%. In 2021, the median sales price of a home is $502,500, and the median annual gross income is $69,200.
- Housing Cost Burden Analysis: 27% of homeowners and 57% of renters are housing cost burdened, meaning that 22,073 Flagstaff community members pay more than 30% of their monthly income towards housing (US Census 2019 American Community Survey).
- Flagstaff's cost of living is 13.1% higher than the national average.
- Flagstaff's cost of housing is 29% higher than the national average.
- According to a community wide housing survey, more than one in four respondents stated they were either "nearly certain" or "very likely" to relocate due to housing costs.

Housing is Flagstaff's Infrastructure

Safe, decent, and affordable housing is a vital part of Flagstaff's infrastructure. Because housing is a basic human need that must come first, every unit counts. Affordable housing improves health and the environment, connects people to neighbors, bolsters housing productivity and economic growth, and supports local job creation.

Housing is interconnected to:

- Healthcare
- Neighborhoods and equity
- Sustainability
- Zoning and land use
- Economic opportunity

See the Flagstaff 10-Year Housing Plan for a narrative detailing our community's interconnected housing challenges and shared solutions.

Source: Live Well Arizona –Elements of a healthy community

Neighborhoods & Equity

As Flagstaff plans strong action on both housing and climate, we must consider the implications of our past. The following is an except from the 10-year Housing Plan:

> For decades, starting at least in the 1930s, low-income and minority communities were intentionally cut off from lending and investment through a system known as redlining. Today, those same neighborhoods suffer not only from reduced wealth and greater poverty, but from lower life expectancy and higher incidence of chronic diseases that are risk factors for poor outcomes from COVID-19. Housing, economic, and social policies should aim to eliminate those risks and undo the unfair burdens of structural racism, both past and present.

How our neighborhoods are designed and who can access them affect our community's health, housing access, resilience, and greenhouse gas emissions. For the complete discussion on neighborhoods and equity, see page 44 of Flagstaff's 10-Year Housing Plan.

HOW WE'LL GET THERE

Flagstaff's 10-Year Housing Plan

Flagstaff residents have made our mountain town the resilient community that it is today. As the City of Flagstaff works to provide equitable solutions to address the Housing Emergency for local residents, we will strive to ensure that affordable housing opportunities and subsidies are available for residents at all income levels and all stages of life.

The City of Flagstaff's mission—to protect and enhance the quality of life for all—directly aligns with the overarching goal of the 10-Year Housing Plan. Together with funding, partnerships, and the community's support, the City of Flagstaff can advance housing options for the full spectrum of residents who call Flagstaff their home.

The 10-Year Housing Plan establishes one overarching goal supported by two fundamental elements that together will significantly impact housing attainability. This goal will be achieved through the implementation of the policy initiatives and strategies described in the Plan.

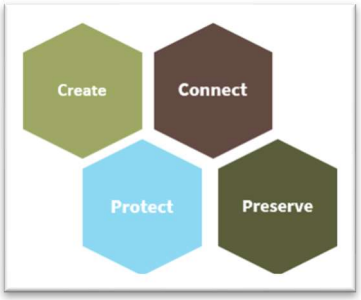
TARGET AREA GOALS

Goal	Year
Reduce the current affordable housing need in our community by half over the next ten years.	2031
Impact at least 6,000 low-to-moderate income Flagstaff residents through a combination of unit creation or subsidy provision.	2031
Create or preserve 7,976 housing units by 2031 with a minimum of 10% of them being affordable. This will increase the overall supply of market rate, workforce, and affordable housing occupied by local residents.	2031

Key Elements of Flagstaff's 10-Year Housing Plan

The Flagstaff 10-Year Housing Plan outlines a single overarching goal with thirteen (13) robust policy initiatives and fifty-eight (58) comprehensive strategies. The policy initiatives and strategies provide a foundational framework for establishing housing programs, prioritizing staff work, and allocating necessary funding for implementation. Community outreach identified four distinct needs related to Flagstaff's housing emergency:

- **Create** housing options for households at all income levels and family sizes occupied by local residents.
- **Connect** people to equitable housing solutions
- **Preserve** affordable housing
- **Protect** people from housing discrimination and remove housing barriers.



Implementation of the Housing Plan will be accomplished through the City's budget process, collaboration with City staff, and private, public, and nonprofit partnerships. Over the next ten years, the City will continue to advance housing opportunities for all Flagstaff residents. The 10-Year Housing Plan is the City's foundational framework for establishing work programs, prioritizing staff work, and allocating the necessary funding for its implementation.

To ensure the principles of Flagstaff's 10-Year Housing Plan are represented in this Carbon Neutrality Plan, this Housing Target Area integrates the four policy areas above – Create, Connect, Preserve and Protect – as **strategies**.

For the Detailed List of Policy Initiatives and Strategies that includes scope, term lengths, and City collaboration, please see the 10-year Flagstaff Housing Plan, page 52.

EQUITY, ADAPTATION, AND MITIGATION CONSIDERATIONS

Housing is **deeply connected** to both climate change and climate action.

Equity:

- Increasing visitation and climate migration will likely **exacerbate existing housing challenges**. Climate change, particularly extreme heat, will likely lead to increased demand for Flagstaff's housing because of our cooler temperatures.
- The **cost of living** is affected by housing, transportation, and utility costs. Transportation and utility expenses are often easier to influence than housing expenses – making them attractive targets for both affordability and climate initiatives. Because Coconino County sees high rates of energy-burdened households, energy efficiency improvements, which can reduce both costs and emissions, are especially critical strategies.
- Climate change will have the most severe effects on our most **disproportionately impacted community members**. These community members may also face substantial challenges affording higher housing, utility and transportation costs.
- **See pages 14-18 of Flagstaff's 10-Year Housing Plan for an extended discussion of housing justice and equity, and page 44 for a discussion on neighborhoods and equity.**

Adaptation:

- Residents who do not have access to secure or affordable housing may face increased challenges: lower financial reserves can reduce a person's ability to **adapt** to sudden changes or emergencies.
- Our buildings can serve as **resilience assets**, or they can exacerbate vulnerabilities. For example: an energy-efficient home can maintain higher air quality during smoke events, and performs better during power outages, retaining more heat in the winter and staying cool during hot days.
- As neighborhoods change due to the climate or housing emergencies, it may affect the resilience of an area. Communities where neighbors know each other, and readily assist during a crisis, are most likely to **thrive** amidst change.

Mitigation:

- Increased **infill development and housing densities** can lead to meaningful reductions in greenhouse gas emissions. **Infill development, higher-density neighborhoods, and mixed-use buildings** can help residents take shorter and fewer trips and encourage active transportation modes like walking, biking, and transit.
- Similarly, medium- and high-density housing can bring **energy efficiency benefits**, reducing energy use for each housing unit. Attached housing, from duplexes or townhouses to apartments, requires less energy for heating and cooling, lowering the emissions generated per resident.
- **Existing homes are key** to reducing emissions and securing a healthier planet since buildings are the largest contributing sector to greenhouse gas emissions. There are small changes most residents make to use less energy and reduce utility expenses. Homeowners and landlords can affect the greatest change by investing in energy efficiency retro-fits, electrification of units, or even on-site energy production.

For an extended discussion of these considerations, see page 46 of the 10-year Housing Plan.

STRATEGIES TO ACHIEVE HOUSING FOR ALL

These strategies match the policies initiatives in the Flagstaff 10-year Housing Plan. See page 52 of the Housing Plan for the timeline, implementation, and collaboration information for each policy and strategy.

HA-1: Create housing options for households at all income levels and family sizes occupied by local residents.

Opportunities for action:

1. Incentivize the creation of affordable units through various programs and mechanisms.
2. Ensure that the Flagstaff Regional Plan includes robust affordable housing goals and policies.
3. Create a dedicated funding source for affordable housing in Flagstaff.
4. Amend the Flagstaff Zoning Code to facilitate the development of all housing types.
5. Explore regulatory efficiency and cost-saving practices.

HA-2: Connect people to equitable housing solutions.

Opportunities for action:

1. Reduce homelessness in the Flagstaff community and seek creative solutions to foster housing permanency for all.
2. Implement a framework for centering equity in proposed and existing housing practices, policies, and programs.
3. Integrate healthcare into housing programs, and housing into healthcare programs, as appropriate.

HA-3: Preserve affordable housing.

Opportunities for action:

1. Encourage the adaptive reuse of buildings.
2. Expand efforts to preserve existing housing stock.

HA-4: Protect people from housing discrimination and remove housing barriers.

Opportunities for action:

1. City Council will continue to lobby and support federal and state legislation to encourage changes to federal and state laws, and to increase the amount of funding available for the preservation and construction of affordable housing.
2. Ensure affordable housing is a part of every Flagstaff neighborhood and work to address disparate impact as part of any development or redevelopment.
3. Continue Flagstaff's commitments to further federal and Arizona Fair Housing laws in all housing-related services and programs, value the efforts of those who seek to reduce barriers to equitable housing opportunities, and provide Fair Housing education and resources to the community.

The Interconnections Between Housing and Sustainability: Shared Solutions

The Flagstaff community faces urgent challenges from housing and climate change. The City of Flagstaff recognizes that the Housing Emergency and the climate emergency share many common solutions and that advancing housing and advancing climate action are not in conflict with each other. Indeed, implementing shared solutions to both challenges can lead to a stronger, healthier, and more connected Flagstaff.

To reduce emissions and build a stronger community, Flagstaff needs to rethink its housing and transportation systems—what we refer to as 'the Big Shift.' This shift entails building our neighborhoods so they are more dense, connected, and complete, so that residents don't have to travel across town as often. These neighborhoods welcome more neighbors of varying income levels, are stronger because neighbors know and help one another, and contribute to health, as residents can take active and healthy modes of transportation to get most of what they need nearby. These neighborhoods resemble Flagstaff's oldest, strongest, and most lively neighborhoods like Southside and Townsite, which were built before people were dependent on cars. Climate action that creates these lively and strong neighborhoods can increase housing and help solve the Housing Emergency, too.

Climate action can support lower overall costs of living. When considering the high costs of living in Flagstaff, housing is the greatest concern, but transportation contributes significantly to the cost of living in Flagstaff, and often requires smaller changes to realize cost savings. Many carbon neutrality solutions can decrease transportation costs by reducing dependence on cars. Car ownership can often be a burden for low-income families: AAA calculates that in 2020, new car ownership cost $9,561 per year for families, not including significant costs to the overall community and the environment.40 Transportation costs tend to be lower for those living in neighborhoods where it is safe and accessible to walk, bike, or take transit, and if folks can be car-free, car-lite, or reduce the number of cars in their household, they can significantly reduce their cost of living. Many Flagstaff residents already are car-free or rely very little on personal vehicles, and are using the bus, biking, carpooling, and walking to meet their daily needs. Reducing how much residents must use cars can reduce the cost of living and make it so that more people can afford to live in Flagstaff.

Housing is critical to community health and overall resilience. Implementing these community solutions will require moving away from today's status quo—a status quo that does not work for many people who struggle to live in Flagstaff and is contributing to global climate change. This will require courage and change to help Flagstaff create more opportunities and become a more welcoming and inclusive community.

For an extended discussion of these interconnections, see page 46 of the Flagstaff 10-year Housing Plan.

Inclusive Recreation

Flagstaff will ensure abundant and equitable access to recreational opportunities, prepare for changes to recreation due to climate change, and reduce emissions from recreation.

WHAT IT MEANS

Flagstaff offers exceptional recreational opportunities to both residents and visitors, whether through City of Flagstaff parks, recreation centers, or access to surrounding National Forest land. These diverse recreational opportunities provide residents with the ability to achieve physical and mental health and wellness. The City of Flagstaff Parks, Recreation, Open Space and Events Division seeks to ensure access to parks and recreation, connectivity, health and wellness, inclusion and equity, and natural resource protection.

Changing conditions will affect recreation for both residents and visitors alike, and may stress the City's ability to ensure accessibility, equity and inclusion across all parks and recreation facilities. For more on how climate change will affect visitation, see the Economic Prosperity Target Area on page 139.

To prepare for low-snow years, Flagstaff will need to continue to diversify its winter recreation offerings. Summer recreation will be affected too: as temperatures rise in Central Arizona, visitation in Flagstaff will likely increase – increasing the demand for recreation in Flagstaff. During periods of high visitation, there are many more people utilizing the same recreation opportunities, whether in the City or in the nearby forests – potentially increasing both user conflicts and impacts to resources. In the late spring and early summer, drought and an increased risk of wildfire can lead to forest closures and reduced access to the local forests, which residents and visitors depend on for recreation, spiritual connection, mental health, and physical fitness. Preparing for these shifts can help the City to foster community health and wellness amidst significant change.

Parks and recreation also contribute to Flagstaff's energy use, water consumption, and transportation emissions. As the climate changes, Flagstaff's parks and recreation centers are likely to utilize more energy and water to maintain operational levels. As Flagstaff plans for evolving and growing recreation, it has the opportunity to reduce emissions from recreation, incorporate new technologies, and integrate more resilient or native vegetation.

HOW WE'LL GET THERE

As the climate changes, Flagstaff will also evolve. Because accessible recreation is a cornerstone of any healthy and connected community, the City of Flagstaff will need to anticipate changes to recreation and ensure equity and accessibility amidst change.

The Flagstaff community must prepare for increased visitation to Flagstaff during the summer months, including working to ensure that Flagstaff's ecological resources, parks and recreation facilities can sustain increases in visitation. Forward-looking planning can help Flagstaff protect ecological resources, diversify available recreational opportunities, and plan for emergencies. Sound planning can also ensure that recreational opportunities can be accessed by a broad range of residents and visitors.

Climate change may increase demands for recreation services while stressing park resources. Necessary preparations include understanding how fields will respond to increased temperatures, evaluating health risks, and preparing for increased water, electricity and fuel demands. To mitigate these impacts, the City will need to seek out diverse solutions that include efficiency improvements, changes in operations, and technological solutions.

Finally, parks and recreation opportunities can complete a neighborhood – providing affordable and accessible opportunities to improve one's mental or physical health and wellness. In this way, recreational opportunities provide critically important resilience and equity benefits to a community. The City must work to maintain our parks and recreation facilities and services – some of our most effective assets when it comes to resilience.

Meanwhile, the City must continue to work to make recreational assets easily accessible to all. The City is working to ensure every resident of Flagstaff has access to a park, recreation center or open space within a 10-minute walk. This requires strong transportation connectivity to neighborhood parks, recreation centers or open spaces. Safe and comfortable active transportation options – taking a bus, biking or walking – are critical to ensure equitable access to parks. The availability, condition and comfort of active transportation infrastructure is key to ensuring access – whether through sidewalks, FUTS trails, or even informal trails that provide connections to local parks. As Flagstaff's active transportation infrastructure expands, maintenance needs increase. To ensure that these connections are well-maintained and accessible to users of all ages, Flagstaff will need to re-envision how it supports the ongoing maintenance of sidewalks, FUTS trails, and other non-vehicular access routes. Potential solutions include the development of dependable funding sources and new collaborations with community partners.

TARGET AREA GOALS

Goal	Year
Manage and enhance existing recreation and outdoor opportunities to maximize resilience to the impacts of climate change.	2030
Accommodate the increased use of City Parks and Recreation facilities and changing maintenance needs.	2030
Reduce emissions from water and energy use at City parks and recreation facilities.	2030
Identify methods for ecosystem monitoring to assess impacts of recreation and climate change	2025

STRATEGIES TO ACHIEVE INCLUSIVE RECREATION

IR-1: Protect natural areas and ecosystem services that are most vulnerable to the impacts of increased visitation and climate change.

Opportunities for action:

1. Prioritize natural resource protection in high-demand recreational areas.
2. Enhance the Flagstaff Convention and Visitors Bureau public awareness campaign that emphasizes 'treading lightly' on the land to accommodate increased visitation and impact.
3. Maintain cooperation with County and U.S. Forest Service recreation programs to plan for and respond to increased visitation and use of recreational services and legally designated open spaces.

IR-2: Ensure equity, accessibility, and inclusion across all City of Flagstaff Parks and Recreation facilities, helping all members of the Flagstaff community to meet their health and wellness needs.

Opportunities for action:

1. Incorporate changing climate conditions and risks to community health, Parks and Recreation staff members, and facilities into the Parks and Recreation Master Plan and Legally Designated Open Space Management Plan update processes.
2. Prepare for increases in demand for programs and facilities, and impacts on Parks and Recreation capital projects, budget, staffing, maintenance, and operations.
3. Work with community partners to understand how closing sections of the nearby national forests due to fire danger impacts local residents, and develop creative approaches to help residents find alternative ways to exercise, recreate, and socialize.
4. Continue efforts to ensure that neighborhoods across Flagstaff have 10-minute access to parks, recreational opportunities or open spaces.
5. Develop a strategy to better support the ongoing maintenance of sidewalks, FUTS trails, and other non-vehicular access routes used to access recreation opportunities.

IR-3: Plan for changes to recreation, reduce emissions, and respond to the impacts of climate change on current Parks and Recreation facilities and operations.

Opportunities for action:

1. Investigate new technologies and techniques to decrease water, electricity, and fuel use at Parks and Recreation facilities.
2. Implement energy and water efficiency retrofits to decrease water and electricity use and costs at all Parks and Recreation facilities.
3. Continue to utilize low-water, climate-adapted, native plantings for all facilities, parks, and streetscapes, and create a best practices manual for irrigation and other operations.
4. Prepare for the financial and greenhouse gas emissions impacts of potential increases in electricity and water use at all Parks and Recreation facilities.

PRIORITY TWO: WE WILL CLEAN OUR ENERGY SOURCES

Electric Mobility

Clean Electricity

Building Fuel Switching

Electric Mobility

Flagstaff will embrace the electrification of mobility options, shifting to vehicle-replacing e-bikes and bike share, electrifying our buses and taking advantage of the rapidly evolving electric vehicle market.

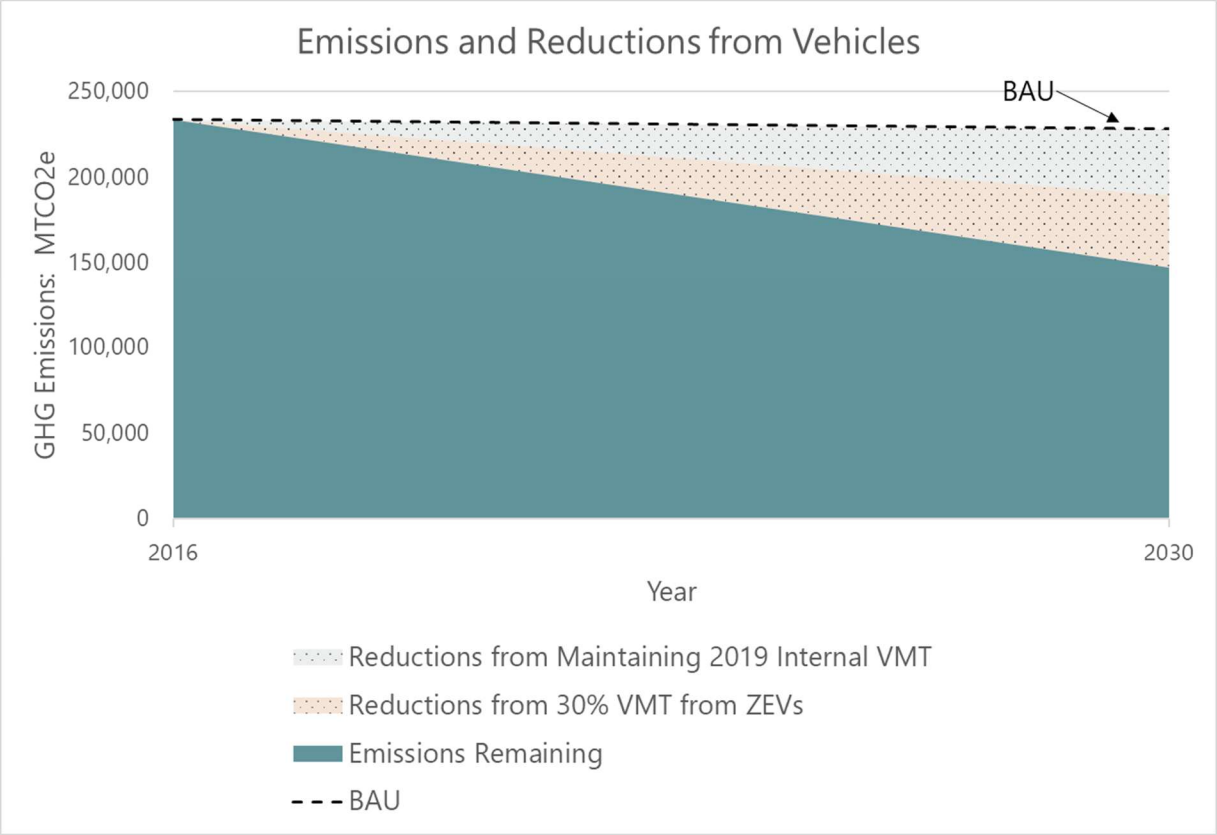


Figure 8: Projected emissions reductions from electric mobility and decreasing dependence on cars, compared to the emissions in the business as usual scenario.

WHAT IT MEANS

Reductions in GHG emissions from the transportation sector will require a transition to clean, low-/zero-emission vehicles while simultaneously enhancing community mobility through increased access to bicycle, pedestrian and public transit modes of transportation to decrease community-wide vehicle miles traveled (VMT). Transportation related emissions account for approximately 30% of Flagstaff's community-wide GHG emissions. In addition to reducing VMT, making progress toward more efficient and lower-carbon vehicles is critical.

HOW WE'LL GET THERE

The future of mobility is electric, mainly due to advances in technology and momentum from the market. Flagstaff can welcome this future by helping increase the speed of the electric mobility transition in Flagstaff. As Flagstaff works to reduce vehicle miles traveled and help folks take non-car modes of travel, electric mobility can play a part in making transit and active transportation more affordability, easier to use, and cleaner.

Electric buses: As we work to increase transit use across Flagstaff, we want to transition our bus fleets from gas or diesel fuels to electric power. Electrification of the bus fleet will require a significant investment from bus fleet operators, including but not limited to Mountain Line, Northern Arizona University and Flagstaff Unified School District. Electrification involves planning for electric charging locations and capacity, operational changes, and coordinating charging schedules, in addition to the acquisition of an entirely new and operationally appropriate bus fleet. The City will work to assist these organizations in their planning for the transition to electric buses, from grant-writing support to charging infrastructure planning.

Mountain Line, Flagstaff's transit provider, has begun planning for a transition to zero emissions vehicles – they recently published a Zero Emissions Bus Transition Plan, and determined to move forward with a battery electric bus transition.[16] Implementation will occur "project by project, bus by bus as funding and interest allows."

Electric micro-mobility: Adding electric power to simple, small transportation devices – such as bikes – is a relatively simple change that transforms the device into a much more accessible and practical transportation option. Electric bike use is rapidly accelerating across the globe, as batteries become smaller and less expensive, and as more people realize the incredible benefits of electrification.

What is electric micro-mobility?

Micro-mobility technology is a rapidly-evolving category of light-weight individual transportation devices. Examples include electric bikes (e-bikes), electric scooters, Segways, electric skateboards, and hoverboards.

While these devices represent very new ways of travel, they are already present in our community, obtainable at local and national retailers, and are already providing accessible, affordable, low-carbon transportation options.

See page 64 for a discussion of how micro-mobility can reduce vehicle miles traveled.

Electric micro-mobility devices are popular for a multitude of reasons: they move people around more quickly than a traditional bicycle or scooter and with significantly less effort – now a five mile commute with hills can be done with far less effort and sweat, making e-bike commutes much more attractive. These devices use very little fuel, or electricity, especially when compared to the gas used to move around a one-

[16] https://mountainline.az.gov/about-us/reports-plans/zero-emissions-bus-zeb-transition-plan/

ton vehicle. This saves money on gas, as well as vehicle wear and tear and maintenance. These devices remove traffic from the road and have a very small footprint, reducing congestion and parking demand – after all, a small scooter is a much more appropriate, efficient and proportional tool to move one person than a car or an SUV. And finally, these devices are popular because they are fun to ride.

The City of Flagstaff can work to welcome these devices in our community and to encourage their use. While these devices represent change in the way we travel, they have numerous personal and community benefits, including that they are a very low-emissions transportation option. Many of these devices could already be found on our neighborhood streets in 2021, whether a senior is taking an e-bike to see their grandchildren, a 10-year-old is using a hoverboard to go to a neighbor's house, or a student is taking an electric scooter to get to class. The City will need to work to incorporate these devices into our transportation planning efforts, so that people using micro-mobility devices have safe options for traveling both within neighborhoods and across town.

Electric vehicles: The widespread transition to zero-emission vehicles is a long-term strategy. The City of Flagstaff can support this transition by investing in and encouraging the necessary supporting infrastructure. Investment and encouragement can occur through codes, partnerships, incentives and other methods that improve the ability of residents to purchase and operate electric vehicles compared to conventional gas-fueled vehicles. For example, charging stations help EV owners fuel their vehicles – the City will encourage businesses and public buildings to install charging stations. In 2020, the City installed four charging stations in City Hall for use by City fleet vehicles as well as the general public. The City can also work through codes: the current Flagstaff building code, adopted in 2019, requires a 240 volt outlet to be installed in new garages – a small, inexpensive and simple modification that ensures the home, which will be around for at least 80 years, is ready for the rapidly approaching future of electric vehicles. This upgrade means a homeowner will not need to perform a costly retrofit to charge their vehicle, saving hundreds of dollars or more.

In addition, the City of Flagstaff will look to transition our own fleet while educating, encouraging and helping facilitate partnerships so that other local fleets might also make the electrification transition over time. We know that it matters which vehicles are electrified – by prioritizing the transition of fleet vehicles and other high usage vehicles that drive a disproportionate number of miles, we can expect to see an outsized impact. For example, if the top 20% of vehicles by mile are electric by 2030, the reduction in fuel use will be considerably larger than 20%.

While the City of Flagstaff can support the transition to EVs by taking early action to establish infrastructure, a considerable amount of the momentum for EV adoption will come from the private sector. Many of these factors are currently unknown or exist only as projections at this time. Some of these factors may include Federal incentives both for infrastructure development and for vehicle purchase. Some of these factors will be market driven – Tesla for example has installed 12 SuperChargers in Flagstaff, and according to ChargeHub there are an additional 50 level 2 and level 3 charging stations in the City that have been installed by businesses and organizations on their own accord.

EQUITY AND ADAPTATION CONSIDERATIONS

Equity: New EVs and electric micro-mobility options can be cost-prohibitive for many. This threatens to leave some populations out of the electric mobility transition, and will likely mean that low-income communities must cope with the higher operating costs and unhealthier air associated with internal combustion engines for a longer period of time. To ensure widespread adoption and affordability for low- and middle-income households, the City will need to establish robust incentive programs.

Adaptation: As Flagstaff experiences the impacts of climate change, having diverse, clean, reliable mobility options will be vital. By creating more good transportation options, Flagstaff can ensure that if one mode of transportation becomes difficult, residents have other choices. Electric bikes are a great way to travel around Flagstaff, even on hot or windy days. Market trends show that electric mobility is the way of the future; by investing in infrastructure and incentives for these options, Flagstaff will be better prepared for these transportation changes.

TARGET AREA GOALS

Goal	Year
The City will provide 50 publicly available Level 2 electric vehicle charging stations	2025

STRATEGIES TO ACHIEVE ELECTRIC MOBILITY

EM-1: Advance the electrification of buses across Flagstaff.

Opportunities for action:

1. Mountain Line will electrify its bus fleet according to its Zero Emissions Bus (ZEB) Transition Plan.
2. NAU will begin electrifying its bus fleet, to comply with its under-development carbon neutrality plan.
3. Partner with the Flagstaff Unified School District to explore funding options for fleet electrification.

EM-2: Welcome electric micro-mobility devices as legitimate, healthy, affordable, and low-carbon modes of transportation.

Opportunities for action:

1. Establish an electric micro-mobility device share service.
2. Distribute electric micro-mobility rebates to community members through local businesses to reduce barriers to residents acquiring these affordable transportation devices.
3. Launch a micro-mobility collective purchasing cooperative to increase access to efficient and affordable modes of transportation.

EM-3: Support residents, businesses, and institutions in the transition to electric vehicles.

Opportunities for action:

1. Focus electrification engagement efforts on the vehicles that drive the most miles – for instance heavily used fleet vehicles.
2. Install electric vehicle charging stations at City facilities to serve the City fleet, City staff vehicles, and the public where appropriate.
3. Develop public and private partnerships for the installation of Level II and Level III DC fast-charging electric vehicle charging stations in publicly accessible parking areas along tourism corridors, at workplaces, and in multi-family housing developments.
4. Adopt a policy requiring 100% of new City fleet sedans and SUVs to be electric vehicles starting in 2022, complemented by aggressive goals to test, evaluate, and, where feasible, acquire electric vehicles for other light-duty, medium-duty and heavy-duty fleet vehicles and equipment categories.
5. Encourage and incentivize existing multi-family housing to offer electric vehicle charging stations.

Zero Emission Vehicles beyond Electric Vehicles

While electric vehicles appear to have the inside track for capturing the market on passenger and light-duty vehicles that produce zero tailpipe emissions, vehicles fueled with hydrogen represent another emerging technology that may also play a role. The City will actively monitor advances in technology, infrastructure and partnership opportunities to support wider-spread adoption of hydrogen vehicles.

Clean Electricity

Flagstaff will obtain as much of its electricity as possible from sources that do not produce greenhouse gas emissions.

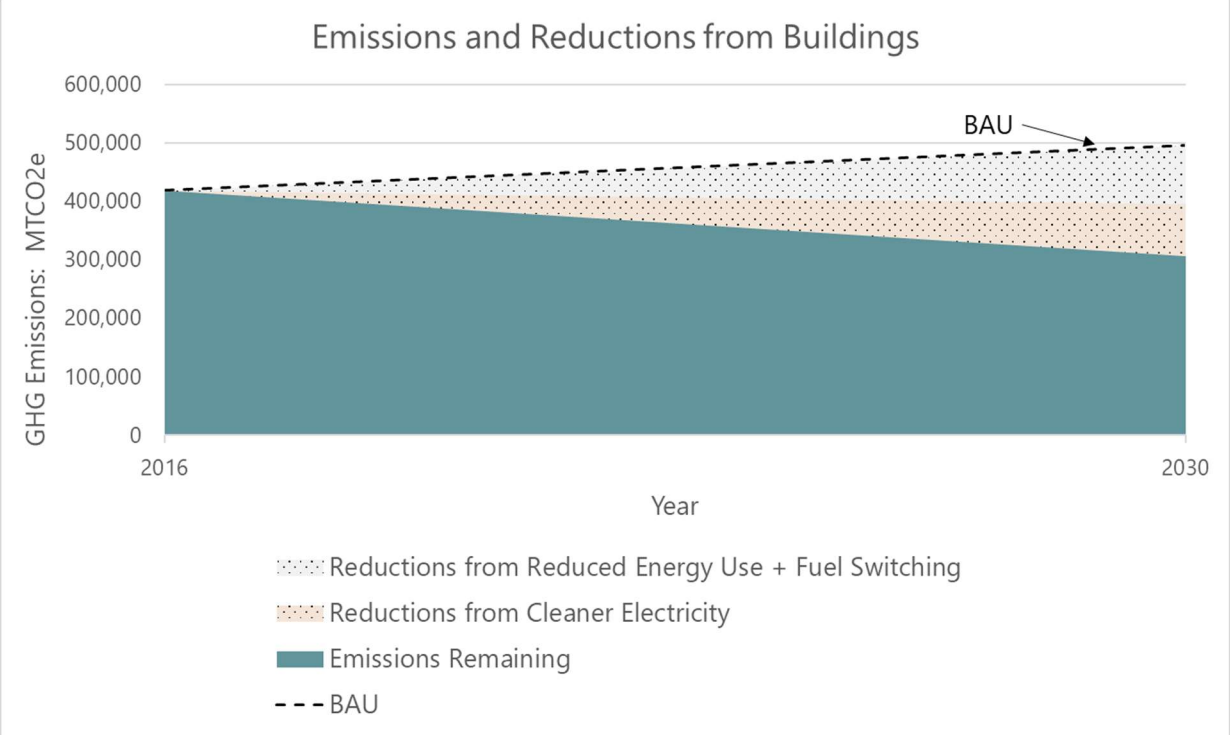


Figure 9: Projected emissions reductions from clean electricity and reducing building energy use, compared to the emissions in the business as usual scenario.

WHAT IT MEANS

Significant reductions in GHG emissions from both the built environment and transportation sectors can be unlocked with a rapid transition to clean, renewable electricity. With clean, renewable electricity available as a resource, appliances, vehicles, and other tools that directly utilize fossil fuels can switch onto this resource. (See Building Fuel Switching on page 92 and Electric Mobility on page 81).

Emissions from electricity currently constitute approximately 25% of all community emissions. This means that even without making any other changes (see the Electric Mobility, Building Fuel Switching, and Reduced Building Energy Use Target Areas, starting on pages 81, 92, and 100 respectively), a 100% clean electricity grid could eliminate one quarter of Flagstaff's emissions. In combination with the various fuel switching strategies, the impact of clean electricity could be even greater.

Are there negative impacts of renewable energy?

When new technologies emerge, there are often legitimate concerns that one bad thing (i.e., air pollution from coal) is just being replaced with another (i.e., waste from used solar panels).There are negative externalities associated with all forms of energy production. While we cannot avoid all negative impacts, we can choose the energy production methods that do the least harm to our environment and our community. The negative impacts of wind and solar are relatively modest, and are far outweighed by the positive impacts on air quality and reduced greenhouse gas emissions.

Large renewable energy projects sometimes face concerns about where turbines go after their useful life, or the amount of water used for large solar arrays. In fact, solar energy uses just 1% or 2% of the water used to create an equal amount of energy from coal or natural gas.[17] The City will continue to consider short- and long-term impacts to the environment and our community when developing renewable energy projects.

HOW WE'LL GET THERE

APS is the investor-owned utility that provides grid electricity to the community of Flagstaff. As of January 2020, APS has made a 'carbon free' commitment by 2050, with an expectation of 65% carbon free grid electricity by 2030. (See the APS Integrated Resource Plan.[18]) This is a 30% improvement compared to the local grid in 2020.

While APS makes the transition to renewable electricity, Flagstaff can increase the prevalence of local renewable energy projects such as rooftop or utility-sponsored community solar to achieve even greater near-term emissions reductions (third-party-sponsored community solar, where solar power projects generate electricity and benefits for multiple users, would require a change in State laws). The municipality can work with the utilities to develop large-scale renewable installations to power *municipal operations* with clean electricity. However, unless there are policy changes at the Arizona Corporation Commission (ACC) and/or APS, it is uncertain whether any additional electricity generated by these municipally-supported installations may be able to be directly acquired by, or attributed to, local residents or businesses. Flagstaff will continue to monitor the evolving electricity policy landscape and consider supporting actions that would unlock strategies for large scale renewable development for the community.

Clean electricity is just one of the many areas where we need to be open to innovation. While solar and wind are specifically called out in this Plan, there are other renewable energy options to explore. Additional technologies, like micro-hydroelectric power, may be incorporated during Plan implementation.

[17] https://nicholas.duke.edu/news/replacing-coal-gas-or-renewables-saves-billions-gallons-water
[18] https://www.aps.com/en/About/Our-Company/Doing-Business-with-Us/Resource-Planning

Until then, this Plan has been developed with only projected on-site residential and commercial installations being able to improve upon the APS grid forecast.

EQUITY AND ADAPTATION CONSIDERATIONS

Equity: Fossil fuels have historically inflicted severe harm to Black, Indigenous, and Hispanic communities through the extraction and combustion of these fuels. By shifting to clean electricity, the current impact these fossil fuels have on historically marginalized neighborhoods and communities can be decreased. To avoid future harm to these communities, they must be consulted prior to and during the development of solar arrays, wind farms, and other new, clean electricity infrastructure.

Adaptation: When developing the infrastructure for new electricity generation, both the City and APS will need to consider how the new developments will respond to shocks and stressors from climate change. A robust, interconnected electric grid with a multitude of battery backup options will be vital to building resilience in the energy sector.

TARGET AREA GOALS

Goals	Year
100% of municipal electricity use will be from renewables (%)	2025
68% of community electricity use from zero carbon energy (%)	2030

The Flagstaff City Council established a goal of 100% renewable electricity by 2050 through the 2018 Climate Action and Adaptation Plan. Our carbon neutrality models suggest that Flagstaff can achieve 68% clean electricity for the community by 2030. While we will endeavor to reach 100% renewable electricity prior to 2050, the current policy landscape suggests that 68% clean electricity is feasible for 2030.

STRATEGIES TO ACHIEVE CLEAN ELECTRICITY

CE-1: Produce 100% renewable electricity to cover all City of Flagstaff municipal electricity needs.

Opportunities for action:

1. Expand capacity of municipally owned property for on-site solar electric and solar thermal generation.
2. Replace or repair the co-digestion system at Wildcat Hill Water Reclamation Plant and increase clean energy production.
3. When landfill sections are completed and capped, install solar to support City energy usage and eventually connect to the electric grid.
4. Update the City of Flagstaff Sustainable Building Resolution, requiring that newly constructed municipal buildings be built to net zero energy standards.

CE-2: Increase renewable energy installations and usage in new buildings.

Opportunity for action:

1. Implement progressively more aggressive building codes, requiring net zero energy buildings by 2030. Net zero energy buildings often incorporate renewable energy installations – primarily rooftop solar- into the design and construction to offset onsite energy use.

Net zero energy buildings – Net zero energy buildings combine energy efficiency and renewable energy to use net zero energy. They use a low amount of energy due to being air-tight, well-insulated and energy efficient. They typically incorporate renewable energy generation on-site, like solar panels. Due to this low energy use paired with energy production, these buildings produce as much energy as they consume, which means that the occupants enjoy extremely low utility bills and a zero-emissions building.[19]

CE-3: Support solar installations on existing residential and commercial buildings.

Opportunity for action:

1. The Solar United Neighbors program will assist residents in obtaining solar electricity for a lower price.

[19] Learn more: https://zeroenergyproject.org/buy/zero-energy-homes

Solar electricity is now the least expensive source of electricity in history.

As of 2020, the International Energy Agency found that high-quality solar photovoltaic (PV) projects are the least expensive source of electricity in history.[20] Large solar plants with battery storage have decreased in price, making them competitive with natural gas. These developments will accelerate the rapid electrification of the electric grid. Market forces will help to facilitate this transition, but there remains a role for government policy makers to remove barriers to this transition, ensuring equity for communities that have been impacted by resource extraction and those that could be negatively impacted by the transition to renewable electricity.

Due to the low cost of solar, solar photovoltaic panels are a wonderful opportunity for Flagstaff residents and businesses to produce their own energy on-site, with financial and resilience benefits.

Legislative change

There are policies and strategies being pursued around the country that are not currently available to the City of Flagstaff because of State-level policies. Many of these strategies have the potential to unlock collaborations, financing and other opportunities that could positively contribute to the goal of achieving Carbon Neutrality.

The City will keep an eye on the policy landscape and may choose to lobby or otherwise advocate for some of these strategies including (but not limited to) Community Choice Aggregation, PACE financing (C-PACE and R-PACE), non-utility Community Solar and more. If any of these become available, this living document may be updated to incorporate the newly available mechanism(s).

The City of Flagstaff should also encourage the ACC and DOE to renew and increase renewable energy production incentives for residential and commercial solar and other distributed generation and storage projects, without additional metering fees or other disincentives.

[20] https://www.iea.org/reports/world-energy-outlook-2020/outlook-for-electricity

Project Highlight: Northern Arizona Solar Co-op with Solar United Neighbors

In partnership with the City, in 2021 the Northern Arizona Coop was organized through Solar United Neighbors, a non-profit organization that seeks to increase the access and affordability of solar energy.

Rooftop Solar and Prometheus Solar, two local Flagstaff installation companies, were selected by the Northern Arizona Solar Co-op to install solar for more than 80 households across Flagstaff, Sedona, and Coconino County. These installations are projected to result in:

- 647 kW of Solar installed
- 11,608 Metric Tons of CO2 avoided lifetime
- $1,845,219 invested in local businesses, jobs, and clean electricity

Building Fuel Switching

Flagstaff will shift our building fuel sources from fossil fuels to renewable sources and electricity for applications including space and water heating, cooking, and perhaps even industrial processes, thus taking advantage of the superior efficiency of electric appliances as well as the rapidly decreasing emissions of the electric grid.

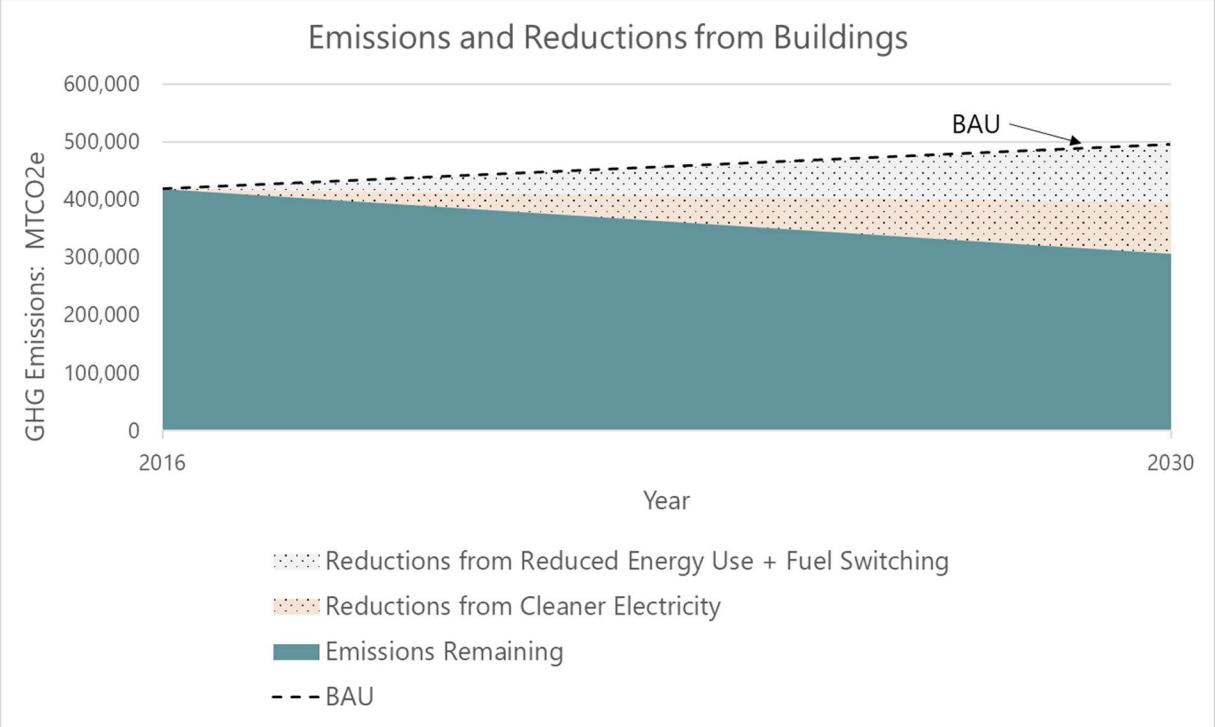


Figure 10: Projected emissions reductions from building fuel switching, compared to the emissions in the business as usual scenario.

WHAT IT MEANS

Fuel switching in buildings involves transitioning buildings from using appliances, processes and generators that directly combust fossil fuels on-site to ones that utilize decarbonized electricity (see the Clean Electricity Target Area on page 86) as well as solar thermal, biomass and other renewable sources of heat and energy. These on-site fossil fuels include natural gas, propane, and diesel. While switching fuel sources, it will also be necessary to ensure that the buildings are well sealed and energy efficient (see Reduced Building Energy Use Target Area on page 100) to manage fuel costs and electrical demand (when applicable).

When building fuel switching is accomplished by transitioning from the combustion of on-site fossil fuels to using electricity, the term “building electrification” is often used to be more specific. Like electric vehicles, building electrification can accomplish significant emissions reductions, but only if the source electricity is sufficiently clean. According to RMI, Arizona has already passed the tipping point in the decarbonization of the electricity grid, so that switching from a natural gas furnace to a grid-based electric heat pump for space and water heating will have an immediate emissions reduction benefit. Additionally, compared to a gas furnace, a heat pump installed in Arizona in 2020 and using grid-based electricity is expected to result in a net reduction in emissions of over 50% for the lifetime of the appliance.

HOW WE'LL GET THERE

"In every city we analyzed, a new all-electric, single-family home is less expensive than a new mixed-fuel home that relies on gas for cooking, space heating, and water heating."
– RMI, All Electric New Homes, a Win for the Climate and the Economy [21]

Approximately 45% of Flagstaff's building emissions, including approximately 56% of residential emissions, come from the on-site combustion of natural gas. Due to the relatively long lifetimes of buildings and appliances, actions now will be crucial for ensuring deep, rapid and long-term emission reductions. These actions include introducing education and incentives to ensure that when existing major appliances require replacement, electric and other renewable alternatives are adopted.

This Plan envisions the electrification of 12,500 major residential appliances as they require replacement as well as significant fuel switching in the commercial sector. Additional efforts can be made to encourage and incentivize electric-only new construction, which has been shown to offer net savings over the lifetime of the building.

[21] https://rmi.org/all-electric-new-homes-a-win-for-the-climate-and-the-economy/

Fossil fuels for low grade heat – like using a chainsaw to cut through butter

Imagine passing someone a stick of butter and asking them to cut it for you. When they leave the table to "get a tool" for the job, you'd probably expect them to grab a butter knife from the kitchen drawer. But instead they return with a chainsaw. Could the chainsaw accomplish the task of cutting butter? Sure. Is a chainsaw the right tool for the task? Certainly not. For the task of cutting butter, a chainsaw uses far more power than is necessary and is clearly wasteful. Similarly, for the task of low-grade space and water heating, on-site fossil fuel combustion uses far more power than is necessary and is wasteful - like using a chainsaw when a butter knife is available.

Even though gas furnaces have become more efficient in the past decades, they will never be able to compare to the performance of an electric heat-pump. This is because furnaces use energy to *generate* heat – while heat pumps primarily use energy to *transfer* heat from place to place, much like a refrigerator or air-conditioner. Indeed, heat pumps are basically air conditioners that can be reversed, meaning they provide both heating and cooling in a single appliance! Transferring heat requires far less energy than generating it, meaning that heat pumps can deliver the same amount of useable heat while using 2-5x less energy than even the most efficient furnaces. For the task of delivering useable heat, compared to a heat pump, even the most efficient furnace is a chainsaw.

To illustrate, consider that a 95% efficient EnergyStar furnace might be able to generate and deliver 950 BTUs/Hr of useable heat for every 1000 BTUs/Hr of gas energy input. BTUs are a unit of energy, and stand for British Thermal Units. Meanwhile, a heat pump is capable of transferring and delivering as much as 4000 BTUs/Hr or more of useable heat for every 1000 BTUs/Hr of electrical energy input. This is because the majority of the thermal energy delivered by a heat pump comes from the environment, not from the input source.

Based on information and image at: https://www.adams-air.com/houston/what-is-COP.php

In addition to being the right tool for the job of delivering low grade heat for space and water heating due to their superior efficiency, heat pumps and other electric appliances can also be powered by renewable sources. This combination means the lifetime energy use and emissions from the use of electric appliances can be far less than appliances combusting fossil fuels on site.

EQUITY AND ADAPTATION CONSIDERATIONS

Equity: Affordability is a significant concern for Flagstaff community members. When working to promote fuel switching, Flagstaff must carefully weigh the balance between climate action and affordability, with the understanding that both are critical to ensure true sustainability. We do not want a result of climate action to be higher cost of utilities for Flagstaff residents, many of whom already struggle to afford to live in Flagstaff.

When working to electrify homes, the City of Flagstaff will balance affordability and climate priorities. Fortunately, advancements in electric heating technologies, particularly through the use of heat pumps, mean that electrification does not necessarily result in higher costs. The Rocky Mountain Institute has found that electrification of space and water heating can reduce costs over the lifetime of the appliances, for both new buildings and some retrofits.[22]

The City will prioritize incentives in collaboration with local partners to make the cost of fuel switching competitive and even beneficial compared to remaining on fossil fuels. The City will work its partners to help residents utilize the latest technology, analyze policies for their impact of affordability, and ensure that electrification does not have detrimental effects, particularly for Flagstaff's low-income families. See the extended conversation about tensions on page 27 for more on electrification and equity.

Electrified homes and buildings may have more price stability, too. Currently, fossil fuels are subsidized and are associated with large externalities, mainly from the negative effects of their greenhouse gas emissions. Should a carbon price come into effect in the next decade, the artificial affordability of using on-site fossil fuels could be dramatically reduced or eliminated (see the Social Cost of Carbon section on page 44).

Adaptation: Surveys conducted throughout the Plan development process have demonstrated that electric grid reliability is a concern for many community members. This is valid, and electric utilities have much work to do in the next decade to bolster the grid for the renewable energy future. The City can support this transition and support grid reliability by implementing initiatives to reduce and manage energy demand - see the Reduced Building Energy Use Target Area on page 100).

[22] https://rmi.org/insight/the-economics-of-electrifying-buildings/

TARGET AREA GOALS

Goal	Year
Reduction in Natural Gas usage by Sector: Industrial: 0% reduction Commercial: 20% reduction Residential: 62% reduction	2030
12,500 residential properties (~50% of residential properties currently connected to natural gas) will have conducted a deep energy efficiency retrofit including the electrification of at least one major appliance.	2030
25% of commercial properties (not including NAU or municipal accounts) will have conducted a deep energy efficiency retrofit including the electrification of at least one major appliance. 15% of commercial properties fully electrify.	2030

Why don't we model natural gas reductions in the industrial sector?

While the low-grade heat used in residential and most commercial applications can be electrified or switched to other renewable sources relatively easily, many industrial processes require high heat or even use natural gas or other fossil fuels as a feedstock. Generally speaking, these are 'harder' problems from a decarbonization standpoint, and as an organization the City is less familiar with how fossil fuels are being used for industrial processes in Flagstaff, and is less well positioned to support Flagstaff industry in making these transitions. The City is prepared to develop education and incentive programs to support residential and commercial entities. While we are optimistic that industrial users will reduce their reliance on fossil fuels, including natural gas, due to our limited information and ability to directly support industrial users, we are not currently modeling any reductions from the industrial sector. Going forward we will look to learn more about the industrial users in our community and their use of fossil fuels, and will look for opportunities to support reductions.

STRATEGIES TO ACHIEVE FUEL SWITCHING

FS-1: Reduce or remove natural gas usage in municipal buildings.

Opportunities for action:

1. Develop and implement a Municipal Building Electrification Plan, to achieve net zero energy in occupied City facilities.
2. Obtain funding to build 100% electric buildings on new City of Flagstaff affordable housing sites, to support affordable living.
3. Electrify appliances during upgrades at existing City of Flagstaff affordable housing sites whenever feasible.

FS-2: Encourage new buildings to rely on the electric grid as their main energy source.

Opportunities for action:

1. Provide monetary incentives to builders that construct or retrofit to achieve net zero energy prior to 2030.
2. Provide incentives to builders to forego natural gas infrastructure in new sub-developments and new buildings.

FS-3: Support fuel switching in existing residential and commercial buildings.

Opportunities for action:

1. Establish a revolving loan fund for major appliance electrification upgrades and solar thermal hot water upgrades for residential and commercial properties.
2. Increase the pace of home and commercial electrification by funding home energy electrification rebates and completing home energy electrification via the Home Energy Retrofit Program.
3. Establish an Electrification Permit Fund to pay for the permits for existing households and businesses to electrify their appliances.
4. Develop incentives to promote the mass installation of solar thermal water heating within the community.

FS-4: Provide training and education on fuel switching.

Opportunities for action:

1. Fund and implement a contractor training program for solar thermal, electric water heaters, electric heat-pump space heaters, and conversions from gas to electric appliances.

2. Develop a program to offer technical assistance, help schedule contractors for fuel switching upgrades, and offer incentives above and beyond what is offered by the utility.
3. Create a Residential Energy Efficiency and Fuel Switching Information Hub for exchanging information about net-zero renovations, electrification, and at-home climate mitigation strategies.

Not Your Grandfather's Heat Pump

According to the Rocky Mountain Institute (RMI) "Heat pump technology has improved significantly in recent years, flipping a commonly accepted narrative that it is not an efficient or dependable heating source. Even accounting for reduced efficiency in extreme cold weather, our analysis finds that modern air source heat pumps are more than twice as efficient as gas furnaces."[23] Modern heat pumps are providing efficient heating in cold weather climates from Denver to Minneapolis to Fargo.

In addition to being able to pair modern heat pumps with smart and programmable thermostats, the main technological updates compared to heat pumps from even a decade ago are the inclusion of:

- Variable speed compressor technology
- Improved expansion valve technology
- Fans with electronically commutated motor (ECM) technology

Each of these technology improvements allow the unit to run at an optimized pressure/openness/speed to best meet the heating (and cooling) needs. Previous heat pumps without these features could typically had to be 'all on or all off,' which reduced performance.

Legislative change

Lobby at the Arizona Corporation Commission for more energy efficiency and electrification programs for all sectors.

[23] https://rmi.org/its-time-to-incentivize-residential-heat-pumps

PRIORITY THREE: WE WILL MANAGE OUR CONSUMPTION

Reduced Building Energy Use

Sustainable Consumption

Water Security

Reduced Building Energy Use

Flagstaff will significantly reduce greenhouse gas emissions from heating, cooling and powering buildings.

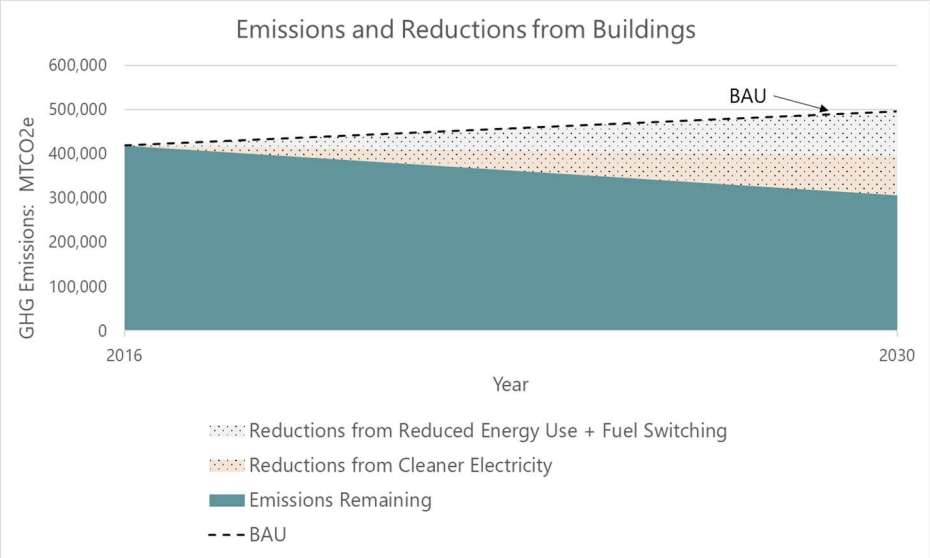


Figure 11: Projected emissions reductions from clean electricity and reducing building energy use, compared to the emissions in the business as usual scenario.

WHAT IT MEANS

Reducing energy demand is one of the quickest and most affordable methods to reduce emissions from buildings.

Whether for new construction or for retrofitting existing buildings, energy efficiency solutions are well understood. Weatherization improves the building envelope and insulation, while other solutions utilize technology (i.e. smart thermostats, energy efficient appliances, distributed energy storage) to optimize energy use. The payback on retrofits, depending on the building, is five to seven years on average.[24]

Reductions in building energy demand will provide immediate emissions reductions from the use of both electricity and natural gas, while also making our homes and businesses more comfortable to live in and more affordable to operate. While APS is making the transition to 100% carbon free electricity (see Clean Electricity Target Area on page 86), reducing building energy demand will also improve the ability of the

[24] https://drawdown.org/solutions/building-retrofitting

Utility to meet demand with cleaner fuel mixes. Reducing building energy demand is especially critical given the various fuel switching strategies in this Plan (see Building Fuel Switching and Electric Mobility Target Areas on page 92 and page 81, respectively). Fuel switching without energy efficiency measures will increase electrical demand significantly. Fuel switching combined with energy efficiency can temper or even reduce electrical demand, thus making it easier and less expensive to bring online the magnitude of clean electricity infrastructure required to meet our future needs.

What about water?

Producing the water that arrives at our taps and then treating it after its use utilizes energy at every stage of our water production and treatment processes. In Flagstaff, water is particularly energy intensive, as many of the wells we use to obtain drinking water are as deep as 1,000 feet or more. Water operations comprise most of the City of Flagstaff's energy use.

Energy use is carefully monitored by the City of Flagstaff's Water Services staff, who work to increase the energy efficiency of Flagstaff's water management processes. Staff also work to manage Flagstaff's water supply, plan for the future, and reduce water use through conservation – more on those efforts can be found at www.Flagstaff.AZ.gov/water.

This Plan, and the City's building energy use reduction efforts, consider water use to fall under the umbrella of building energy use. As water used in a home or a business represents energy use, water efficiency and conservation contribute to reduced community energy use. City staff will work across divisions to coordinate water and energy conservation initiatives.

HOW WE'LL GET THERE

Emissions from buildings currently constitute approximately 44% of all community emissions. To reduce energy demand Flagstaff must set aggressive reduction targets for both new and existing building stock. Due to their long lifetimes and the rate of growth in Flagstaff, it will be important to integrate more energy-efficiency technologies and infrastructure into new construction in the near-term through policies, incentives and economics. The 2018 Climate Action and Adaptation Plan forecast a goal of a net-zero construction code for all new residential and commercial buildings by 2040. This goal will be accelerated to 2030 with an intermediary glidepath to net-zero building code in 2025. While it is important for new buildings to be energy efficient, the existing building stock of 2021 is expected to make up over 90% of the community buildings in 2030. Therefore, it will be critical that a significant number of these buildings, especially the older and lower performing ones, undergo building retrofits to both reduce their energy demand and improve their comfort and utility for their occupants. This Plan envisions and supports performing home energy and electrification retrofits on 12,500 homes (~50% of the existing housing stock) in addition to a significant number of building retrofits in the commercial sector. Performing retrofits at this scale will be an enormous opportunity for jobs and partner collaboration.

EQUITY AND ADAPTATION CONSIDERATIONS

Equity: Three in ten households in the US face challenges in meeting their energy needs.[25] Low-income households face disproportionately higher energy burden – or the portion of gross household income spent on energy costs. According to the Department of Energy, low-income households spend 8.6% of their income on energy, compared to 3% for other households.[26] In Flagstaff, low-income households spend 13% of their income on energy each year; higher-income households spend between 1% and 3%.[27] This is a large energy burden that leads to a high cost of living, limited disposable income and financial insecurity for Flagstaff's low-income families.

Purchasing new, energy efficient technology or appliances often requires a significant up-front financial investment. While all households can benefit from the return on investment provided by energy efficiency, high up-front costs meant that not all households can access this investment opportunity that helps save money over the long term. This inequity can persist in incentives, where only those who have access to upfront funds to purchase the appliance are able to access the financial incentive.

Climate action in this target area will work to reduce the energy burden for low-income families, and work to provide emissions and cost-saving benefits equitably throughout the community.

Adaptation: More efficient buildings can help Flagstaff residents be more prepared for more extreme weather, like extreme heat, large winter storms, or extreme cold. By reducing the energy used in homes and other buildings, energy efficiency investments can lead to lower heating and cooling energy use, which leads to lower energy bills and lower reliance on outside fuels, which can be helpful during extreme weather.

Heat pumps are a climate mitigation tool that help residents heat their homes using electricity instead of fossil fuels. Heat pumps can also be used as air conditioners, which can help people with health conditions get through Flagstaff's hottest summer days, but also use a lot of energy. Currently, most homes in Flagstaff do not have air conditioning. As more homes in Flagstaff install heat pumps, more residents will have access to air conditioning, creating the possibility for increased energy use in the summer months. Energy-efficient building practices and demand management will be needed to ensure that Flagstaff's buildings are well-insulated and require lower amounts of both heating and cooling.

[25] https://www.eia.gov/todayinenergy/detail.php?id=37072
[26] https://www.energy.gov/eere/slsc/low-income-community-energy-solutions
[27] https://www.energy.gov/eere/slsc/maps/lead-tool

TARGET AREA GOALS

Goal	Year
Reduce greenhouse gas emissions from heating, cooling and powering buildings by 34% from BAU.	2030
Reduce electricity usage by building sector: Industrial: 0% reduction Commercial: 0% reduction Residential: 4% reduction	2030
Reduce natural gas usage by building sector: Industrial: 0% reduction Commercial: 20% reduction Residential: 62% reduction	2030

STRATEGIES TO ACHIEVE REDUCED BUILDING ENERGY USE

BE-1: Achieve net zero energy City of Flagstaff facilities.

Opportunities for action:

1. Perform a full-scale energy audit and implement recommended energy retrofits for all City of Flagstaff facilities from this audit.
2. Design and obtain funding for new City of Flagstaff Affordable housing sites to be net zero energy.
3. When retrofits at existing City of Flagstaff Affordable housing sites are made, implement efficiency upgrades to move the sites towards net zero energy.

BE-2: By 2030, require new homes in Flagstaff to be net zero energy homes.

Opportunities for action:

1. Implement progressively more aggressive building codes, requiring net zero energy buildings.
2. City staff should ensure the City's building code is reflective of rapidly changing technology related to energy efficiency, renewable energy, energy or battery storage, and electrification.
3. Provide incentives to builders to construct net zero energy buildings, prior to a net zero energy code requirement. Use these buildings to showcase the feasibility, benefits and innovation.
4. Require large new buildings and new neighborhood developments to submit c**arbon neutrality alignment statements**, to increase collaboration between developers and the City and to communicate how developments contribute to the City's carbon neutrality goals.

BE-3: Reduce energy use in existing buildings.

Opportunities for action:

1. Incentivize and subsidize home energy efficiency retrofits on a sliding scale based on income.
2. Establish a revolving loan fund for energy efficiency upgrades to make affordable financing available to both commercial and residential properties.
3. Work with real estate energy partners to obtain energy efficiency information during real estate transactions, such as requiring home energy efficiency scores when homes are sold or ownership is transferred.
4. Catalyze energy efficiency and more affordable living in rental housing, increasing energy efficiency in rental homes through incentives and potential minimum standards.
5. Expand energy efficiency outreach, including energy efficiency workshops, education on energy price signals, and how to navigate time-of-use pricing.

Why net zero energy homes?

Net zero energy homes are tied to the electric grid, and use a low amount of energy due to being air-tight, well-insulated and energy efficient. They typically incorporate some sort of renewable energy generation on-site, like solar panels. Due to this low energy use paired with energy production, these homes produce as much renewable energy as they consume over the course of a year, leaving the occupants with a net zero energy bill, and a carbon-free home.[28] Homes can be built as **net zero ready**, meaning they can become net zero with the installation of solar panels.

Net zero energy *ready* homes are already being built in Flagstaff – the Crestview neighborhood, by the developer Capstone, is comprised of all net zero energy ready homes – including the homes participating in the City of Flagstaff Community Land Trust Program.

The Department of Energy (DOE) has a Zero Energy Ready Home Program, to recognize ZERH homes and ensure "**outstanding levels of energy savings, comfort, health, and durability.**"[29] The DOE promotes the following benefits from zero energy ready homes:

- Improved home experience and lower ownership costs,
- Benefits to home builders, including customer satisfaction and lower liability,
- Support of a more resilient electric grid with lower peak demand, and
- Approximately $150 billion of utility savings and signification jobs benefits.[30]

Legislative change

This strategy would benefit from enabling legislation to allow:

1). Energy use disclosure and benchmarking for all buildings, and

2). An Arizona PACE program to encourage property owners to make energy-related investments and upgrades to buildings using a special property assessment, for both residential and commercial properties.

[28] Learn more: https://zeroenergyproject.org/buy/zero-energy-homes
[29] https://www.energy.gov/eere/buildings/zero-energy-ready-homes
[30] https://www.energy.gov/sites/prod/files/2020/08/f77/Zero%20Energy%20Ready%20Homes-%20Why%2C%20What%2C%20and%20How.pdf

Sustainable Consumption

Flagstaff will move towards sustainable consumption, divert more materials from the landfill through reuse and recycling, and then reduce emissions from the landfill.

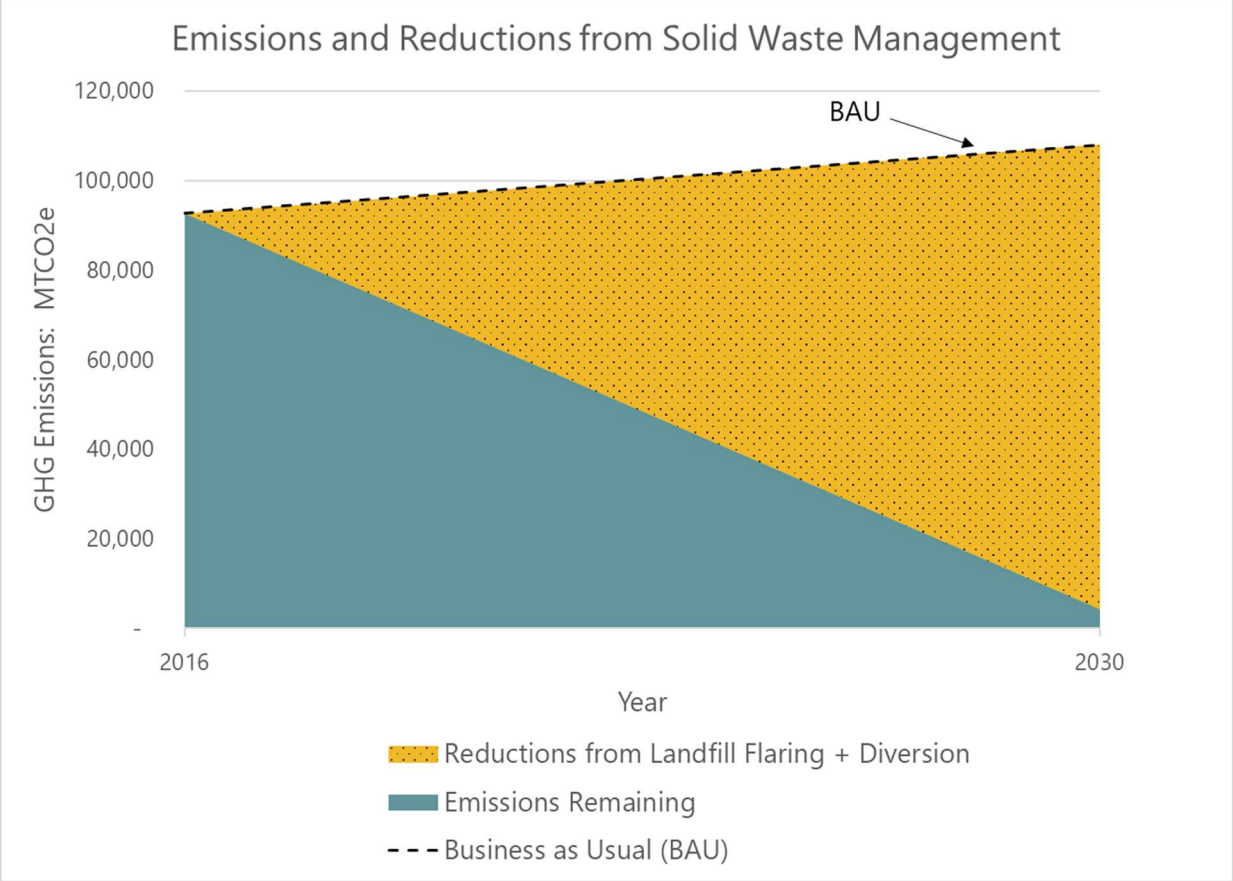


Figure 12: Projected emissions reductions from solid waste management, compared to the emissions in the business as usual scenario.

WHAT IT MEANS

Given our current sector-based inventory methods (see page 157), community emissions related to solid waste come almost entirely from landfill gas, a natural byproduct of the decomposition of organic material. Landfill gas tends to be 40-60% methane, with the rest being carbon dioxide and other non-

methane organic compounds. Methane is a potent greenhouse gas that is 28-36 times more effective than carbon dioxide at trapping heat in the atmosphere over a 100-year period.[31]

HOW WE'LL GET THERE

While reported emissions related to solid waste account for approximately 16% of Flagstaff's current emissions profile, the impact of waste and consumption is likely to be significantly underestimated due to the fact that Flagstaff currently conducts a sector-based rather than a consumption-based inventory (see the Sector-Based Greenhouse Gas Inventory section on page 157). Therefore, many of the prevention actions in this Target Area are expected to have unmeasured beneficial impacts beyond even what can be captured using our current methods of measurement. Additionally, many of the actions in this Target Area offer environmental, economic, and social co-benefits. For example, actions such as rescuing edible food from the landfill and redistributing to food donation programs not only reduces methane emissions, it also helps to address hunger in local communities.

The main strategy in this Plan for managing landfill emissions calls for installing gas collection systems at the Cinder Lake Landfill. This should include pre-installation of a horizontal gas collection system during the construction of the next landfill cell, which is expected to get underway in the next 5-7 years. This next landfill cell will also be lined, which will help maximize the efficacy of the pre-installed gas collection system. Retroactive installation of a gas collection system within the currently open and unlined cells, which are expected to be closed and capped between 2026-2029, may not achieve optimal collection efficiency, but this voluntary action would be supported by the Arizona Department of Environmental Quality. Analysis will need to be conducted to determine the gas collection efficiencies that can be achieved for these unlined cells, and the emissions and reductions projected can be updated as more data becomes available. Flaring was chosen over other potential options (i.e. gas to energy) for the currently open cells after assessing the expected returns and determining that they did not justify the increased price. Flaring has been shown to have a 98% methane destruction efficiency, meaning that it destroys 98% of the gas collected.

The City of Flagstaff ReThink Waste Challenge is a program that joins innovation, equity, and waste minimization. By providing funding to innovative projects focused on decreasing waste, entrepreneurs are better able to implement strategies to decrease waste in the Flagstaff community.

Finally, it should be noted that the ReThink Waste Plan was adopted by resolution in 2018, the same year as the Climate Action and Adaptation Plan (CAAP). These two plans were largely aligned in terms of goals and timelines. Given that the Climate Emergency Declaration has advanced the goals and timelines of the CAAP, the ReThink Waste Plan should also be updated. Indeed, the actions in this target area should be considered a starting point and sneak peek for some of the updates to come in the ReThink Waste Plan.

[31] https://www.epa.gov/lmop/basic-information-about-landfill-gas

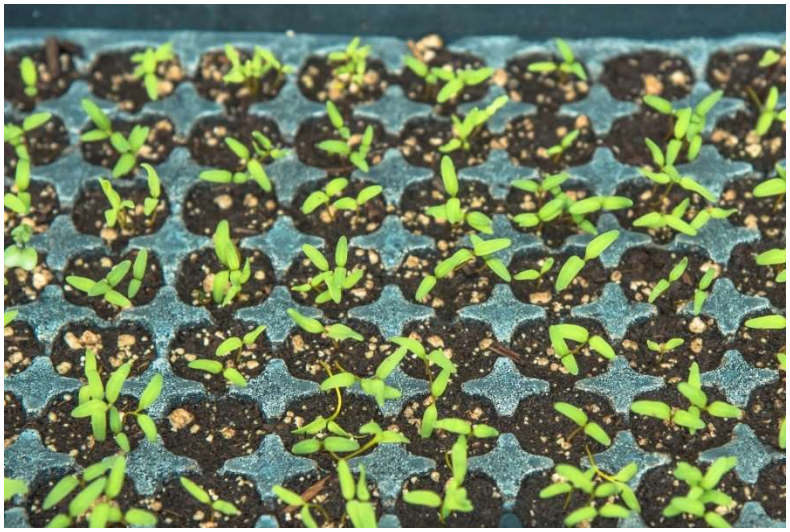
EQUITY AND ADAPTATION CONSIDERATIONS

Equity: Programs to incentivize decreasing waste and overall consumption can be financially beneficial to low and middle income households that produce little waste. The Pay as You Throw pilot program is an example of this, where those who produce little waste will pay less than those who create more. However, some low- and middle-income households inherently produce more waste due to factors such as family size, age, or disability. These factors must therefore be considered when creating and implementing waste reduction programs in order to create effective policies that decrease waste in an equitable manner.

Adaptation: Ideas behind decreasing waste and consumption sometimes rely on purchasing reusable items, under the assumption that all people can afford to buy these items. However, we can learn from the most sustainable among us - those who have decreased waste out of necessity; reusing jars and containers instead of purchasing a new Hydro Flask bottle or package of Tupperware actually does more to decrease consumption. Flagstaff can learn from the ingrained resilience and wisdom of our elders that exists within our community.

TARGET AREA GOALS

Goal	Year
Reduce methane emissions from the landfill by up to 98%	2030
Ensure equal access to recycling services across Flagstaff.	2030
80% community waste prevented and diverted from landfill	2030



STRATEGIES TO ACHIEVE SUSTAINABLE CONSUMPTION

SC-1: Manage emissions from the Cinder Lake Landfill.

Opportunities for action:

1. Establish gas capture and flare systems at the Cinder Lake Landfill.
2. Explore the feasibility of a large-scale digestion or other composting mechanisms.

SC-2: Encourage sustainable consumption.

Opportunities for action:

1. Expand educational programming to encourage sustainable consumption by residents and businesses.
2. Collaborate with local and regional partners to reduce construction and demolition waste.
3. Encourage low-carbon food consumption.

SC-3: Divert more waste from the landfill.

Opportunities for action:

1. Convert the materials recovery facility (MRF) to a transfer station to expand allowable recyclable materials and increase diversion from landfill.
2. Utilize MRF space for a Center for Hard to Recycle Materials (CHARM). Host regular community events and drop off days at this facility and partner with businesses to divert the material.
3. Incorporate residential "Pay as you Throw" volumetric pricing to divert more waste from the landfill.
4. Complete waste characterization study to identify recoverable materials that create economic development opportunities.

SC-4: Reduce organic waste going to the landfill and reduce food insecurity.

Opportunities for action:

1. Expand composting services to reduce food waste and yard waste going to the landfill, starting with a drop off composting service for residential customers and eventually offering curbside collection service.
2. Offer a composting service to commercial customers.
3. Expand educational programming to prevent wasted food in households and businesses.
4. Work with local partners and provide municipal support and resources to maximize food rescue and redirect that food to help address food insecurity in our community
5. Incentivize or mandate the use of locally produced compost to increase demand.

The importance of developing a market for compost material

A composting operation large enough to accept Flagstaff's organic waste will be a major financial investment. In order for the operation to be successful, there needs to be a robust market to sell finished compost and drive greater organic waste diversion. If there is too little demand for compost material, the price of the material will be too low to justify the investment. Thankfully, there are great examples of jurisdictions across the county that we can look to for examples of how to boost demand for compost material. States such as Washington, Oregon, and others require its use in highway development and stormwater infrastructure, while other communities encourage the use of compost as part of new housing developing. Not only does this help sustain composting programs but it also improves soil quality and sequesters carbon.

Water Security

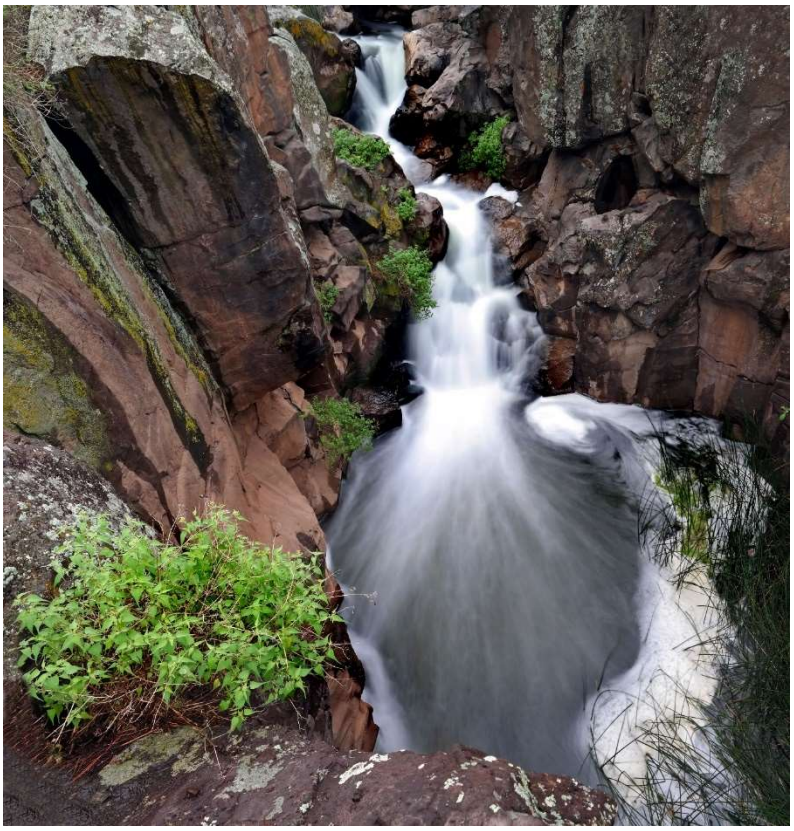
Flagstaff will ensure that water resources are distributed equitably and sustainably, the community is empowered to use water efficiently, and water and wastewater treatment minimizes greenhouse gas emissions.

WHAT IT MEANS

Water Security refers to the surface water, groundwater, and reclaimed water that serve our residential, commercial, industrial, institutional, 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.

The treatment and conveyance of Flagstaff's water supply and wastewater emit a considerable quantity of greenhouse gas emissions. Actions to minimize water use and optimize treatment and conveyance processes can help lower the community's greenhouse gas footprint.

Nearly 80% of Flagstaff's water comes from forests at high risk of significant wildfire damage. Despite progress in water conservation, as our population grows, tourism increases, and the climate changes, we expect water demand to increase while climate change stresses our water resources.



Our water comes from forests at high risk of significant wildfire damage. Despite progress in water conservation, as our population grows, tourism increases, and the climate changes, we expect issues like wildfires or reductions in snowpack and snowfall will stress our water resources. Our community will need to be ready to fund larger or more innovative water infrastructure projects.

Water Supply, Quality, and Infrastructure
Vulnerability to Climate Change

By 2100, Flagstaff communities are likely to face:

HIGH VULNERABILITY	MEDIUM-HIGH VULNERABILITY	HIGH VULNERABILITY
Reduced water availability and increased demand are expected to accelerate the need to develop new water supply projects.	More wildfire, drought, and flooding are likely to impair water quality.	More wildfire and flooding is likely to significantly damage natural and human-made water infrastructure.

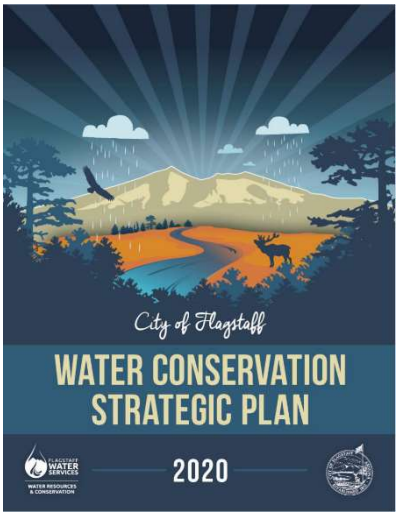
HOW WE'LL GET THERE

The City of Flagstaff works to provide water, wastewater, and stormwater services that meet the present and future environmental, health and safety needs of the community. A reliable water supply is essential to maintaining our community's economic vitality and overall sustainability. The City works in a variety of ways to ensuring water security and sustainability:

- The City of Flagstaff has been using reclaimed water to off-set potable water used for irrigation since 1966.
- The City's Water Conservation Program provides numerous incentives to Flagstaff residents for water conservation measures including rainwater harvesting, changing out high water use fixtures, and efficient landscapes.
- The City has tiered water rates for the single-family residential sector, the highest water use category by volume.
- The City's Water Services Division has conducted energy audits of their water and wastewater treatment facilities to identify ways to reduce energy consumption.
- Due to water conservation efforts of the City and residents, water use per capita has decreased approximately 50% in the past 40 years.
- The City of Flagstaff has a 100-year Designation of Adequate Water Supply from the Arizona Department of Water Resources, demonstrating the City's commitment towards securing a long-term water supply.
- The City will ensure that Flagstaff has adequate water supplies, now and into the future. The City of Flagstaff Water Services Division is working to meet the present and future needs of the Flagstaff community through long-term planning, upcoming rate studies, and continuing conversations with the community. The City will employ a variety of strategies to achieve its climate and water goals, such as: Conserving water through infrastructure that enables and expands water reuse.
- Maintaining forests and ecosystems through management is vital for watershed function and health.
- Reducing water use through conservation, reducing the use of energy for water delivery and treatment and protecting vital resources.
- Promotion of natural drainage systems and low impact development to reduce flooding and stormwater issues that may be exacerbated under future climate conditions, as well as recharge aquifers.

Additionally, the City of Flagstaff will work to better understand the greenhouse gas emissions from water production, delivery, and wastewater treatment in the public and private sectors. It will begin to track the kilowatt hours (kWh) and greenhouse gas emissions per gallon of water produced, for both potable and reclaimed water.

The **Flagstaff Water Conservation Strategic Plan** was adopted in December 2020, to plan for the expansion and improvement of water conservation efforts at the City of Flagstaff. The Plan recommends implementing expanded water conservation efforts to improve Flagstaff's sustainability as a community through long-term water resource reliability. Conservation is the least expensive means of meeting future water supply needs for the Flagstaff area.



Two policy proposals developed through this Strategic Plan are particularly relevant to climate action:

1. Amend the City of Flagstaff plumbing code to require WaterSense certification for new faucets, showerheads, and toilets.
2. Improve landscape design standards (including increased passive and active rainwater absorption) as well as the removal of problematic plants from the current landscape design plant list.

TARGET AREA GOALS

Goal	Year
Ensure a secure and sustainable water supply that is accessible and affordable in the face of climate change impacts.	2030
Conserve community water resources by maximizing water efficiency and supporting innovations in water resources, including within stormwater, groundwater, surface water, and reuse systems.	2030
Reduce greenhouse gas emissions from water production and delivery and wastewater treatment in the public and private sectors.	2030

STRATEGIES TO ACHIEVE WATER SECURITY

WS-1: Improve water infrastructure and expand water reuse.

Opportunities for Action

1. Evaluate the greenhouse gas emissions and financial impacts of potable reuse, water importation, and groundwater pumping.
2. Incorporate enhanced energy efficiency and smart controls into water production and wastewater treatment designs on new projects and upgrades of existing equipment.
3. Increase the efficiency of municipal irrigation systems and practices.
4. Purchase backup generators for the Flagstaff water and wastewater infrastructure system in order to achieve the City Council's goal of providing a "sustained minimal" level of water services in the event of a catastrophic power loss.
5. Evaluate the viability and costs of new advanced reclaimed water treatment technologies to increase water quality for potable reuse.
6. Update the Water Resources Master Plan to ensure a long-term sustainable and secure supply when faced with climate-related hazards.
7. Evaluate options for enhancing resiliency of the reclaimed water system, such as additional storage and looped piping.

WS-2: Improve ecosystem management for protection of water resources.

Opportunities for Action

1. Maximize groundwater recharge, such as by prioritizing the use of reclaimed water to recharge aquifers and protecting recharge zones in perpetuity.
2. Evaluate landscape and stormwater codes for suitability with projected changes in temperature and precipitation, and how effectively the codes support the development of green infrastructure.

WS-3: Continue to support water conservation efforts across the Flagstaff community.

Opportunities for Action

1. Expand public education on water conservation and the "one water" concept, which says that all water is reusable.
2. Work with high water users within the non-residential customer classes to maximize water use efficiency.
3. Develop policy and processes to evaluate water use and community benefits such as economic development when permitting new businesses and community events.
4. Evaluate the viability of introducing various water conservation requirements for new construction, such as rainwater harvesting for irrigated spaces.
5. Create a repair loan program for City customers to encourage repairs to aging water infrastructure in homes and businesses.
6. Increase participation in water conservation incentives and rebates for indoor and outdoor water use efficiency, as recommended by the City's 2020 Water Conservation Strategic Plan.

WS-4: Maximize passive and active community rainwater infiltration.

Opportunities for Action

1. Increase implementation of low impact development and water programs, including rainwater harvesting, the low impact development ordinance, and the NPDES Section 402 Program.
2. Maintain the rural floodplain ordinance.
3. Commit funding for new and the replacement of old stormwater infrastructure to ensure adequate sizing to accommodate anticipated precipitation changes.
4. Create a watershed management plan.

WATER SECURITY TENSIONS

A reliable water supply is essential to maintaining our community's economic vitality and overall sustainability. The City's Designation of Adequate Water Supply links water supply to future water demands for all unbuilt plats and parcels in Flagstaff, planning 100 years into the future. However, climate change poses threat to Flagstaff's water supply, requiring us to make difficult decisions as we work to provide water security for the community. The majority of Flagstaff's water is sourced from the C aquifer, an underground water source that is maintained (recharged) largely through the melting of snowpack and reclaimed water discharged into the Rio de Flag. Climate change will shift more of Flagstaff's precipitation from snowpack to rain, which could decrease aquifer recharge. Continuing to be innovative and focused on water efficiency and water conservation is essential going forward.

The other primary source of Flagstaff's water supply is surface water from Upper Lake Mary and water from the Inner Basin of the San Francisco Peaks. Both supplies are within forested, undeveloped watersheds of the Coconino National Forest, and at high risk for wildfire. Protecting these supplies from catastrophic wildfire is a key priority of the City, with watershed health programs funded through a water rate designated for that purpose. What are options for future water sources? One option is to expand groundwater development onto the City's Red Gap Ranch, located 40 miles east of Flagstaff with access to the C-aquifer, the area's largest and deepest underground water source. While this option ensures access that would increase the City's groundwater resource capacity, pumping and transportation infrastructure would be needed to deliver water to Flagstaff, including a 40-mile pipeline and booster stations to bring the water up 2,000 feet of elevation to the city. The water at Red Gap Ranch is slightly saltier than Flagstaff's current water supply and may need treatment before consumption, a process that would further increase energy use for the production of this water.

Another option is to investigate the opportunity for storm water to either serve as a water supply or to offset potable water uses.

Lastly, is the significant opportunity Flagstaff has to advance the treatment and reuse of reclaimed water. Increased use of reclaimed water whether directly or via recharge lessens demand on other water sources. However, this framework would require difficult community and municipal discussions of current water management systems and would involve new expensive treatment infrastructure development to accommodate the framework's implementation.

Flagstaff's current water supply is also subject to higher demand as the city's population and visitation increase. Adjusting current water management to include future demand will require the City to seek out new innovative solutions and consider the cost of building new infrastructure as well as the associated long-term greenhouse gas emissions. As Flagstaff considers future water security and its climate goals, the City will have to weigh the emissions, financial implications, and long-term resilience associated with various water sources and management strategies.

PRIORITY FOUR: WE WILL UPHOLD OUR COMMITMENTS

Healthy Forests and Open Spaces

Health and Safety

Economic Prosperity

Carbon Dioxide Removal

Healthy Forests and Open Spaces

Flagstaff will support thriving local ecosystems that are resilient to climate change, publicly accessible, and store carbon dioxide.

WHAT IT MEANS

Healthy Forests and Open Spaces refers to ecosystem health, environmentally sensitive lands, plants, soils, and wildlife in the context of the conservation and protection of natural systems. This target area also includes open spaces that protect environmental quality and biodiversity, support tourism, and protect historic and cultural resources.

Flagstaff is fortunate to have a bounty of beautiful natural spaces that provide multiple benefits for the community, including the provision of clean air and water, recreational opportunities, and wildlife habitat. Many of Flagstaff's natural systems and surrounding natural areas will be impacted by climate change, threatening important services such as water filtration, flood abatement, recreation, and fire protection. Changes in temperature, snowpack, and the abundance of diseases and pests will stress Flagstaff's surrounding forests and the species that depend on them. Although not formally accounted for in Flagstaff's greenhouse gas emissions inventory, natural ecosystems such as forests capture and store carbon, acting as a greenhouse gas "sink." Proper ecosystem management can optimize this process of carbon sequestration, as well as minimize the potential risk of greenhouse gas emissions from wildfires.

The ponderosa pine forests of northern Arizona have existed for thousands of years and evolved to benefit from frequent fires ignited by both seasonal monsoonal weather patterns and cultural burning practices. Unfortunately, more than a century of fire suppression-based management has left the forest in an altered condition. These changes threaten Flagstaff's natural resources, economy, infrastructure, and quality of life, which negatively impact recreation and tourism-based economies.

The threats and preventive solutions are complicated but well understood. Restoring the forest to its natural, fire adapted pattern can mitigate unnatural wildfire threats. Long term forest restoration strategies will also stabilize and enhance carbon storage. Collaborative efforts that involve agencies, communities and stakeholders are required to advance risk reduction projects.

Forest Health and Wildfire

Vulnerability to Climate Change

By 2100, Flagstaff communities are likely to face:

HIGH VULNERABILITY	HIGH VULNERABILITY	MEDIUM-HIGH VULNERABILITY	HIGH VULNERABILITY
Overall declines in forest health and widespread forest loss due to wildfires, drought, pests, and invasive species.	Larger, more frequent stand-replacing wildfires.	Larger, more frequent flooding after wildfires. More floods in general.	More beetle infestations and invasive species due to warmer, drier conditions.

Good Fire and Bad Fire

Fire plays a central role in structuring and regulating the function of forest ecosystems. The ponderosa pine ecosystem surrounding Flagstaff evolved to tolerate and flourish amidst regular fires of lower intensity. Low-severity fires are a natural part of Flagstaff's ecosystem – and a key component of the health of our forests. This is what we refer to as '**good fire,**' which burned young trees and forest floor materials.

As the Flagstaff region grew in the second half of the 20th century, the natural fire regimes were interrupted through fire suppression. Fire was often viewed as bad, leading to efforts to prevent or reduce the growth of all wildfires. This continual fire suppression in the forests of the western US resulted in substantial changes to forest structure, composition, and function. This resulted in dense forests and hazardous amounts of fuels in the forest, leading to the high-severity, stand-replacing fires we see across the west today.

Ecological restoration and fuels reduction programs – such as thinning or prescribed fires - attempt to assist in the recovery of ecosystem function in forests where the fire regime has been disrupted. This is an attempt to restore 'good fire' to the landscape. As Flagstaff seeks to restore forest health and become a fire adapted community, the community will need to continue conversations on how to support a fire-adapted forest and encourage the 'good fire' that is essential for our ecosystem.

Adapted from the Northern Arizona University Ecological Restoration Institute's online resource on ponderosa pine ecosystems: https://eri.nau.edu/research-topic/ponderosa-pine-ecosystem/

Walker Lake - Then and Now

These two photos document the same place – Walker Lake, north of Flagstaff – and illustrate the landscape changes after decades of fire exclusion.

Top photo: Walker Lake in 1875 by John Hillers

Bottom photo: Walker Lake in 2004 by Neil Weintraub

HOW WE'LL GET THERE

Environmental systems—including the Rio de Flag watershed, grasslands, wildlife corridors, cultural sites, sites of community significance, and biodiverse wildlife and plant habitats—provide benefits to the Flagstaff community. Ensuring that the forests in and around Flagstaff are healthy can reduce wildfire risk, increase climate resilience, and sequester carbon by facilitating the historic ponderosa pine ecosystem.

The City of Flagstaff is working to reduce the risk of unnaturally severe wildfires, restore the structure, pattern, composition, and health of fire-adapted ecosystems, and provide for wildlife and plant diversity. Much of this work depends on our ability to secure funding, work with regional and federal partners, and support forest-product industries. Focus areas include:

1. Developing sustainable, appropriately-scaled business models to harvest, process, and sell the wood products removed during ecological restoration-based thinning.
2. Transforming fire management policies and funding to better support the implementation of ecologically appropriate fire.
3. Developing new collaborations and funding sources to ensure that we can achieve the desired forest health outcomes across priority landscapes.
4. Increasing public engagement and education to help prevent wildfires. As Flagstaff's populations grows and vulnerabilities increase, there may be an increase in human-caused fires. Educational outreach programs can help to prevent unnatural, high-severity wildfires caused by human activity.

Building on a track record of forward-thinking wildland fire management

In 1997, the City of Flagstaff established a Wildland Fire Management Program (WFM) to address wildfire risks within City limits. The mission of WFM is to protect Flagstaff's residents, resources, and priority watersheds from the effects of catastrophic wildfire. Our vision is a community where Flagstaff thrives due to the Wildland Fire Management program's ability to leverage its unique skills and knowledge with Wildland Fire Response, Forest Management and Firewise community engagement. This program has evolved to include multi-jurisdictional fire management and forest health partnerships.

In November 2012, residents of Flagstaff overwhelmingly approved a $10 million bond to support forest restoration work within key watersheds on the Coconino National Forest and on State and City lands. The Flagstaff Watershed Protection Project, led by the Wildland Fire Management Program, is a unique effort where forest restoration work on the National Forests is being funded by a municipality. This $10M investment is designed to mitigate between $573 million and $1.2 billion in future costs.

During the summer of 2020, the City of Flagstaff developed an innovative way to further invest in the prevention of undesirable wildfire impacts. The Water Resource and Infrastructure Protection fee is now included on City of Flagstaff water services monthly bills. This fee will support the Flagstaff Fire Department's Wildland Fire Management Program's ability to protect Flagstaff and its priority watersheds from the effects of catastrophic wildfire. A fee of $0.52 per 1000 gallons of water used will provide a reliable and stable source of funding for the Wildland Fire Management Program.

The continuing work to improve forest health, transform fire management, and protect public health is multi-faceted. Forest health and open space work often depends on diverse partnerships, complex projects, or decades-long planning efforts.

Carbon sequestration in fire-prone forests

Flagstaff's forests sequester carbon from the atmosphere. How do forest health improvements relate to carbon sequestration? Research at the University of New Mexico and the USDA Forest Service provides actionable information on the long-term carbon benefits of reducing high-severity risk:

Research Brief for Forest Managers: Carbon Sequestration in Fire-Prone Forests
Matthew Hurteau, University of New Mexico.
Malcolm North, USDA Forest Service, PSW Research Station

"As trees grow, they sequester carbon from the atmosphere, some of which is converted to wood. Carbon removed from the atmosphere and stored in trees provides a **climate mitigation benefit…**. On lands that are currently forested, increasing the climate mitigation benefit is more complicated than increasing the amount of tree biomass per unit area. **The role of disturbance in forested systems must be considered** since large-scale disturbances such as wildfire can release carbon back to the atmosphere."

"In the western United States, a long period of fire suppression has increased tree density and fuel accumulation. In forest types that were historically maintained by frequent, low-severity fire, fire suppression has increased the risk of high-severity wildfire. Fuels reduction treatments to reduce this risk and restore forests to a more open, fire-resistant structure are being widely implemented. These treatments **carry a near-term carbon cost** because standing tree biomass is reduced to reduce the risk of high-severity fire."

"However, **there are long-term carbon benefits from reducing high-severity fire risk.** By reducing tree density and fuels, and retaining large, fire-tolerant species, **carbon loss is reduced when a wildfire occurs.** Forest management based on ecosystem-specific practices will likely yield the greatest benefit in carbon storage and long-term stabilization."

"Management Implications:

- Consolidating carbon stocks in fewer, larger trees reduces the risk of carbon loss from fire.
- The pre-suppression forest structure provides the best target from maintaining sustainable carbon stocks and ecological function."

To review the full research brief and reference papers, see:
https://ucanr.edu/sites/CentralSierraForestry/files/330089.pdf

A few illustrative partnership efforts to date include:

- The **Greater Flagstaff Forest Partnership** is an alliance of environmental, governmental, and business organizations, working on forest ecosystem restoration in and around Flagstaff. GFFP has been supported by the City of Flagstaff since 1996.
- **Community volunteer events** on Flagstaff's legally designated open space properties remove invasive weeds that threaten natural ecosystems.
- The City has procured multiple rounds of grant funding to distribute HEPA air purifiers to residents who struggle during poor air quality events.

- In 2021, the Flagstaff Fire Department partnered with Summit Fire and Medical District, the International Association of Fire Chiefs, and the Nature Conservancy's North America Fire Program partnered together to host the first Prescribed Fire Training Exchange (TREX) in Arizona. This exchange brought together structural and wildland firefighters from nine agencies and partners in northern Arizona. The Flagstaff TREX crew accomplished 881 acres of prescribed fire on city and federal lands while training in prescribed fire, land management, the wildland-urban interface, and smoke management.

Flagstaff's Open Spaces

The Flagstaff community has access to over 3,000 acres of legally-designated open space properties within the City of Flagstaff limits, including Picture Canyon Natural and Cultural Preserve, Observatory Mesa Natural Area, and McMillan Mesa. These areas are managed to provide recreational and educational opportunities. Open Space Stewards – volunteers from our community – assist the City in maintaining open spaces and engaging the public.

To many Flagstaff area residents, open space is the defining feature of Flagstaff's character and attraction. Open space defines the region's quality of life, protects the region's ecological health, supports existing and future economic development, and preserves historic and cultural resources.

To ensure the continued preservation and sustainable enjoyment of our open spaces, the City works to improve the management of its 3,069 acres of protected open space. The City strives to improve ecosystem protection and open space access, such as through improved land management, improving trail linkages to open spaces, or developing partnerships with nearby landowners. Over the coming decades, the City seeks to identify and fund management at $100 per acre of designated open space.

Native plants and invasive weed control

Climate change can increase the damage done by invasive weeds. As the climate changes and as Flagstaff grows, the importance of native plants increases. Incorporating low-water native plants and climate-adapted native plants into Flagstaff's developed areas and neighborhoods helps to conserve water resources, provides habitat for animals and pollinators, and increases community resilience.

An increased focus on supporting native plants and removing invasive weeds will help Flagstaff to sustain our natural landscape. This will require engaging volunteers, creating regional partnerships, and engaging with the community. A coordinated strategy can support native plants in the built environment and natural landscapes. City standards and processes can also be revised to better support native plant restoration and control invasive weeds.

Finally, a changing climate will stress Flagstaff's dominant ponderosa pine ecosystem. Proactive land management can include collaborations to help Flagstaff plant communities adapt to a changing climate or restore areas after disturbance.

TARGET AREA GOALS

Goal	Year
Maintain ecosystems within and outside of the City of Flagstaff as dependable sources of recreation, economic prosperity, biodiverse plant and wildlife habitat, cultural identity, and spiritual connection in the face of a changing climate and expected ecosystem transitions.	2030
Strengthen ecosystem resilience to climate change with a focus on benefits provided by local ecosystems, including forests, watersheds, and wildland-urban interface areas.	2030
Incorporate the use of climate-adapted native plants in landscaping and restoration work in the built environment.	2030

STRATEGIES TO ACHIEVE HEALTH FORESTS AND OPEN SPACES

HF-1: Protect existing forests, resources, and meaningful open spaces.

Opportunities for Action

1. Support planning and zoning efforts that protect natural resources, including surface water resources.
2. Reduce urban encroachment into the forest, such as by promoting infill development as supported in the Regional Plan.
3. Integrate leave no trace into City programming, including Open Space, Parks and Recreation and the Flagstaff Fire Department programs.
4. Create dedicated funding for outreach and education related to the importance of Open Space preservation and to meet the changing needs of the Open Space section.
5. Increase funding for the procurement and management of legally designated open spaces.
6. Work with partners to map invasive plant infestations, seek funding and organize effective and well-coordinated programs, and work with development projects to create invasive species and weed management plans, to control invasive plant species across all jurisdictions.
7. Offer education, assistance, and incentives to private property owners to control invasive plant and weed species and replace them with climate-adapted native plants on their land.
8. Increase funding to manage the most aggressive and difficult to control weeds that have the greatest potential for negative environmental impacts, to replace them with climate-adapted native plants.

HF-2: Restore and maintain the natural fire-adapted structure and pattern of the forests of the greater Flagstaff region through collaboration with partners.

Opportunities for action

1. Identify additional permanent funding from the City of Flagstaff to support forest health improvements to reduce wildfire risk and provide ecosystem service protection.
2. Establish long-term governmental agreements with federal, state, local, tribal, non-profit and private partners to restore and maintain the national fire-adapted structure and pattern through forest thinning, prescribed burning, post-treatment monitoring, and invasive weed control.
3. Support restoration-based forest product industry innovation to use the abundant forest products resulting from forest thinning and restoration.
4. Increase capacity of year-round wildland fire staffing.
5. Support the transformation of state and federal policies that promote wildfire risk reduction.

HF-3: Educate the public on forest health and wildfire risk reduction.

Opportunities for action

1. Expand supportive programming and public awareness campaigns on the linkages among human-caused fires and public health, quality of life, ecological resources, and carbon dioxide removal, targeted at both Flagstaff residents and visitors.
2. Increase City of Flagstaff staffing and resources for outreach and education related to forest health.
3. Increase capacity for Firewise programming and wildland-urban interface (WUI) code enforcement within Flagstaff neighborhoods.
4. Increase awareness of the need for home hardening and the resources available to support residents in home hardening and fire wise activities.

HF-4: Support innovation in the forest health and wildland fire sectors.

Opportunities for action

1. Calculate for the carbon stored in Flagstaff's open spaces, forested areas, and regional forests, to understand carbon impacts of both forest health improvements and high severity wildfires.
2. Build collaborations and promote shared investment in forest health and carbon dioxide removal industries.
3. Support innovation in the forest products industry.
4. Support the use of public and private land to allow for establishment of forest product industry operations.

HF-5: Encourage diverse native plant ecosystems in the built environment.

Opportunities for action

1. Expand current incentive programs to encourage low-water and climate-adapted native landscaping.
2. Strengthen current zoning code requirements for native landscaping to include the use of climate-adapted varieties of native species that can survive in changing conditions.
3. Develop a municipal strategy for identifying and utilizing climate-adapted native plants.
4. Provide educational opportunities for residents to learn about the techniques and benefits of native and climate-adapted landscaping.

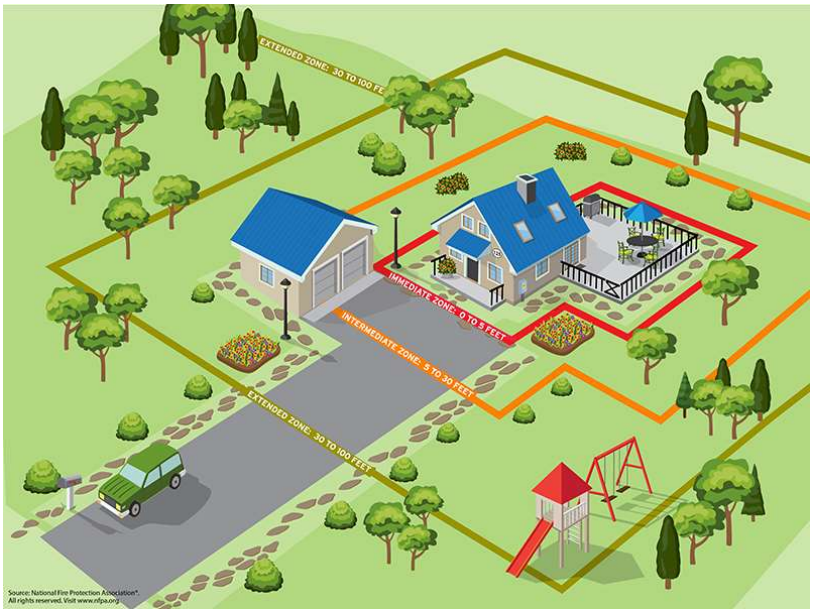
HF-6: Proactively manage for expected ecosystem transitions, including the potential threats to ponderosa pine forests.

Opportunities for action

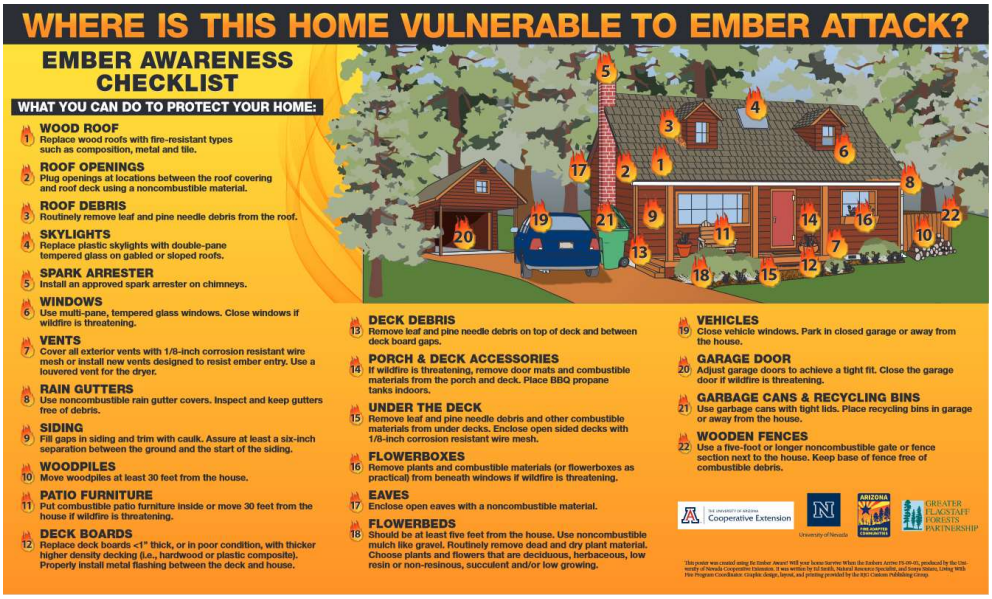
1. Collaborate with the research community and on-the-ground partners on projects related to assisted migration and identification of plant varieties that are more tolerant of future climate conditions.
2. Partner with land managers to increase the use of climate-adapted native plants in all restoration efforts.
3. Implement an education campaign related to climate change and ecosystem/vegetation adjustments and resulting impacts in Flagstaff's natural areas.

Evolving Wildfire Risks

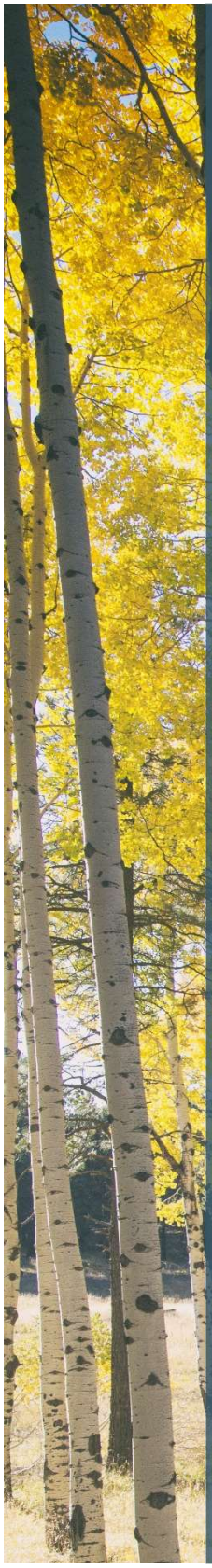
As Flagstaff prepares for the future, residents and businesses will need to prepare for changing wildfire risks. As the West's devastating fires of the last decade have shown, homes far from the wildland-urban-interface (WUI) are at risk. Residents are encouraged to not only 'firewise' their properties but to also 'harden' their homes in the event of 'ember attacks'. The City encourages to look beyond their properties and to help create both firewise neighborhoods and a fire-adapted community.



The above graphic depicts three home ignition zones, extending up to 100 feet from the house. Source: National Fire Protection Association (NFPA)



A home hardening flyer was created by the Greater Flagstaff Forest partnership and partners.



NATURAL ENVIRONMENT TENSIONS

Proponents of land conservation and affordable housing have rarely seen common ground they may occupy. These two interests are often pitted against one another in development agreements and among scarce funding opportunities. Both parties are experiencing unprecedented challenges to protecting places and providing for people.

The accelerating growth and fragmentation of protected open spaces is one of the greatest challenges to the preservation of natural areas. Every year, millions of acres of woodlands and natural areas are developed. The results too often have produced fragmented wildlife habitats, loss of a sense of place, disruption to critical ecosystems, and excessive stormwater discharge into wetlands and waterways.

All the while, the gap continues to widen between wages and housing costs. Housing prices are accelerating faster than wage increases, exacerbating the housing shortage for low- and moderate-income community members, including our teachers and police officers. In 2018, the National Low Income Housing Coalition ranked the State of Arizona as having the 25th highest hourly wage needed to afford a two-bedroom rental in the nation.[1] According to the analysis, a renter must make $18.46 per hour to afford a two-bedroom rental; at the 2017 minimum hourly wage, that would necessitate a 70-hour work week.

Sustainable communities have good jobs, adequate housing, and a strong sense of place derived from local natural and cultural resources. How does a community move forward? There are promising trends for conservation-based affordable housing and strategies for forging more creative partnerships between land conservation and affordable housing. By addressing community needs for housing and natural resource protection together and engaging community members in the process, conservation-based affordable housing developments can generate new public and political support. The best examples reflect the need for connections to ensure the strategic protection of conservation areas, are appropriate to the conservation intent, and are located to least disturb resources while being near jobs, services, and transit opportunities.

1 "Out of Reach: The High Cost of Housing". National Low Income Housing Coalition. 2018. https://nlihc.org/sites/default/files/oor/OOR_2018.pdf.

Health and Safety

Flagstaff will take proactive steps to protect and improve health, provide reliable and multi-faceted access to health services, prepare for disruptive change, and increase infrastructure and emergency response system resilience.

WHAT IT MEANS

Climate change will impact health across the Flagstaff community. These impacts will range from acute risks like wildfire to more distributed impacts like increases in allergens. While the list of health impacts is extensive, pertinent examples include:

- Extreme heat and wildfire smoke are significant risks for disproportionately impacted communities such as Flagstaff's outdoor workers, the elderly, the very young, and low-income populations.
- Extreme heat kills more people in the US than any other weather event. Flagstaff will experience more days over 90 degrees as regional temperatures warm. While this is not extreme heat when compared to most other places in Arizona, Flagstaff does not possess the infrastructure or systems to deal with extended extreme heat. Many homes lack air conditioning or proper ventilation, and risks are particularly higher for elderly and low income populations, as well as those living in older buildings that don't have updated climate control infrastructure.
- Increased wildfire risk will stress emergency services and expand wildfire risk areas to encompass more homes. Increased severity and frequency of wildfires are highly likely to lead to loss of homes, challenges to businesses, damage to infrastructure and even loss of life. Both fires and flooding often necessitate temporary evacuations, that can potentially lead to long-term displacement or homelessness.
- Post-fire flooding is a substantial risk that can wreak havoc for years or even decades after an initial fire, leading to injury, loss of life, significant stress, displacement, and other long-term health impacts.
- Climate change is already changing vector (mosquito) densities and ranges and there is potential for increases in the prevalence of various diseases and parasites.
- Climate change will increase the frequency of extreme events – increasing the severity of both winter and monsoon storms. These storms can cause direct and indirect health challenges, from home flooding and traffic collisions to decrease in access to services or difficulties stemming from limited mobility.
- With rising temperatures globally, we will likely see an influx of individuals experiencing homelessness as people try to escape extreme heat in southern climates. This may increase the potential for life-threatening situations along with the increase in wildfires. An increase in interactions among city dwellers and individuals experiencing homelessness has the potential to

cause friction or lead to the further alienation of some of our most disproportionately impacted community members.

- As the changing climate leads to increased global conflicts and pressures on all environmental, social and financial systems, individuals and community will experience increased stress and mental health challenges.
- Climate change increases the risk of global pandemics, as environmental and land use changes lead to increased interaction among animals and humans.

These risks and vulnerabilities, among others, will increase the pressure on our environmental, social, governmental, public safety, and public health systems. These systems and associated services rely at least partially on community funding, illustrating the financial challenges of climate change. The Flagstaff community will be faced with difficult choices about how to use limited financial resources to protect health and reduce risk.

Shifting from a fire season to a fire year

Flagstaff is situated in the middle of a ponderosa pine forest, a fire-adapted ecosystem with a long history of fires. As the climate changes and the southwestern United States has remained in historic drought conditions, fire professionals and federal agencies are shifting from thinking of a 'fire season' to a 'fire year':

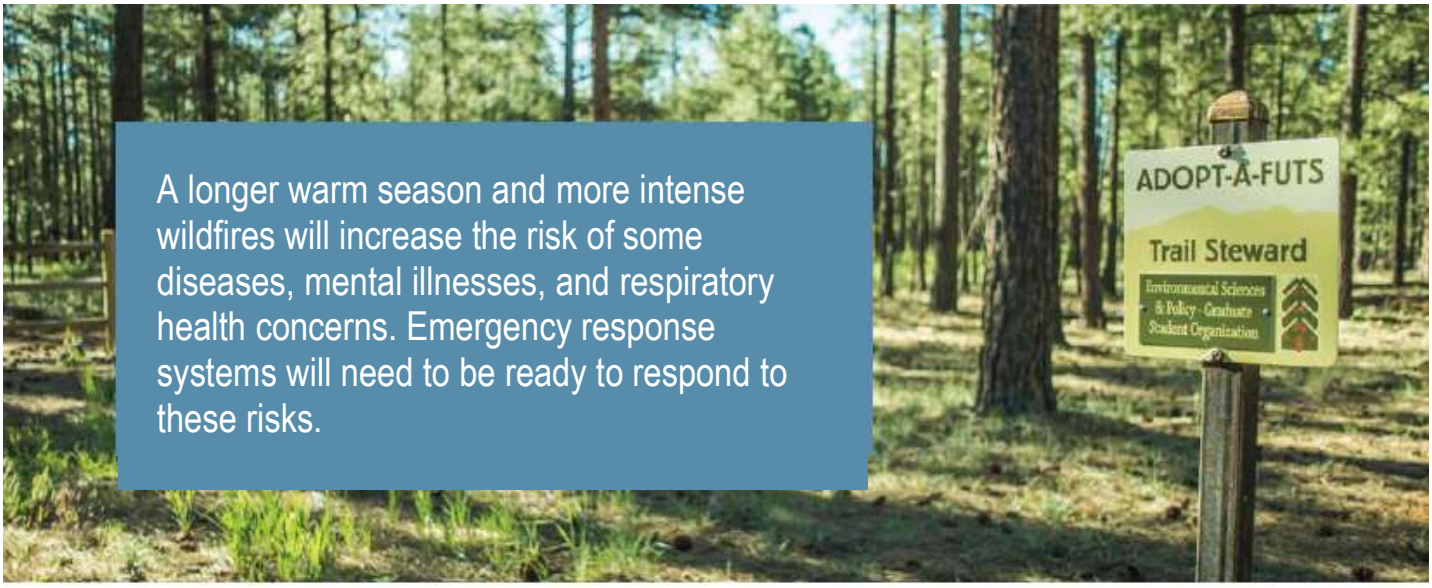
"Wildfire is year-round for much of the United States and the Forest Service is shifting to the concept of a fire year. Wildfire season has become longer based on conditions that allow fires to start and to burn—winter snows are melting earlier and rain is coming later in the fall. What was once a four-month fire season now lasts six to eight months. For example, fires in recent years have burned well outside of the typical fire season throughout California, Arizona, New Mexico, Tennessee and New Jersey. Fires in the winter months are becoming part of the norm."

The Marshall Fire, a grass fire in Bounder County, started on December 30, 2021. It was among the most damaging in fires in Colorado's history – destroying over 1,000 homes, prompting the evacuation of 35,000 people, costing over $10 billion, and killing two individuals.

As Flagstaff shifts to plan for a "fire year," it must develop new strategies to plan for increased risk and vulnerabilities throughout all seasons. Wildfire can now reduce air quality and impact health in any month. Residents will need to shift expectations and maintain preparedness throughout the year.

"Wildfires in All Seasons?' United States Department of Agriculture
https://www.usda.gov/media/blog/2019/06/27/wildfires-all-seasons

Marshall fire information: https://wildfiretoday.com/2022/10/29/report-released-for-the-marshall-fire-which-destroyed-1056-structures-southeast-of-boulder-colorado/



A longer warm season and more intense wildfires will increase the risk of some diseases, mental illnesses, and respiratory health concerns. Emergency response systems will need to be ready to respond to these risks.

Public Health, Safety, and Emergency Services
Vulnerability to Climate Change

By 2100, Flagstaff communities are likely to face:

MEDIUM VULNERABILITY	MEDIUM VULNERABILITY	LOW VULNERABILITY	MEDIUM-LOW VULNERABILITY	MEDIUM-LOW VULNERABILITY
More periods of poor air quality due to larger and more frequent wildfires.	More extreme heat days (>90°F) could increase risk of heat-related illness.	Increased exposure to allergens is possible as spring grows warmer and more dry weather increases dust.	More frequent extreme events could increase risk of mental health issues.	Increased exposure to valley fever and West Nile virus is possible as the warm season lengthens. Existing response resources may be adequate.

HOW WE'LL GET THERE

Protecting public health will require a diverse suite of strategies to assess vulnerabilities, reduce risk, change behaviors, and help build resilience.

Efforts to reduce risks to health and safety span sectors:

- To respond to Flagstaff's highest climate threat, Flagstaff's wildland urban interface code seeks to reduce vulnerabilities and risk across the community.
- The Ready Set Go campaign encourages residents to be more informed about potential wildfire emergencies and how to be prepared for and evacuate during emergency situations.
- Coconino County Health and Human Services provides health and safety information to residents experiencing flooding in their neighborhoods, with a particular emphasis on mosquito control.
- The Flagstaff Fire Department and the Flagstaff Sustainability Office provide HEPA air purifiers to disproportionately impacted community members to assist during poor air quality days.

These efforts highlight just a few ways that public health and climate intersect across our communities. Analysis is needed to identify specific health risks and vulnerabilities, assess neighborhood vulnerabilities, and pinpoint which communities are likely to be most impacted.

To maintain community health amidst the challenges of climate change, Flagstaff must develop a comprehensive approach to building more resilient systems, protecting health, and meeting the evolving needs of community members. Collaborations across agencies will be critical: the City of Flagstaff will partner with Coconino County and other regional actors to anticipate changing risks and build community health resilience. Efforts must address both acute and distributed health risks, such as wildfire threats to homes and increases to seasonal allergens.

As the City works with its partners to expand health and climate analysis and programming, it will need to incorporate the following concepts:

- Equity and community health are intricately related. The elderly, people experiencing homelessness, and low-income populations are most vulnerable to climate change impacts. Identifying and protecting disproportionately impacted communities now can help reduce the negative impacts of climate change.
- Functional public infrastructure such as roads, shelters, and utility services are critical for sustainable economic and social wellbeing in the face of climate change. Actions to improve the resilience of public infrastructure, such as through improved maintenance and planning, will enable the community to withstand unanticipated shocks and disruptions like flood events.
- Community engagement on the relationships between climate change and health can build community preparedness and resilience, helping individuals to better prepare for changing risks. Actions that build community awareness about vulnerabilities—such as the interaction of heat risks, disease, and poor air quality—will give community members the knowledge needed to plan and take action.

- Public health systems across the country are often simultaneously under-resourced and facing increasing demands. As climate change increases community challenges, the demands on already-stressed public health infrastructure may exceed its capacity. The Flagstaff community will need to work together to prepare for climate change hazards and their effect on public service demand and provision.

The City of Flagstaff will partner with Coconino County Health and Human Services to better understand the relationship between climate change and health in Flagstaff's neighborhoods and provide programming that can address gaps and serve the needs of residents amidst disruptions. Resilience-building to reduce risk and improve health will take the commitment of the City, regional institutions, local businesses and organizations, neighborhood groups and individuals.

TARGET AREA GOALS

Goal	Year
Prioritize public safety and health services in the face of anticipated climate change impacts.	2030
Improve the resilience of building infrastructure to climate hazards.	2030
Anticipate climate change impacts that will affect public health by identifying at-risk community groups and neighborhoods and planning appropriate responses.	2030
Increase community engagement and improve communications on health vulnerabilities and building resilience.	2025

STRATEGIES TO ACHIEVE HEALTH AND SAFETY

HS-1: Identify community health impacts from climate change and target support to assist at-risk populations in adapting to change and protecting their health.

Opportunities for Action

1. Characterize relative fire, flood, mosquito, and other risk exposures to climate change among community groups and neighborhoods.
2. Adequately fund health and emergency services reaching populations disproportionately impacted by climate change impacts.
3. Address woodsmoke, such as through programming that encourages use of certified wood stoves, a public education campaign, and/or rebates for wood stove buybacks or replacements.
4. Encourage low-emissions, energy-efficient climate control measures, such as through building codes, to help sensitive populations deal with higher temperatures.
5. Work with partners to identify threats to food security for disproportionately impacted populations and to develop solutions.
6. Increase information available to community members regarding increased risk of health impacts due to climate change and actions they can take to protect their health and increase community resilience.
7. Improve community messaging on how to respond to simultaneous heat risks and poor air quality due to smoke and provide resources to disproportionately impacted community members.
8. Establish programs to assist disproportionately impacted populations during extreme temperature and dangerous air quality events.

HS-2: Prepare for changing risks to public health due to climate change and increase collaborations across agencies to improve health and climate awareness, preparedness, and resilience.

Opportunities for action

1. Continue collaborations to study and prepare for increased risk of illness and disease due to increased dust, a warmer climate, higher mosquito densities, and other potential results of climate change.
2. Initiate a working group on public health and climate change, including participation from the Coconino County Health and Human Services , the City of Flagstaff, and NAU, among others, to inform policy and programming.
3. Increase collaboration to evaluate the interaction between the built environment and disease vectors like mosquitos.
4. Study how the changing ecosystem around Flagstaff contributes to increased risk of disasters.
5. Support Coconino County Health and Human Services in providing education to healthcare providers on how climate change will affect heat-related illness, altitude-related issues, fatalities, and demand for services.
6. Build a climate-health hazards vulnerability index for the Flagstaff community.

HS-3: Adequately fund services for disaster preparedness.

Opportunities for action

1. Dedicate increased funding to City of Flagstaff emergency management and disaster preparedness and accommodate demand for health services among at-risk populations.
2. Embrace grassroots and neighborhood movements that advocate for greater services.
3. Create educational campaigns to raise awareness of climate-related health and safety issues and services.
4. Increase coordination between Flagstaff agencies, institutions and community organizations regarding climate and health, disaster preparedness and increasing vulnerabilities due to climate change.
5. Complete the Rio de Flag flood control project.
6. Incorporate considerations of disaster preparedness, passive survivability, distributed on-site energy generation and back-up power, and living buildings into City of Flagstaff codes, plans, and processes.

HS-4: Improve the resilience of public infrastructure and City facilities.

Opportunities for Action

1. Create preparedness and recovery plans for all City divisions.
2. Prepare for existing City of Flagstaff buildings to be used in different ways, both in low-impact ways, such as community members using public buildings as cooling centers on hot days, and as safe-havens during acute emergencies.
3. Construct new City of Flagstaff buildings to be carbon neutral and designed for use as resilience hubs, providing safe havens for community members during all types of disruptive events.
4. Update engineering standards and maintenance practices to increase resilience amidst an increase in extreme events such as higher temperatures and increased incidences of flooding.
5. Incorporate green infrastructure principles into all public infrastructure projects, creating more natural amenities throughout the city.
6. Develop reserve funding for extreme weather events in the City of Flagstaff.
7. Engage community leaders, partners, and agencies in planning for the graceful failure of community systems, support structures, and infrastructure during extreme events and power disruptions.
8. Foster a culture of emergency preparedness and planning among City staff through regular conversations about vulnerabilities and resilience building, scenario analysis, and emergency planning exercises.

Regenerative and health-promoting buildings

Living Buildings are:

- Regenerative buildings that connect occupants to light, air, food, nature, and community.
- Self-sufficient and remain within the resource limits of their site.
- Create a positive impact on the human and natural systems that interact with them.

Source: The International Living Future Institute

HEALTH AND SAFETY TENSIONS

Climate change affects different groups in different ways. In some cases, climate change threatens cultures, communities, and social fabric. The indigenous communities of the Southwest face particularly high vulnerabilities, according to the National Climate Assessment.[1]

A May 2018 Public Radio International report covered the story of sheep herder Lorraine Herder, a woman living on Black Mesa, a remote area of the Navajo reservation in Northern Arizona, northeast of Flagstaff.[2] Lorraine is part of a livestock-raising tradition that is under threat from climate change.

"My mom was a sheep herder all her life, so I've been with the sheep ever since I was a little girl, and it means a lot to me," Herder says. "I wanted to live that life, you know, living off the land." However, rising temperatures and shrinking water sources on the Navajo reservation are a major threat to these important Navajo cultural traditions. "The drought makes it difficult for us," Herder says, and adds, "The biggest challenge is finding water for our livestock right now. We're the last few shepherds out here."

Scientists studying the impact of global warming on the Navajo Nation are noticing major changes in the environment. "The amount of surface water flowing in streams on the Navajo Nation has declined by about 98 percent over the 20th century," says Dr. Margaret Redsteer, a scientist at the US Geological Survey in Flagstaff, Arizona. The effects of climate change have taken a major toll on families who have lived on their ancestral Navajo land for generations. Many residents already live without running water, making the situation even more difficult.

This story highlights how those populations with the fewest greenhouse gas emissions—and that thus contribute the least to climate change—are often the most affected. This inequity is true both internationally and within communities. Poorer nations are more vulnerable to climate change impacts, especially shifts in agriculture that threaten food supply and access.[3,4] Low-income households, which have lower carbon footprints, will likely struggle more to adapt to change.[5,6] In addition, low-income communities are often located in areas with greater exposure to climate change threats (e.g., natural hazards like flooding), placing those communities at increased risks with limited resources.[6] While many such communities have practiced sustainability for generations, climate change threatens their tradition and culture. This persistent imbalance compels Flagstaff to consider equity and vulnerabilities when considering climate change and taking action.

1 "Indigenous Peoples." National Climate Assessment. https://nca2014.globalchange.gov/highlights/report-findings/indigenous-peoples. 2 "Navajo women struggle to preserve traditions as climate change intensifies." PRI. https://www.pri.org/stories/2018-05-25/navajo-women-struggle-preserve-traditions-climate-change-intensifies. 3 "The distributional impact of climate change on rich and poor countries." Mendelsohn, et al. https://doi.org/10.1017/S1355770X05002755. 4 The World Bank. "Shock Waves: Managing the Impacts of Climate Change on Poverty." https://doi.org/10.1596/978-1-4648-0673-5. 5 "Income inequality and carbon consumption: evidence from environmental Engel curves." The London School of Economics and Political Science. http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2017/11/Working-Paper-285-Sager.pdf. 6 The World Bank. "Shock Waves: Managing the Impacts of Climate Change on Poverty." https://doi.org/10.1596/978-1-4648-0673-5

Economic Prosperity

Flagstaff will cultivate a prosperous and stable economy with abundant and equitable access to employment and entrepreneurship opportunities.

WHAT IT MEANS

Economic prosperity refers to community and economic health, including opportunities to reduce emissions and help the community's business and tourism sectors prepare for climate change.

While climate change will impact all sectors of the local economy, by preparing for change, the Flagstaff community can adapt to changing conditions while creating a stronger community and greater shared prosperity. Businesses can help lead the way in this transition through creativity, innovation, and resilience.

The City of Flagstaff works to develop a diverse, sustainable economy that provides benefits across the Flagstaff community. Tourism and visitation are and will remain strong economic drivers for Flagstaff. Meanwhile, Flagstaff's business sector goes far beyond - ranging from biomedical manufacturing to astronomy and brewing. Flagstaff offers residents and visitors alike a wide range of cultural and outdoor experiences, through offerings like local bike shops, regional museums, a vibrant non-profit sector, markets and festivals. Business attraction efforts encourage relocation by companies that provide high wages and have low environmental and water impacts. All of these forces combined provide job opportunities and careers to the greater Flagstaff region.

Climate change will have specific effects on visitation. To prepare for low-snow years, Flagstaff will need to continue to diversify its tourism activities and businesses. Conversely, rising temperatures in Central Arizona will likely lead to increased visitation to Northern Arizona in the summer months. Increased summer visitation can create both opportunities and challenges – businesses may benefit from increased economic activity, while Flagstaff's infrastructure and housing sector may face pressure. Preparing for these changes can help the city to foster a stable and vibrant economy, improve community health, and benefit from visitation.

Visitation also contributes to Flagstaff's energy use, water consumption, and transportation emissions. Efforts to minimize the environmental impact from tourism makes good business sense and can position Flagstaff as a visible leader in sustainability.

For further discussion on visitation and recreation, see the Inclusive Recreation Target Area on page 76.

Flagstaff's Economy at a Glance

Key industry sectors

- Advanced Manufacturing
- Astronomy
- Bioscience
- Craft Brewing
- Digital / eCommerce
- Entrepreneurship
- Retail
- Tourism

Large local employers

- Northern Arizona University
- Flagstaff Medical Center
- W.L. Gore & Associates
- Flagstaff Unified School District
- Coconino County
- City of Flagstaff
- Walmart
- Nestle Purina PetCare
- The Guidance Center
- US Forest Service
- Coconino Community College

Flagstaff's winter recreation is expected to change as snowpack declines and becomes less predictable. Our businesses and services will need to be ready to adapt and evolve.

Tourism and Recreation
Vulnerability to Climate Change

By 2100, Flagstaff communities are likely to face:

MEDIUM-HIGH VULNERABILITY	MEDIUM-LOW VULNERABILITY
	
Significant snowpack loss may reduce winter recreation and tourism.	More wildfire, drought, or extreme heat may temporarily reduce recreation and tourism in summer, spring, and fall.

HOW WE'LL GET THERE

By promoting a sustainable local economy, Flagstaff can support businesses as they reduce emissions and plan for a changing climate. Climate considerations should be integrated into core economic decision processes, through systematic change to policy and assessment tools, performance indicators, risk models, and reporting requirements.

While climate change will present challenges, it also provides extensive opportunities for advancing innovative technology, solutions-focused entrepreneurship, and the development of a circular economy. To reduce emissions, build community resilience, and increase equity, the international community will rely on creativity, and technological advancement, and new ways of doing business.

*The solar industry illustrates the power of technological innovation and rapid growth. Since 2011, the solar industry has experienced an average annual growth rate of 33%. In 2021, the solar industry provided more than 255,000 jobs and generated $33 billion in private investment in the US economy (Solar Energy Industry Association).*Flagstaff can foster a robust, diverse economy that reduces environmental impacts, supports residents and provides climate solutions. Flagstaff can continue to expand on its current sustainable business development activities:

- The annual Innovate Waste and Carbon Neutrality Challenge incentivizes businesses to discover new ways to convert waste into marketable products, reduce emissions or remove carbon dioxide from the atmosphere.
- The Mountain Line bus system offers a weekend bus route to Snowbowl to serve both residents and tourists who ski and snowboard.
- The Sustainable Automotive Tax Credit helps ensure that economic benefits of converting to electronic vehicles are received by Flagstaff businesses and residents.
- UACJ Automotive Whitehall industries, a manufacturer of electric vehicle parts, has recently selected Flagstaff for a new manufacturing plant, bringing millions of dollars in investment and hundreds of high wage jobs.
- The City of Flagstaff is the first participant in the APS Green Power Partners program, ensuring that 100% renewable electricity powers municipal operations. This is a first step in sourcing higher portions of the community's electricity from renewable sources, something many businesses are seeking to fulfill their own climate goals.

Flagstaff can continue to build on these successes, spurring climate innovation, supporting climate action by businesses, and strengthening the business sector to help meet the needs of residents and visitors alike.

TARGET AREA GOALS

Goal	Year
Build a diverse, strong, resilient, and equitable economy in the face of threats from climate change, supporting community members whose jobs are at risk from climate change impacts and the creation of jobs in renewable energy and energy efficiency.	2030
Identify threats to current industries from climate change and opportunities for new industries	2025

STRATEGIES TO ACHIEVE ECONOMIC PROSPERITY

EP-1: Accelerate the transformation to a low-carbon economy that minimizes emissions and spurs innovation.

Opportunities for action:

1. Promote Flagstaff as a climate action committed destination by highlighting the businesses that are taking steps to reduce resource consumption.
2. Strengthen the fossil fuel divestment policy for the City of Flagstaff.
3. Promote Flagstaff as a car-free destination through informational campaigns for visitors.
4. Encourage business development for businesses that have lower or beneficial impacts on natural resources.
5. Seek to attract and develop businesses that provide leadership or innovation in the climate action sector as part of their business model.
6. Promote circular economy principles through education campaigns and roundtables with business leaders focused on the opportunities that a circular economy provides.
7. Encourage visitor-focused businesses to implement programs that reduce resource consumption.
8. Promote workforce development efforts that support the jobs of the future and the shift to climate-friendly, innovative technologies.

EP-2: Support the adaptation efforts of local businesses as the climate changes and the economic landscape shifts.

Opportunities for action:

1. With community stakeholders and partners, conduct a study and host a community conversation to identify threats to current industries, opportunities for new businesses and industries, and areas that need support.
2. Work with businesses to assess their climate change vulnerability and plan for the future.
3. Utilize existing community resources to support community members whose jobs may be at risk from climate change impacts through retraining programs and business support.
4. Prepare water, road, and other public infrastructure for increased demands from growth and tourism.
5. Ensure companies that are considering locating here are well-informed about how well local resources are matched to their demands.
6. Continue to support diversification of tourism activities, to balance impacts and adapt to changing climate conditions.
7. Continue efforts to accommodate year-round travel.

Building Electrification Workforce Needs

Climate action and evolving technology will lead to economic growth and new jobs. Already, the clean energy and electrification fields have created demand for new types of jobs and a trained work force. To learn more about building electrification, see the Building Fuel Switching Target Area on page 92.

Today, Flagstaff residents are seeking contractors to support home electrification – something that could require the work of plumbers (to install a new heat pump water heater), HVAC mechanics (to install a cold climate heat pump), electricians (to upgrade electric service), and energy efficiency contractors (to improve home weatherization). Residents have reported difficulty in finding contractors willing or able to work on building electrification.

There is a nation-wide need for training and workforce development to achieve widespread building and vehicle electrification. Rewiring America estimates in that "an aggressive national commitment to electrify all aspects of our economy would create up to 25 million good-paying American jobs over the next 15 years and 5 million sustained jobs by mid-century." www.rewiringamerica.org/policy/jobs-report

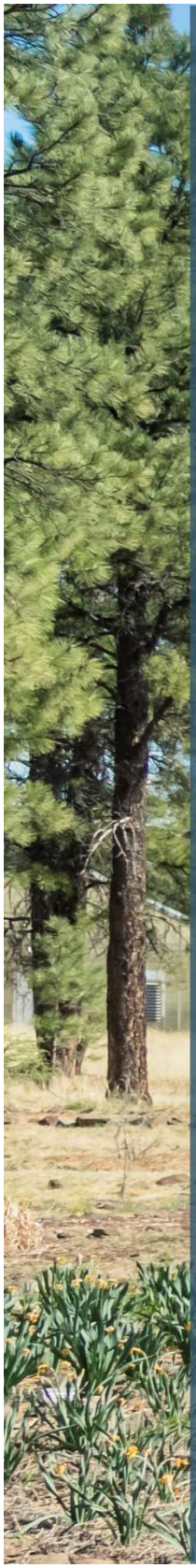
In Flagstaff, the problem is especially acute, as high housing prices and regional isolation can lead to difficulty in hiring and worker retention. The City is working with regional partners to identify local needs, available resources, and financial opportunities to provide the necessary education and training that will support building electrification.

Job opportunities associated with adaptation to climate change.

Economic development conversations often focus on the potential jobs benefits from reducing greenhouse gas emissions, such as solar energy, electric vehicles, or building electrification. Yet adaptation and resilience-building can have significant economic development benefits as well. The list below, from a Santa Fe watershed plan, provides a few examples of how reducing climate risks can support a variety of jobs.

Climate Risk	Action / Job	Job Type
Forest Fire	Thinning / burning	Forestry
Flooding	Drainage stabilization	Hydrologists, earth-movers, etc.
	Strengthen riparian corridors	Ecologists, foresters, etc.
Drought	Retrofit with efficient/smart plumbing and water catchment / reuse systems	Plumbers, construction workers
Increased temperatures	Retrofit buildings for passive solar	Construction workers
	Tree planting to increase shade	Landscapers, arborists, parks management
GHG Concentrations	Install renewable energy systems	Electricians
	Energy audits and retrofits	Energy auditors, contractors
	Land restoration	Ecologists, biologists, geologists
Community destabilization	Neighborhood association, business, non-profit and community coordination	Community organizing

Source: "Forest and Water Climate Adaptation: A Plan for the Santa Fe Watershed." http://www.santafewatershed.org/sfwa/wp-content/uploads/2014/02/Santa-Fe-Watershed-Forest-Water-Climate-Adaptation-Plan-Final2.pdf



ECONOMIC PROSPERITY AND RECREATION TENSIONS

In 2017, Flagstaff was the 14th most-visited city in the United States with nearly 5 million visitors. These visitors contributed $500 million to the local economy and supported an estimated 8,000 jobs.[1] By 2050, visitation to Flagstaff and northern Arizona is projected to reach 9.5 million people annually.[2] Nearby outdoor recreation facilities such as national monuments, forests and parks, Arizona Snowbowl, and Lowell Observatory drive Flagstaff's tourism economy.

The impacts of climate change threaten the Flagstaff area's surrounding natural resources. Projections of decreased snowpack will impact winter recreation and tourism, while increases in summer temperatures, drier conditions, and wildfire risk to ponderosa pine forests could alter visitation during spring, summer, and fall. As cities in central Arizona experience increasingly extreme summer temperatures, more individuals may visit Flagstaff to seek refuge from the summer heat.

Flagstaff's economic dependency on at-risk natural resources and tourism creates a point of contention as our community seeks to become more sustainable. As visitation increases, so will the need to maintain and enhance infrastructure. For example, higher visitor demand and vehicle travel in our national forests may require more frequent road maintenance and increase greenhouse gas emissions. Increased tourism during hotter months may increase stress on water resources.[3] Invaluable cultural resources are at risk of vandalism as visitation surges.[4] Finally, with more individuals visiting Flagstaff and purchasing seasonal homes, affordable housing demands will increase pressure on low-income communities.

Despite these vulnerabilities, visitation is an important driver of the Flagstaff economy and contributes significantly to quality of life in Flagstaff. As this Plan is implemented, careful consideration will need to be made when addressing goals of decreasing greenhouse gas emissions, maintaining a rich economy, balancing visitation with natural resource conservation, and taking equitable climate action.

1 "Fiscal Year 2017 Annual Report and Fiscal Year 2018 Marketing Plan" Flagstaff Convention & Visitors Bureau. 2018. https://en.calameo.com/read/0050207463ae8c6e9e959 .
2 "Flagstaff Regional Plan 2030: 2016 annual Report" City of Flagstaff. 2017. https://www.flagstaff.az.gov/2936/Flagstaff-Regional-Plan-2030. 3 R. H. Bark, "Assessment of climate change on local economies." Sonoran Institute and Lincoln Institute of Land Policy. 2009. https://www.lincolninst.edu/sites/default/files/pubfiles/bark-wp09rb2-full_0.pdf . 4 "Flagstaff Open Space 2018 Annual Year in Review." City of Flagstaff Sustainability Program. 2018.

Carbon Dioxide Removal

Flagstaff will achieve carbon neutrality by first measuring the remaining emissions produced by our community each year, and then balancing with an equivalent amount of carbon dioxide removal (CDR) through local and regional initiatives. If local and regional initiatives are unable to fully satisfy the community's CDR obligation, Flagstaff will explore options for obtaining carbon dioxide removal certificates (CORCs) or other high-quality offsets.

WHAT IT MEANS

Carbon dioxide removal (CDR) refers to the process of removing carbon dioxide from the atmosphere. Removed carbon dioxide can be stored in terrestrial, geological, and oceanic reservoirs and can be stored in products. Removed carbon dioxide may also be utilized, but if this utilization returns the carbon dioxide to the atmosphere, the removal would no longer qualify as a negative emissions initiative – though the net impact may well contribute to reducing community emissions, which is also a productive outcome when striving toward carbon neutrality. There are numerous established and emerging approaches for accomplishing CDR, each associated with a different deployment maturity, permanence of storage, and drawdown potential, as well as considerations of costs, location, co-benefits, risks, and uncertainties.

HOW WE'LL GET THERE

Since emissions will still be produced in Flagstaff by the year 2030, carbon dioxide removal (CDR) will be necessary to achieve carbon neutrality. The magnitude of CDR required will ultimately depend on, and be equivalent to, the amount of emissions still produced each year. If all other local reduction strategies outlined in this Plan meet projections, then it is expected that there will be over 471,000 MTCO2e still produced locally in 2030.

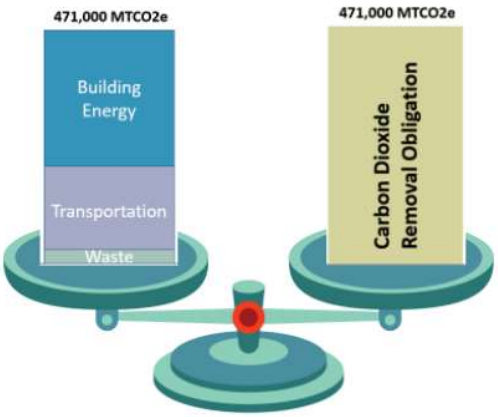


Figure 13: The two sides of the carbon neutrality scale: On the left side are the remaining emissions still produced (after reductions). On the right side is carbon dioxide removal. The two sides of the scale must balance out to achieve carbon neutrality.

Assuming that local reductions continue each year beyond 2030, then the annual CDR obligation required to achieve carbon neutrality will likewise decrease over time. It should always be kept in mind, reductions need to be prioritized and that (using the framework of the graphic above) the smaller that we can make the left side of the scale in 2030, or any other year, the smaller our CDR obligation.

As a City and community, we will first investigate the feasibilities of standing up and supporting local carbon dioxide removal (CDR) initiatives. Potential CDR projects may include nature-based initiatives on City lands and Open Spaces that remove carbon dioxide from the atmosphere and store it in biomass and soils. These could include urban forestry projects in areas of town that lack canopy and are vulnerable to the impacts of heat, or regenerative practices on riparian or degraded lands. We may also explore CDR initiatives that support the removal of waste and liability biomass from our surrounding forests – such as bioenergy or biochar. In addition to performing CDR, many of these initiatives would also reduce the risk of catastrophic forest fire as well as protecting, restoring, or otherwise supporting numerous ecosystems, allowing them to better provide all their many ecosystem services more effectively. We may even consider being an early adopter and making investments in the deployment of technology supported CDR initiatives including projects that provide long-term storage in materials or geologic formations. In developing the portfolio of initiatives that will be needed, the City may look to take the lead on some CDR projects, while other efforts may result from collaborations and perhaps even requests for proposals (RFPs). We also expect that the market will play a role and that some businesses will find opportunity in the CDR space.

If we are unable to meet our full CDR obligation with the portfolio of local initiatives that we develop, we will also have to consider obtaining carbon dioxide removal certificates (CORCs) or other high-quality offsets from third party vendors to satisfy the remaining obligation. The markets for CORCs are in early development and the price forecast is highly uncertain. Offsets have had a checkered history in terms of verification, additionality and permanence and are generally regarded as being insufficient to the problem. In order to address these limitations, Flagstaff will evaluate potential offsets using the Oxford Offsetting Principles[32] in order to ensure that they are high quality.

THE OXFORD OFFSETTING PRINCIPLES

- Cut emissions, use high quality offsets, and regularly revise offsetting strategy as bast practice evolves.
- Shirt to carbon removal offsetting.
- Shift to long-lived storage.
- Support the development of net zero aligned offsetting.

[32] https://www.smithschool.ox.ac.uk/publications/reports/Oxford-Offsetting-Principles-2020.pdf

EQUITY AND ADAPTATION CONSIDERATIONS

Equity: According to the EPA, "A growing body of research points to "intra-urban" heat islands, or areas within a city that are hotter than others due to the uneven distribution of heat-absorbing buildings and pavements, and cooler spaces with trees and greenery. These differences can result from disparities in the way communities are planned, developed, and maintained. There are often correlations between hotter neighborhoods and demographic characteristics of residents, with factors such as race and income often playing a role in who bears the brunt of extreme heat."

Initiatives that increase urban and residential canopy cover and decrease the "heat island effect" are just one example of projects that can have both equity and carbon dioxide removal benefits. Biochar and compost initiatives could also be designed to improve food security for disproportionately impacted residents while also capturing carbon in soils.

Adaptation: There are numerous nature-based CDR approaches that can contribute to improved forest and soil health. Healthy forests provide numerous ecosystem services that will help our community be more prepared and resilient to a changing climate, including protecting water resources. Contributing to local forest health also decreases the risk of catastrophic wildfire, which presents risks to both property and human health.

What about our trees?

The City of Flagstaff has numerous natural landscapes that act as carbon sinks, removing and storing carbon dioxide from the atmosphere. In addition to the ponderosa pine forests within City limits, Flagstaff has 3,300 acres of legally designated open spaces, as well as the Rio de Flag corridor and associated wetlands. At this time, we don't *yet* measure any CDR taking place within these natural landscapes. Over the next two years we will collaborate with partners and organizations (including NAU, the Forest Service, ICLEI) that are working on protocols for determining what (and how much) existing nature-based CDR is appropriate for inclusion in our inventory. It will probably be appropriate to consider and quantify CDR taking place on City owned Open Space, since we manage those areas and their continued protection will allow the CDR these spaces perform to be preserved - in addition to allowing them to perform their many other ecosystem services. It will not likely be appropriate to simply claim 'dibs' on the CDR happening in nearby forests that we aren't involved in managing or protecting. Once we have protocols in place, we expect to find that *some* of the projected 471,000 MTCO2e CDR obligation may already "be on the scale." However even if the entire area of Flagstaff were covered in forest, this would not satisfy our expected CDR obligation – our carbon footprint is greater than our geographical footprint.

TARGET AREA GOALS

Goal	Year
Remove an equivalent amount of carbon dioxide from the atmosphere as is produced by the community. If all reduction goals are met, this obligation projects to be approximately 471,000 MTCO2e in 2030. This number can be reduced annually as greater local reductions continue to be achieved.	2030

STRATEGY

CD-1: Develop a portfolio of local and regional carbon dioxide removal initiatives to meet Flagstaff's commitment to carbon neutrality.

Opportunities for action:

1. The City's 8000 acre Red Gap Ranch property east of Flagstaff on the I-40 corridor is a possible site for an innovative high desert carbon dioxide removal and sequestration project.
2. Explore the feasibility of smaller-scale regenerative agriculture, meadows, and forests as sequestration sinks in Flagstaff's high desert environment.
3. Collaborate with Northern Arizona University and other governmental organizations and non-profits in Northern Arizona and on the Colorado Plateau to explore opportunities for regional initiatives that achieve carbon dioxide removal and sequestration.

CD-2: If local carbon dioxide removal projects are insufficient, obtain high-quality carbon offsets and CO2 Removal Certificates (CORCs).

Opportunities for action:

1. Evaluate potential certificates and offsets using the Oxford Offsetting Principles.
2. Purchase certificates and offsets that align with Flagstaff’s priorities and the Oxford Offsetting Principles.

CDR First Steps

At this time, this Plan does not offer a prescriptive vision for the exact carbon dioxide removal portfolio that Flagstaff will develop and support over the next nine years. That work will require developing regional partnerships, identifying opportunities for collaboration as well as funding. Today, we can estimate how much CDR is likely to be necessary to achieve carbon neutrality, based on the emissions reductions anticipated. And so now begins the groundwork to stand-up and support local CDR projects to meet this obligation. We expect that part of this development will likely involve conducting feasibility studies on various project proposals. We also know that we will need to start deploying initiatives in the next few years to give them time to develop and scale.

One thing we do know – it pays to be proactive. Time and again we see that it is the communities that have done the groundwork that are able to take advantage of opportunities – for funding, collaboration, or otherwise. By adopting the Climate Emergency Declaration and thus kicking off the discussion about carbon dioxide removal in our community, we have made our interests clear to potential collaborators, and we are positioning ourselves to be uniquely prepared to take advantage of opportunities as they arise.

V. BACKGROUND

This background section provides information on climate change impacts in Flagstaff and how Flagstaff contributes to climate change via greenhouse gas emissions. This information provides a foundation for our actions. More details on both topics are available on the City of Flagstaff climate action website, at www.flagstaff.az.gov/climate.

In this chapter:

- The Climate Emergency Declaration
- Climate change in Flagstaff
- Flagstaff's greenhouse gas emissions

THE CLIMATE EMERGENCY DECLARATION

The Flagstaff City Council adopted the Climate Emergency Declaration on June 23, 2020. The declaration establishes eight resolutions:

Section 1. The City of Flagstaff declares that a climate emergency threatens our City, region, state, nation, civilization, humanity and the natural world, and recognizes the need for a dramatic increase in its ambition to combat climate change, so that it meets or exceeds the current recommendations of the foremost climate scientists working around the world.

Section 2. The City of Flagstaff commits to its own City-wide transition and climate emergency mobilization effort, utilizing Flagstaff's Climate Action and Adaptation Plan as the foundational framework in recognition of accelerating climate changes and prioritizing appropriate funding for its implementation.

Section 3. The City of Flagstaff commits to educating residents and especially Flagstaff's youth about the current climate emergency and inspiring action.

Section 4. The City of Flagstaff underscores the need for full community participation, and recognizes that the residents of Flagstaff, and community organizations and other such allies will be integral to and in the leadership of the mobilization effort.

Section 5. The City of Flagstaff commits to keeping the concerns of vulnerable communities, minorities, and those experiencing poverty central to all transition and climate emergency mobilization efforts and to facilitate the active participation of such communities.

Section 6. The City of Flagstaff joins a nationwide call for an emergency mobilization collaborative effort, in full partnership with surrounding Tribal nations and traditional agricultural communities, at all levels of government to prioritize adaptation and mitigation in relation to climate change while making all government decisions.

Section 7. The City of Flagstaff will take steps to revise the goals outlined in the Climate Action and Adaptation Plan to be in alignment with the United Nations' November 2019 Emissions Gap Report, while maintaining equal emphasis on adaptation, mitigation, and equity, by advancing the Climate Action and Adaptation Plan's goals to achieve carbon neutrality by 2030.

Section 8. The City of Flagstaff calls on the State of Arizona, the United States of America, and all governments and peoples worldwide to initiate a transition and climate emergency mobilization effort to mitigate global warming and create high-quality, good-paying jobs with comprehensive benefits for those who will be impacted by this transition.

Climate change in Flagstaff

The climate is changing, due largely to human-caused greenhouse gas emissions worldwide. These emissions come from a variety of sources: the cars we drive, the energy we use, the things we use, and even the food we eat. These emissions, once released, stay in the atmosphere, leading to abnormal weather patterns and severe weather events.

Flagstaff emits greenhouse gas emissions into the atmosphere, therefore contributing to global climate change. Emissions in Flagstaff come from three main sources: our energy and electricity sources, how we get around and build our town, and the things we buy and throw away. The chart below shows the portion of our emissions that come from each of these sources (pie chart below).

We get this information about Flagstaff's greenhouse gas emissions from our yearly greenhouse gas inventory. This is a common practice where municipalities itemize and track their annual greenhouse gas emissions. This information tells us where our mitigation efforts are successful, and which areas need more work.

ENVIRONMENTAL CHANGES

Coconino County is already experiencing increased temperatures, and can expect further increases in the future. Flagstaff can also expect to see:

- Increased wildfire risk
- Increased drought
- More flooding
- More insects in the forest and the city
- Damage to our water supply and quality
- Less snow and more rain

For more information on climate change in Flagstaff, view Flagstaff's Climate Profile available at www.Flagstaff.az.gov/climate.[33]

[33] https://www.flagstaff.az.gov/DocumentCenter/View/57498/Climate-Profile?bidId=#:~:text=Since%201950%2C%20Flagstaff%20has%20experienced,risen%20above%2090%C2%B0%20F.&text=In%201974%20and%201990%20temperatures,the%2090%C2%B0%20F%20threshold.

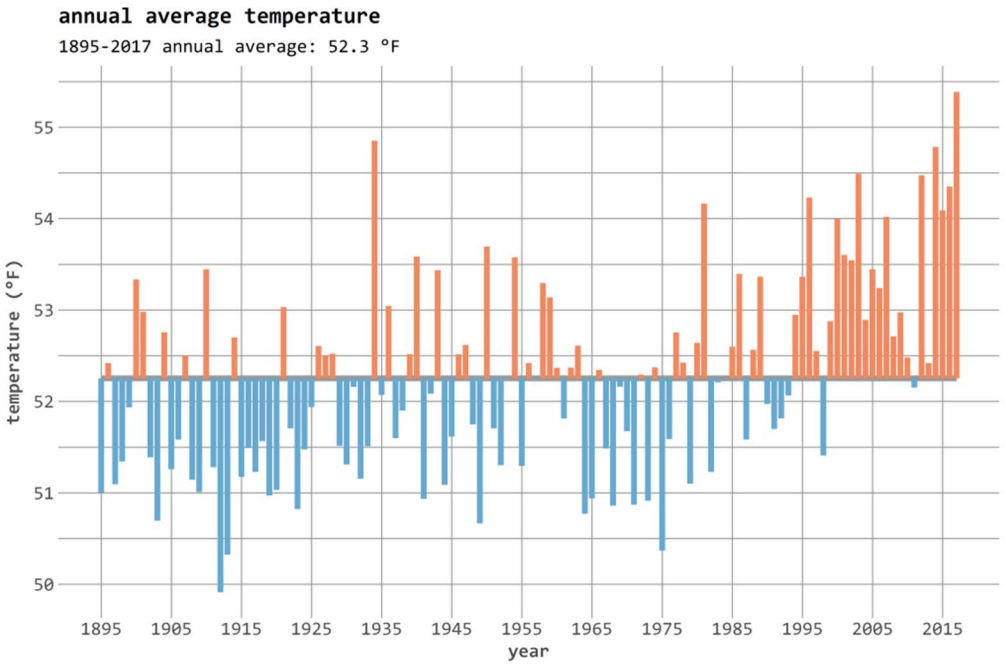


Figure 14. Average annual temperatures for Coconino County from 1895–2017. Orange lines indicate years where the average annual temperature was above average. Blue lines indicate years in which the average annual temperature was below average.

SOCIAL SYSTEMS CHANGES

We can also expect to see a variety of changes to our social systems, including:

- Increased allergens and longer allergy seasons
- Increased susceptibility to insect-borne illness
- Decrease visitation for snowplay
- Heat-related illnesses
- Regional growth that stresses Flagstaff's housing

To learn more about Flagstaff's vulnerabilities, review the Climate Profile at www.Flagstaff.AZ.gov/climate .

Flagstaff's Greenhouse Gas Emissions

HOW WE MEASURE OUR CONTRIBUTION TO CLIMATE CHANGE

To reach carbon neutrality, we must understand how Flagstaff contributes to climate change through greenhouse gas emissions. Each year the Flagstaff Sustainability Office completes a community-scale greenhouse gas emissions inventory. This inventory calculates the emissions produced by the activities taking place in our community. Activities we can measure include the release of 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.

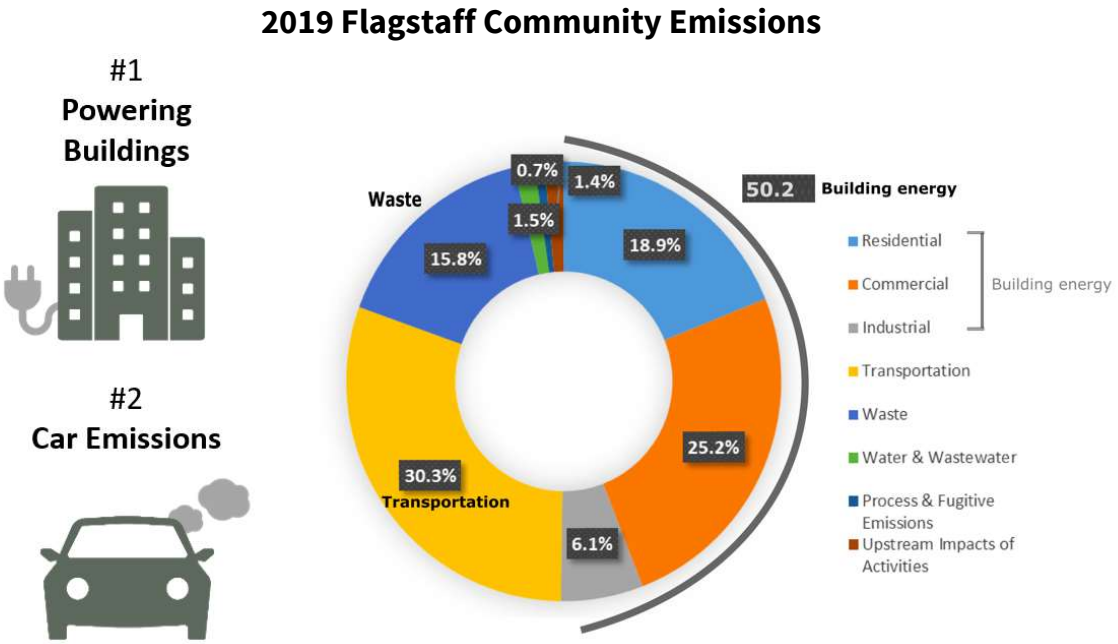


Figure 15. Greenhouse gas emissions from activities across the Flagstaff community in 2019.

Our greenhouse gas emissions fall into four main categories:

1. **Building Energy** contributes to approximately 50% of our emissions. This category represents emissions coming from the use of electricity and natural gas in our homes, and commercial and industrial buildings. Most of these emissions are split between commercial and residential buildings.
2. **Transportation** contributes to approximately 30% of our emissions. This primarily represents emissions from the fuels we use to get around town in vehicles.
3. **Solid waste** contributes to 16%of Flagstaff's emissions, primarily due to emissions from Flagstaff's Cinder Lake Landfill.

4. **Other emissions** are produced from water and wastewater treatment (2%), upstream impacts of activities (1%), and process and fugitive emissions (0.7%). 'Upstream impacts of activities' include emissions that occur prior to the consumption of fossil fuels, from the point of resource extraction, through processing and transportation. 'Process and fugitive emissions' result from the direct release to the atmosphere of GHG compounds from various types of equipment and processes, such as refrigeration and industrial processes. While smaller relative to other sectors, these categories are all important to measure and manage to achieve our emissions reduction goals.

A SECTOR-BASED GREENHOUSE GAS INVENTORY

Currently our inventory methods do not allow us to account for the imported or embedded emissions in the products that we consume. For example, an apple grown in Washington state and consumed in Flagstaff will have embedded emissions associated with the growing, picking, packaging, and transportation to Flagstaff that are not captured using our inventory method. For this reason, it is reasonable to assume that the results of our sector-based inventory represent the minimum emissions attributable to our community activities.

FLAGSTAFF'S GREENHOUSE GAS EMISSIONS

The City of Flagstaff has been tracking community greenhouse gas emissions since 2006. Since then, the way we track emissions has evolved. Currently, the City uses the U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. This global standard for community-level greenhouse gas inventories creates a reliable methodology that enables Flagstaff to compare its emissions to other communities. Methods and protocols will continue to evolve and improve over time, as will data collection and availability.

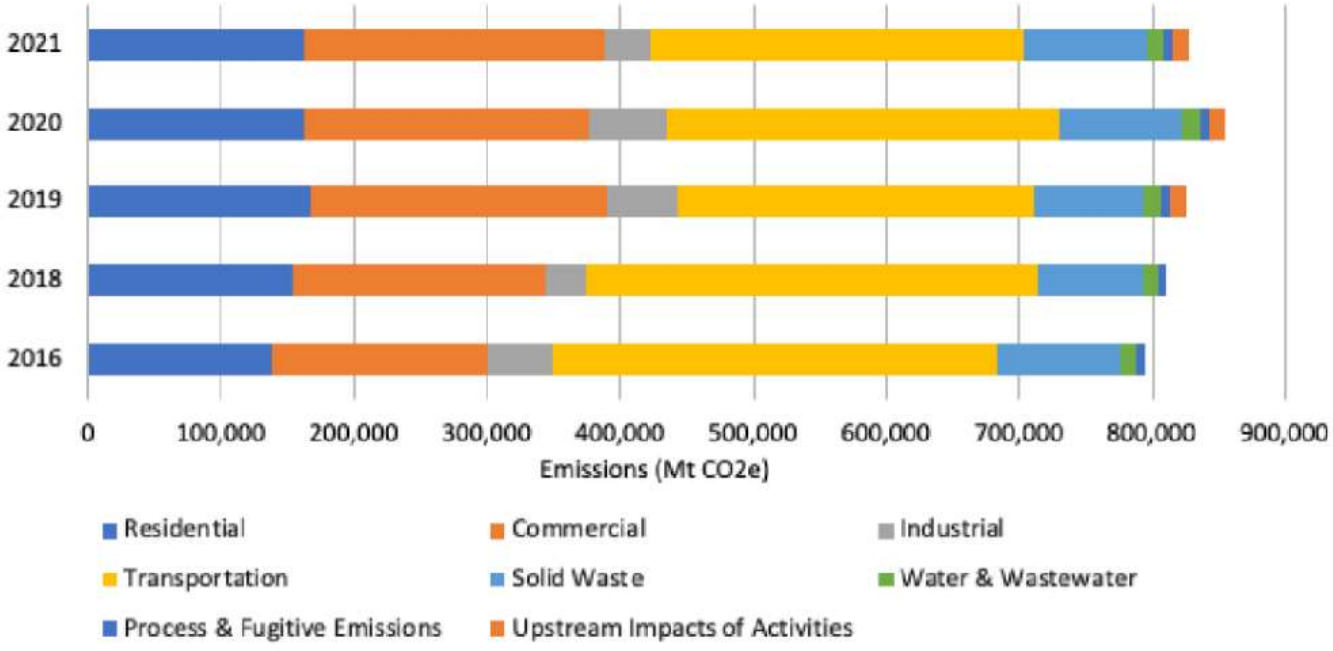


Figure 16. Greenhouse gas emissions by sector for 2016, 2018, 2019, 2020 and 2021.

Each year, the annual greenhouse gas inventory methodology will be updated to utilize the best available data and practices. When possible and prudent, Flagstaff will also work to retroactively and transparently apply updates and improvements to relevant projections-based models so that their baselines and forecasts might better reflect current methods and data. Indeed, the 2018 Climate Action and Adaptation Plan reported the 2016 baseline for community emissions to be 787,000 MTCO2e. To be more consistent with the improved data and methods that were available for the building and transportation sectors in 2020 while developing the Carbon Neutrality Plan, the 2016 baseline used for this Plan was updated to 759,000 MTCO2e. (See the conversation about the projected 44% reduction in emissions on page 11.)

There have been updates in methodology almost every year that the inventory has been done. One example illustrates methodology updates to improve accuracy in 2019 and 2021:

- In 2019, contractual natural gas was accounted in the inventory for the first time, resulting in a report showing a significant year-over-year increase (47%) in the total amount of natural gas delivered, and associated emissions. Despite having greater visibility on this source than in previous years, due to ongoing data limitations, contractual natural gas was simply split 50:50 between the commercial and industrial sectors.
- In 2021, the City was able to get yet more information on contractual natural gas. Rather than a 50:50 split, the actual allocation in 2021 was approximately 90% commercial and 10% industrial. Applying this improved information in 2021 contributed to both muted and significant year over year impacts on the larger commercial and smaller industrial sectors (+6% and -44% respectively).

While methodology updates have been made each year to provide the best available inventory, the City does not regularly re-evaluate either the 2016 emissions baseline or the 2030 business as usual (BAU) emissions projections. Doing so would be a significant endeavor for which only truly major changes and improvements would merit the investment of time and resources. Furthermore, in some cases, updates to baselines and projections may not be feasible (e.g.. if more granular data that is available for CY2021 isn't also available for previous years). That said, the City is in active discussions with multiple leading carbon accounting organizations and is regularly evaluating opportunities to continue to ensure that both the annual and historical emissions inventories reported are using the best data and methods available.

For more information on our greenhouse gas inventory and how our methodology and results have changed over time, see: www.flagstaff.az.gov/climate.

The Flagstaff Climate Action and Adaptation Plan was adopted in November 2018. While the 2019 inventory reflects emissions after adoption of the CAAP, it will take a few years for the impacts on our emissions to be observed. For instance, in 2019, City Council adopted a building code that will ensure new buildings use significantly less energy. However, this code was not mandatory until January 2020, and its emissions reductions will only be truly apparent after buildings built in 2020 and beyond become a greater portion of Flagstaff's building stock.

[34] EPA's greenhouse gas equivalencies calculator: https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

How do we measure greenhouse gas emissions?

On average, Flagstaff contributes to the production of 759,000 metric tons of carbon dioxide equivalents (MTCO2e).

In order to try to imagine what 759,000 MTCO2e might look like, one might first start by imagining a piece of coal burning, smoking, and releasing CO2 emissions into the atmosphere. Now, if for some reason we wanted to have a single-day bonfire that would emit the entirety of our annual emissions - 759,000 MTCO2e - we would need to gather a lot of coal. Because we are in Flagstaff, we might choose to use our local train tracks to help us bring in all the coal we need for this bonfire.

If we were to fill every railcar with coal, we would require an impossibly long train made up of 4,168 railcars' worth of coal. This would stretch over 41 miles. If you were to get caught behind the gates when this train came by, even if it could travel at the full legal in-town speed limit, you would be waiting at the gates for nearly an hour.[34]

THANK YOU

Thank you to the Flagstaff community.

2020 – 2021 Climate Emergency Steering Committee.

- Rick Barrett, Engineering, City of Flagstaff
- Greg Clifton, City Manager, City of Flagstaff
- Justin Emerick, Water Services, City of Flagstaff
- Dan Folke, Community Development, City of Flagstaff
- Joe Galli, Flagstaff Chamber of Commerce
- Geoffrey Gross, Coconino County
- Todd Hanson, Public Works, City of Flagstaff
- Gail Jackson, Economic Collaborative of Northern Arizona (ECONA)
- Natalie Jacobs, Citizens' Climate Lobby
- Megan Kelly, Grand Canyon Trust
- Dara Marks Marino, Climate Activist
- Dave McCain, City of Flagstaff Sustainability Commission
- Dave McIntire, Economic Vitality, City of Flagstaff
- Kate Morley, Mountain Line
- Matt Muchna, Northern Arizona University
- Amanda Ormond, Ormond Group, LLC
- Judson Tillinghast, APS
- Jed Westover, Loven Contracting

2020 – 2021 Flagstaff Sustainability Office - staff and interns.

- Ramón DC Alatorre, Climate & Energy Coordinator
- Nicole Antonopoulos, Sustainability Director
- Jillian Goulet, Climate Engagement Coordinator
- Dylan Lenzen, Sustainability Specialist
- Marissa Molloy, Administrative Assistant
- Jenny Niemann, Climate & Energy Specialist

- Stephanie Arcusa, GHG Emissions Intern
- Lee Bryant, Climate Engagement Coordinator
- Deirdre Conroy, Community Resilience VISTA
- Anona Miller, Transportation & Climate Intern
- Marie Nabors, Carbon Sequestration Intern
- Isabelle Wilhelm, Transportation & Climate Intern

Note: both current and former staff and interns are listed.

2020 – 2021 technical emissions consulting provided by the Cascadia Consulting Group.

APPENDIX A

The information in this Appendix is intended to give more detailed insights into *some* of the actions and ambition (e.g.. number of retrofits) that were used to arrive at our carbon neutrality calculations.

Path to Carbon Neutrality – outcomes modeled	**Example City Supporting Actions in the Model**
On-road transportation: Vehicle miles traveled (VMT) set to be held at 2019 **levels [1.59M/day (internal)]**	*20% increase in residential density *25% decrease in distance to transit *ATMP fully funded and implemented, including portions that have yet to identify dedicated funding sources; Assumes the Primary Bikeways Network is fully in place
30% Remaining miles electric (or zero tailpipe)	*All new sedans and SUV City of Flagstaff (COF) fleet vehicles till be electric vehicles (EV) or zero emissions vehicles starting in 2022 *50 EV charging stations provided by COF for community. *Additional EV charging stations as needed for fleet operations. **Impact Gap! Some of this will have to happen without COF support. **The 30% goal was modeled**, either the market needs to fill the gap or COF will need to add additional support. OR BOTH.
2000 home solar systems installed (5kW each) for 10MW distributed residential	*Facilitate a twice annual Northern Solar Co-op with SUN *New home building codes
Commercial sector brings on 10MW solar by 2030	
Industrial sector brings on 5MW solar by 2030	
Includes a 50MW solar installation at RGR + 10MW solar at the Cinder Lakes Landfill Assumes 25MW goes to make all COF electricity renewable Assumes COF works with APS to allow half of the remaining solar to be acquired/attributed to the commercial/residential sectors at 7.5MW/10MW split. Note: This does include some policy optimism - that APS and ACC will allow.	*COF works with APS to get utility scale solar at RGR

Path to Carbon Neutrality – outcomes modeled	Example City Supporting Actions in the Model
COF 100% renewable electricity by 2025 (likely to require 25-30MW); + energy efficiency and fuel switching upgrades across the municipality by 2030	*See utility scale solar above *Complete COF municipal energy audit and ESCO
12,500 total residential retrofits ~50% of existing homes. Note: This plan includes actions whereby the City directly supports between 4000 – 5500 of these retrofits.	*Relaunch and retool the ARRA era residential retrofit program: Design program for 4000 retrofits. *Revolving loans funds *Rebate programs **Impact Gap! Some of these have to happen without COF support. **The 12500 goal was modeled.** Either the utilities/State/Fed/market needs to fill the gap or COF will need to add additional support. OR BOTH.
25% of all commercial accounts (NOT COF or NAU) get a deep energy efficiency retrofit	*Revolving loan funds *Rebate programs **Impact Gap! Some of these have to happen without COF support. **The 25% goal was modeled.** Either the utilities/State/Fed/market needs to fill the gap or COF will need to add additional support. OR BOTH.
15% of commercial accounts/establishments fully electrify (not including COF or NAU)	*Revolving loan funds *Rebate programs **Impact Gap! Some of these have to happen without COF support. **The 15% goal was modeled.** Either the utilities/State/Fed/market needs to fill the gap or COF will need to add additional support. OR BOTH.
Landfill gas collection and flaring is operational	*COF installs system when current sequences are capped.