The Flagstaff Carbon Neutrality Plan

An Evolving Framework for Action

DRAFT - May 2021

Table of Contents

Letter from the Flagstaff City Council

This letter will be written based on City Council direction given at the May 25th Council work session

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 types 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 emerging types 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 busses, electric bikes, small electric devices like scooters and hoverboards (electric micro-mobility), and electric vehicles (EVs).

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 99 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 nine target areas for reducing our community's emissions, each with specific strategies to guide Flagstaff's work. This Plan updates the 2018 Flagstaff Climate Action and Adaptation Plan (CAAP) and draws 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 vulnerable communities in an equitable transition towards carbon neutrality.

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's discussion starting on page 16.

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.

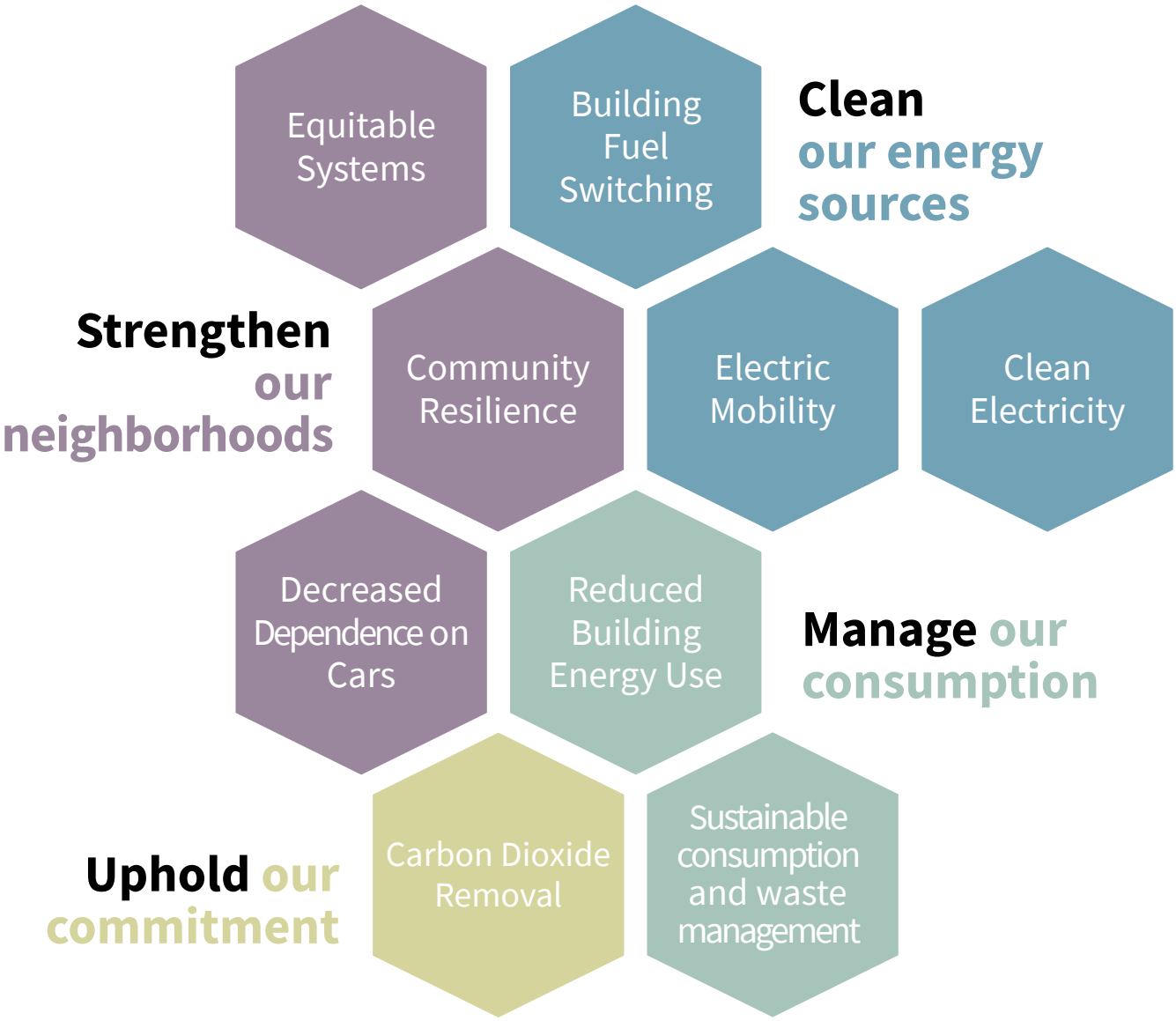
Goal Three: **Address climate change in a manner that prioritizes those most impacted and ensures the costs and benefits of climate adaptation and mitigation are equitably distributed.**

Climate change disproportionally impacts vulnerable 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.

The Climate Emergency Declaration calls for ambitious action on adaptation and equity alongside mitigation. Goals two and three reflect the adaptation and equity goals established in the 2018 Flagstaff Climate Action and Adaptation Plan. Read more about these principles on page 26.

Our Path to Carbon Neutrality

To reach carbon neutrality, we will…



TARGET AREAS AND STRATEGIES

Flagstaff will achieve carbon neutrality by taking action in the following target areas:

- Community Resilience
- Equitable Systems
- Decreased Dependence on Cars
- Electric Mobility
- Clean Electricity
- Building Fuel Switching
- Reduced Building Energy Use
- Sustainable Consumption and Waste Management
- Carbon Dioxide Removal

Target areas and their supporting actions are detailed starting on page 42.

1. FOCUS 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 vulnerable 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.

2. FOCUS TWO: WE WILL CLEAN OUR ENERGY SOURCES

Electric Mobility

- **EM-1:** Advance the electrification of busses 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 power source.
- **FS-3:** Support fuel switching in existing residential and commercial buildings.
- **FS-4:** Provide training and education on fuel switching.

3. FOCUS THREE: WE WILL MANAGE OUR CONSUMPTION

Reduced Building Energy Use

- **BE-1:** Achieve net zero 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 and Waste Management

- **MM-1:** Manage emissions from the Cinder Lake Landfill.
- **MM-2:** Encourage sustainable consumption.
- **MM-3:** Divert more waste from the landfill.
- **MM-4:** Reduce organic waste going to the landfill and feed hungry people.

4. FOCUS FOUR: WE WILL UPHOLD OUR COMMITMENT

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

Carbon neutrality involves two core actions: first one must reduce emissions by 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**. Compared to this scenario, the strategies and outcomes envisioned by the Plan will lead to a 44% reduction in emissions. While 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, Image A and Image B, display these emission reductions, in different ways.

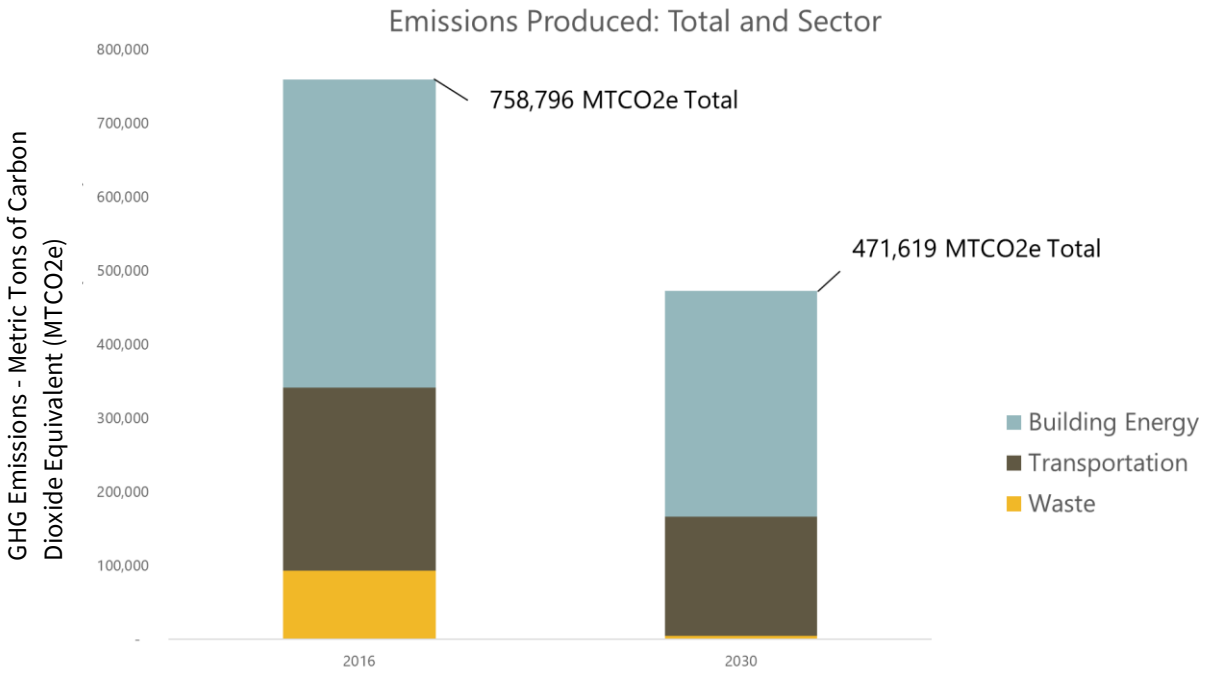
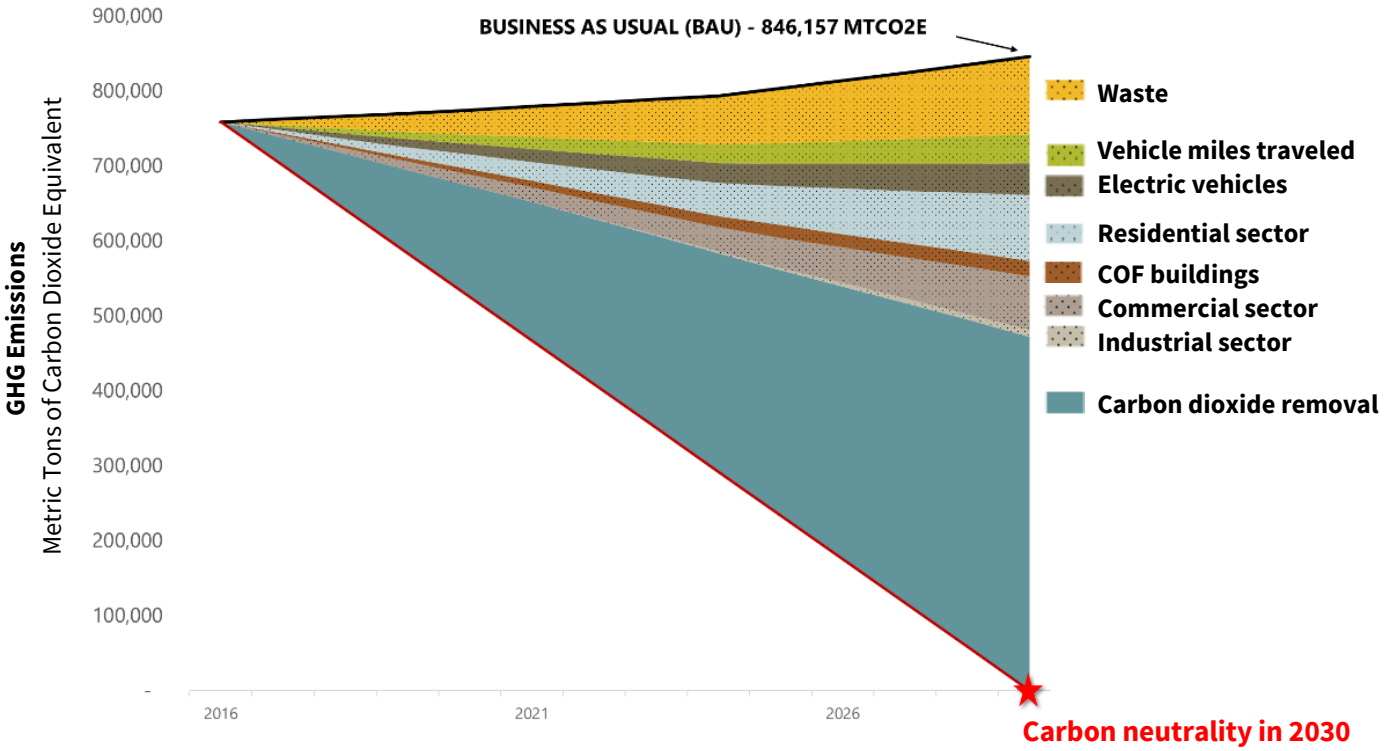


Figure 1: Remaining emissions still produced in 2016 (measured) and 2030 (projected). This bar graph only considers the emissions produced and does not consider the net impact that carbon dioxide removal (CDR) initiatives would have.



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	- COF **100% renewable electricity** by 2025: 50MW Solar installation at **Red Gap Ranch** before 2025 and 10MW solar installation at the **landfill**. - 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 Spaces.

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 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 vulnerable 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.

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 the 2018 Climate Action and Adaptation Plan – also known as the CAAP – and replaces the mitigation goals and actions of 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 vulnerable 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.

This Plan will replace the mitigation portion of the 2018 CAAP. While we have a new mitigation goal – carbon neutrality by 2030 – we will continue to reference the 2018 CAAP for the overarching adaptation and equity goals.

The Climate Emergency Declaration calls for more aggressive action on equity and adaptation, too. After we adopt this Carbon Neutrality Plan, we will start conversations with the community about bold action on adaptation and equity, and will revise our plans to reflect the Climate Emergency Declaration's calls for greater resilience and a focus on climate equity.

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 over time

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, 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 99.

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 vulnerable 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 for this ambitious goal. 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 93.

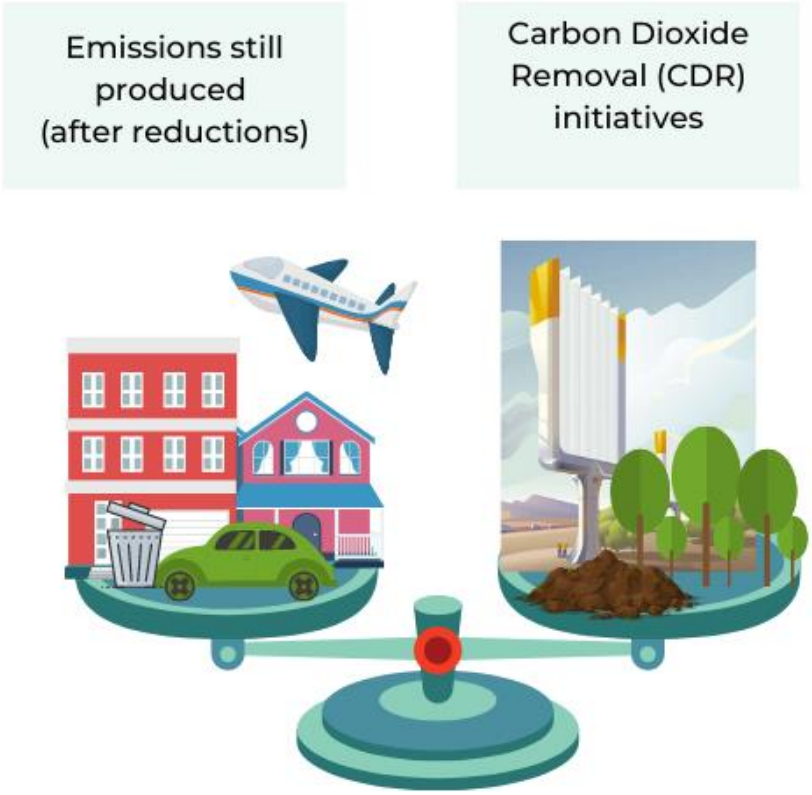


Figure 3. The two sides of the carbon neutrality scale: On the left side are the remaining emissions still produced (after reductions). On the right side is carbon dioxide removal. The two sides of the scale must balance out to achieve carbon neutrality. (Note: Mechanical Tree illustration on right side of scale comes from https://research.asu.edu/capturing-carbon)

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 to Flagstaff. The FWPP will 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 both for ourselves as well as our children 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%. See Figure 3 and 4 below for an illustration of the reductions required based on different timeframes of action.

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.

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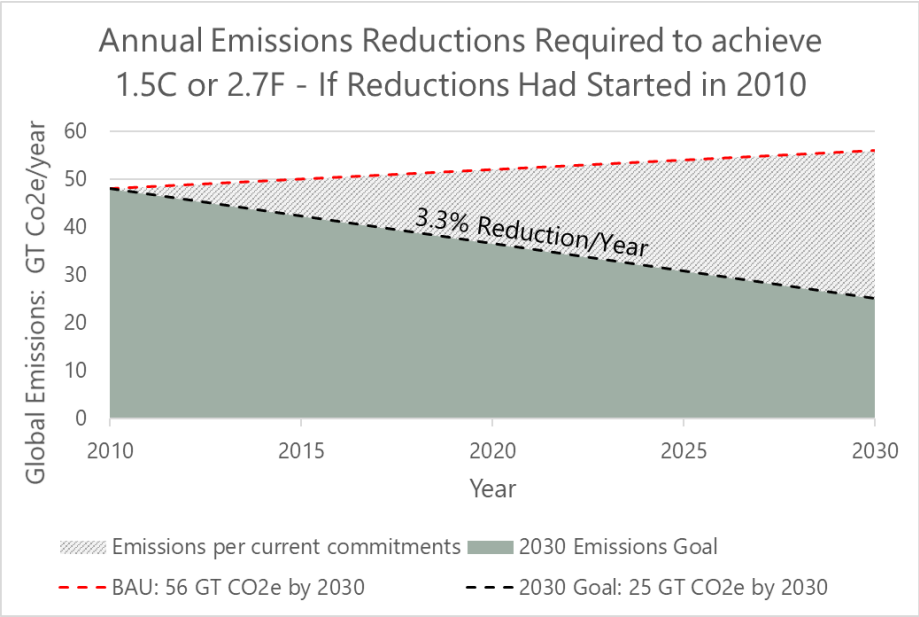
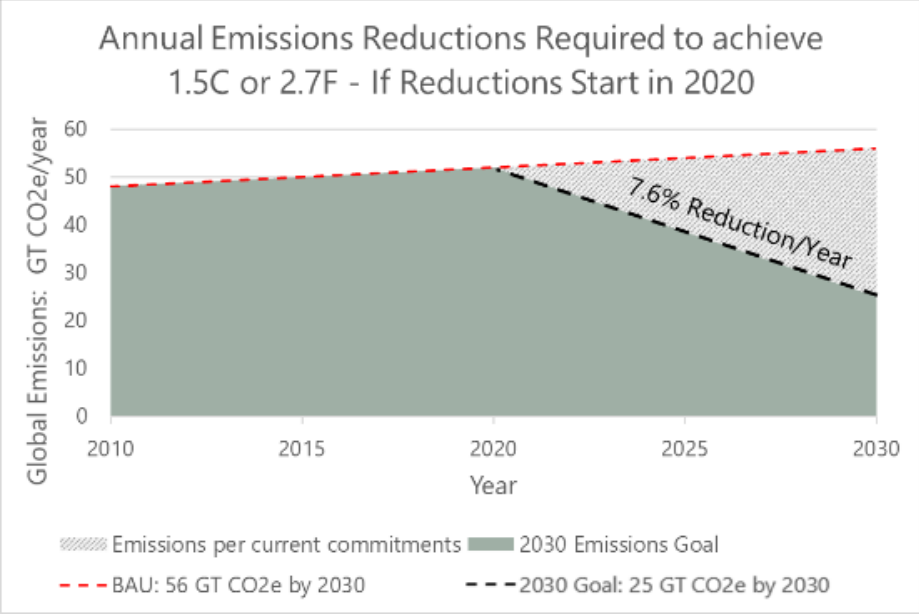
[1] Full Cost Accounting of the 2010 Schultz Fire: http://openknowledge.nau.edu/1282/1/Combrink_EtAl_2013_ERIWhitePaper_SchultzFullCostAccounting.pdf

[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

It is also 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 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 40). The City's Climate Emergency Declaration recognizes that the time to invest in our future is now.

6. CARBON NEUTRALITY IS SUPPORTED BY THE MARKET

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.

[5] https://policyintegrity.org/files/publications/Economic_Consensus_on_Climate.pdf
[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 100. 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.

As of spring 20201, examples of leadership can 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 an ambitious 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 52.

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]

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 - Today, 55 percent of Flagstaff residents are 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.

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 the Community Resilience target area - see page 45 for more information.

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 our vulnerable 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 vulnerable 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. Today, 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 vulnerable 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 48 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 Committee, as will every subsequent annual update.

CLIMATE ACTION IN FLAGSTAFF WILL:

- Produce co-benefits
- Rely on partnerships
- Prioritize incentives
- Be an iterative and adaptive process

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 Reduce 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 in the right direction.

- 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.

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.

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

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 22.
- 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 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. The City will work to partner with local businesses to learn about barriers and opportunities, ramp up their climate action efforts and highlight success stories.

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. Today, 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 our energy web page.
- 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 BE AN ITERATIVE AND ADAPTIVE PROCESS

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.

Carbon neutrality is an ambitious 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
Decreased Dependence on Cars	**Adopt and implement the Active Transportation Master Plan**
	Launch the protected bike lane pilot
	Improve COF regulations to allow for more infill housing and greater density
	Analyze and update COF street engineering standards to consider how street design affects travel choices and contribute to GHG emissions
	Analyze and update the COF 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 of 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 facilities
	Adopt a City electric vehicle procurement policy
	Complete an audit of COF 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
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 (COF) buildings
	Implement energy retrofits and conservation projects identified by the energy audit
	Update the Sustainable Building Resolution for COF buildings
	Implement a City of Flagstaff electricity rate optimization program
Sustainable Consumption and Waste Management	**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
CDR	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 COF	Develop and encourage a COF 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 24.

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. This 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 obstacle 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 it's 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 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 100) 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

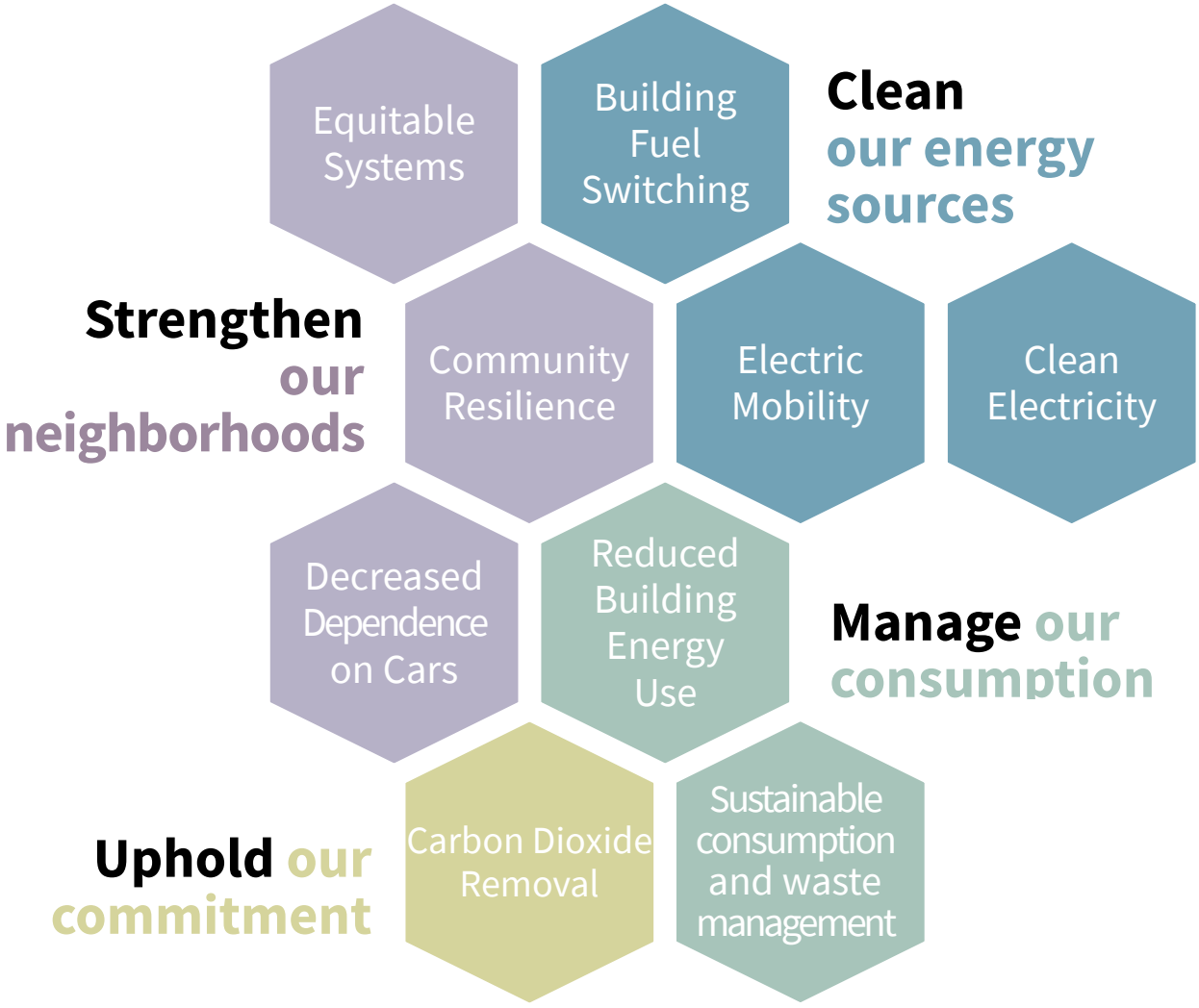
Financial investments are necessary for Flagstaff to reach carbon neutrality. Investing in climate action throughout Flagstaff has many benefits, financial and otherwise. The benefits of adaptation include the costs we avoid by reducing or averting the negative local impacts of climate change, while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

- Increase existing City fees on certain activities, such as increasing the Environmental Management Fee.
- Propose 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.
- Issue bonds, a mechanism for the City to pay for large infrastructure projects.
- Apply for grants from the federal government and private organizations or foundations.
- Allocate City resources to climate-focused initiatives.
- Establish a local emissions reduction fund, to allow individual donations to fund emissions-reducing projects.

IV. THE PATH TO CARBON NEUTRALITY



To achieve carbon neutrality, we will work through nine target areas of action:

Focus One: Our neighborhoods

- Community Resilience
- Equitable Systems
- Decreased Dependence on Cars

Focus Two: Our energy sources

- Clean Electricity
- Building Fuel Switching
- Electric Mobility

Focus Three: Our consumption

- Reduced Building Energy Use
- Sustainable Consumption and Waste Management

Focus Four: Our commitment

- Carbon Dioxide Removal

ABOUT OUR TARGET AREAS

This Plan defines nine 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.

The following 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 and Waste Managemen**t.

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 nine 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.
- Connections to the 2018 Climate Action and Adaptation Plan.

Focus One: Our Neighborhoods

We will strengthen our neighborhoods through:

- Community resilience
- Equitable systems
- Decreased dependence on cars

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 populations within our community. 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.

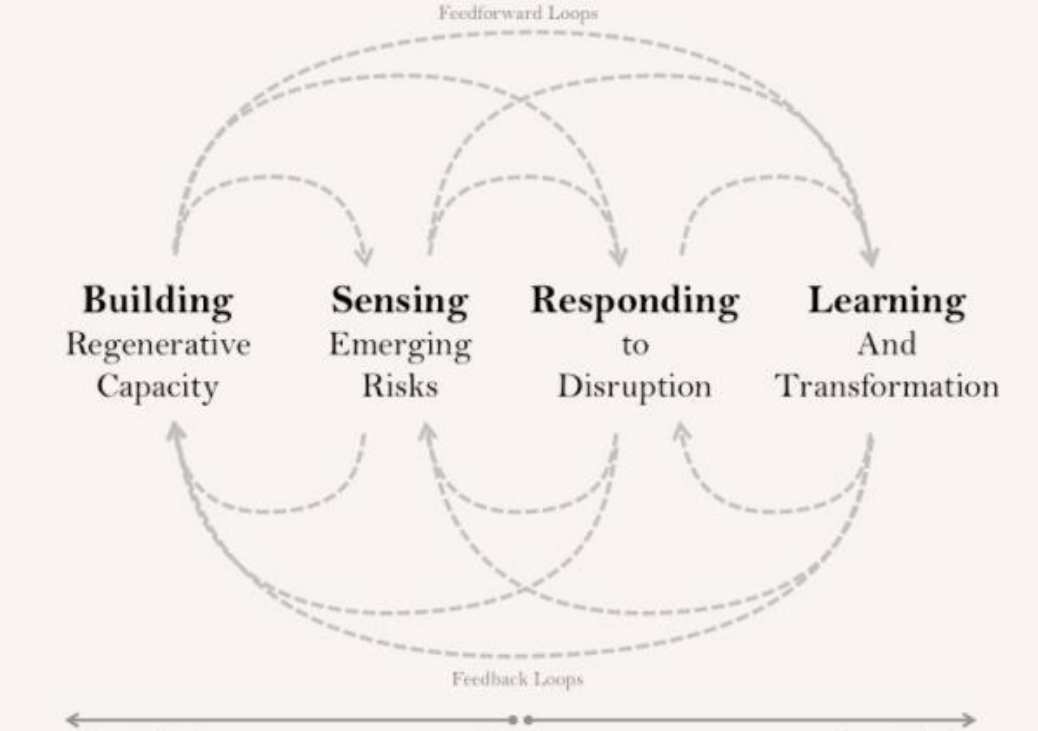


Figure 6: The feedback loops involved in resilience building. Image Credit: Erik Hollnagel

EQUITY AND ADAPTATION CONSIDERATIONS

Adaptation is interdependent with equity: 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 vulnerable 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. Vulnerable 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 vulnerable 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 vulnerable.
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 Water Conservation Master Plan.

Connections to the Flagstaff 2018 Climate Action and Adaptation Plan:

Overarching goal 2: Prepare the city's neighborhoods, systems, and resources to be more resilient to climate change impacts.

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 vulnerable communities in Flagstaff within the Approach chapter of this Plan on page 27.

Acting equitably requires identifying vulnerable 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 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 vulnerable. 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 vulnerable 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 equitable.

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.

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

Opportunities for action:

1. For each climate action, identify vulnerable 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:

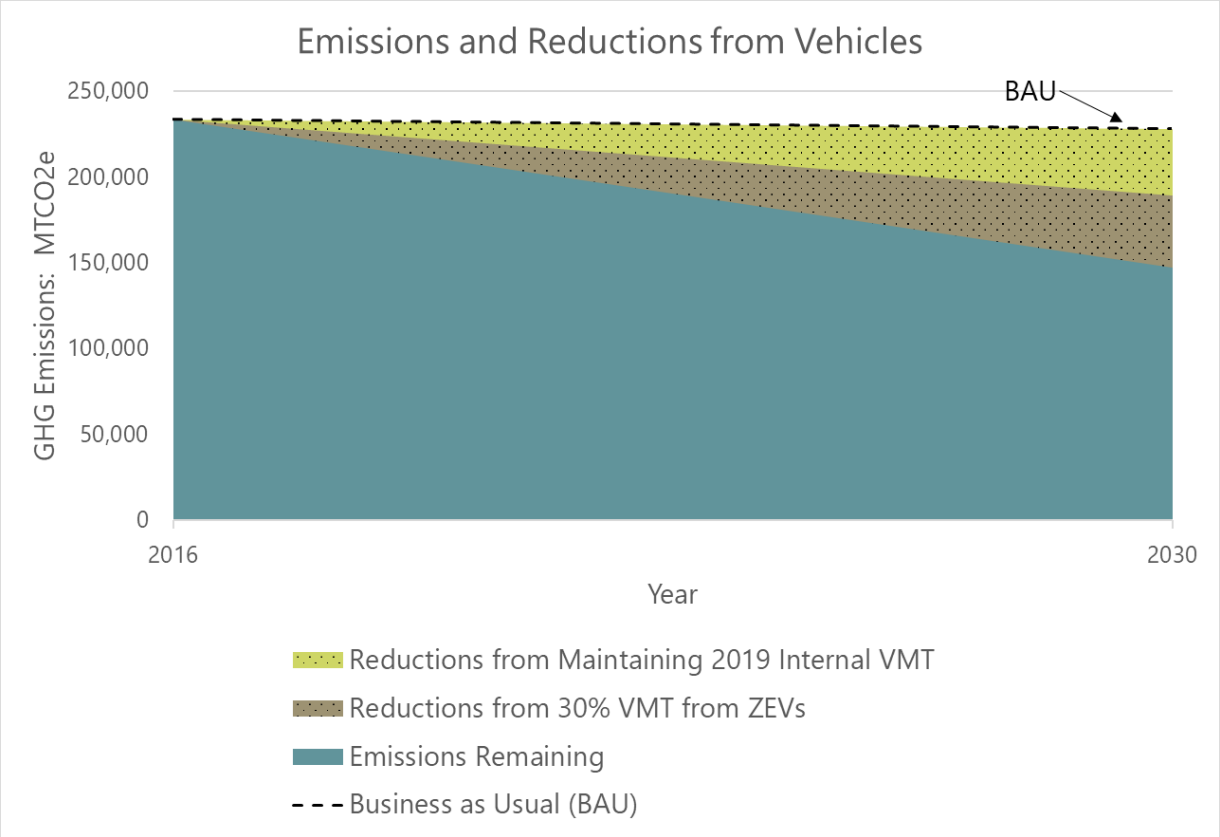
1. Build relationships with organizations and community leaders serving vulnerable communities.
2. Identify areas where vulnerable groups have already been affected by climate change, and where gaps in trust might exacerbate existing disparities in the community.

Connections to the Flagstaff 2018 Climate Action and Adaptation Plan:

Overarching goal 1: 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.

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.



WHAT IT MEANS

Reductions in 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 accomplished simultaneously with a transition to clean, low- and zero-emission vehicles (see Electric Mobility on page 35). Transportation-related emissions account for approximately 30% of Flagstaff's community-wide GHG emissions, so making progress toward reducing commuting miles and increasing equitable access to goods and services are essential to effective action.

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 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.[11] 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.

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 forthcoming Active Transportation Master Plan. 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. Mutliple new neighborhoods are planend 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.

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.

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

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 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%[12]. 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 busses, 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 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.

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, 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.

[12] 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

Flagstaff residents deserve what are called **15-minute neighborhoods**: places to live where you can meet most of your daily needs with just 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. We 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 building densly in areas that are less prone to flooding and fire, Flagstaff can be better prepared for an increase in these events.

GOALS

Goal	Year
Hold vehicle miles traveled 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

What is electric micro-mobility?

Micro-mobility technology is a rapidly-evolving category of light-weight individual transportation devices. Examples include electronic scooters and electric bikes (e-bikes), 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 section on page 65 for more information.

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. Adopt, 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.

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.

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.

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.

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 Can We Account for GHG Emissions in Transportation Planning?

Municipalities across the country are beginning to incorporate 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 busses 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.[13] 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.[14] Flagstaff can invest in keeping its air quality clean *now*, to avoid future regulation and mandates.

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

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 "Interval 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.

Connections to the Flagstaff 2018 Climate Action and Adaptation Plan:

Transportation and Land Use Strategy 1: Advance land use planning that minimizes the distance people have to travel by car and that increases community resiliency.

Transportation and Land Use Strategy 2: Prioritize, incentivize, and promote transportation by biking, walking, and transit.

Transportation and Land Use Strategy 5: Manage transportation demand and reduce the frequency with which people drive alone.

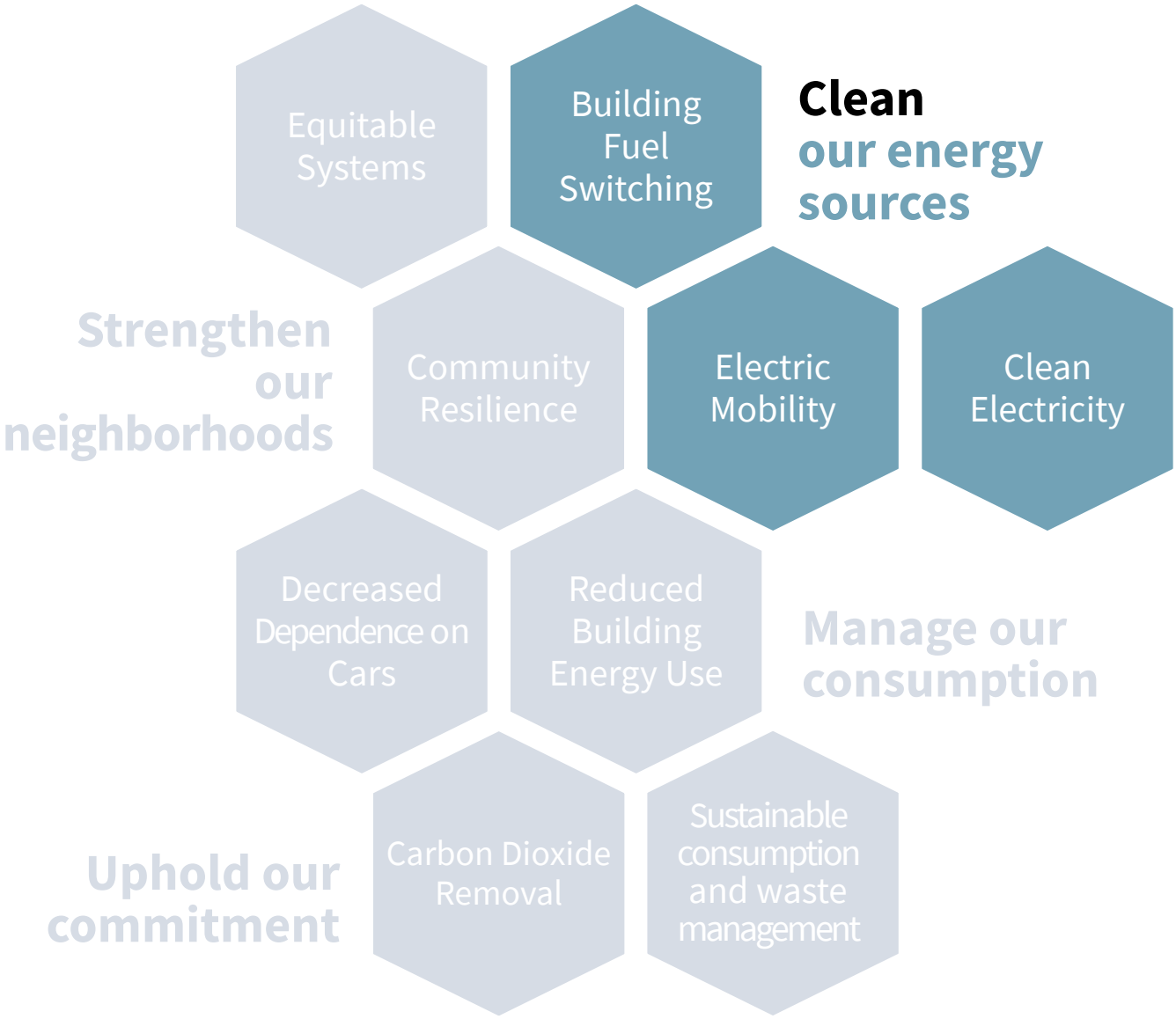
Improvements in transit infrastructure, operations, and encouragement

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.

Focus Two: Our Energy Sources

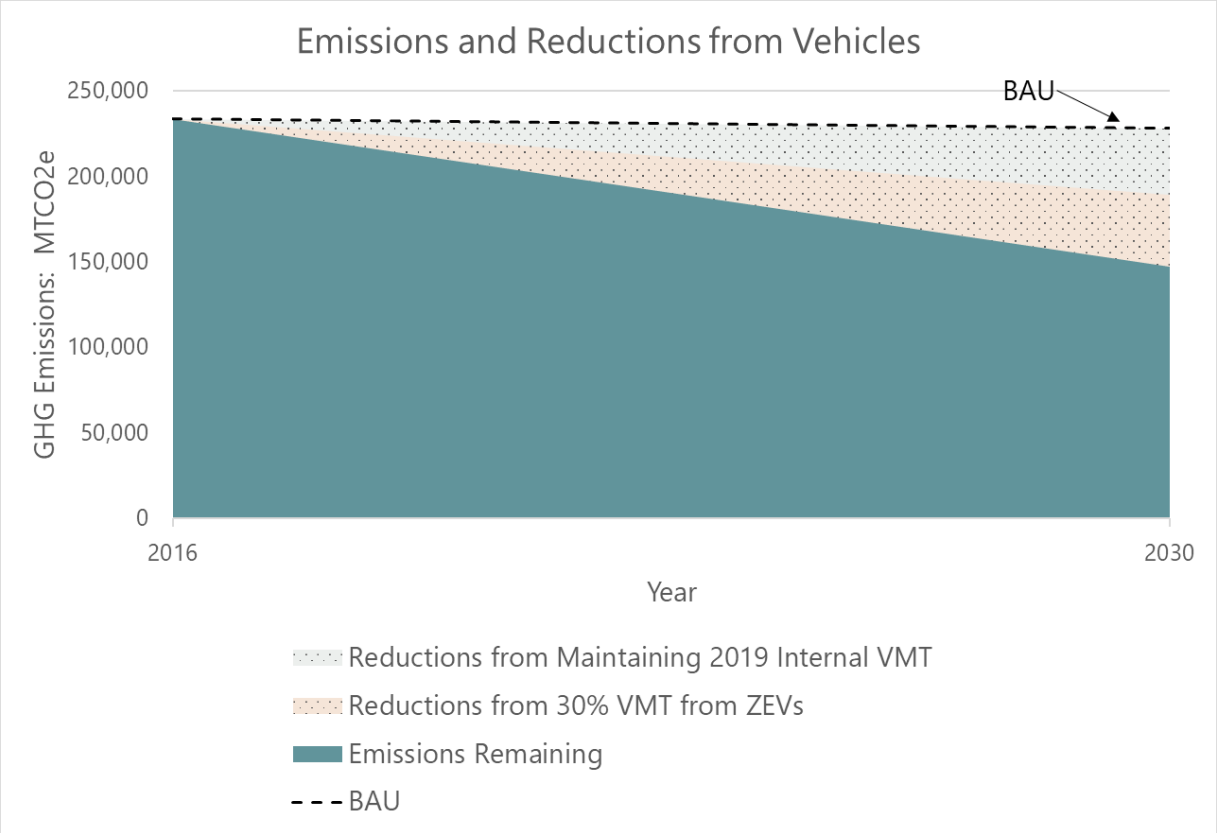


We will clean our energy sources through:

- 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 busses and taking advantage of the rapidly evolving electric vehicle market.



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 while decreasing 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 widespread transition to zero-emission vehicles is a long-term strategy. The City of Flagstaff can support this transition by investing in and advancing (through Codes, partnerships, incentives, etc.) the necessary supporting infrastructure. 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. 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.

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 FUSD 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.

What is electric micro-mobility?

Micro-mobility technology is a rapidly-evolving category of light-weight individual transportation devices. Examples include electronic scooters and electric bikes (e-bikes), 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 56 for a discussion of how micro-mobility can reduce vehicle miles traveled.

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

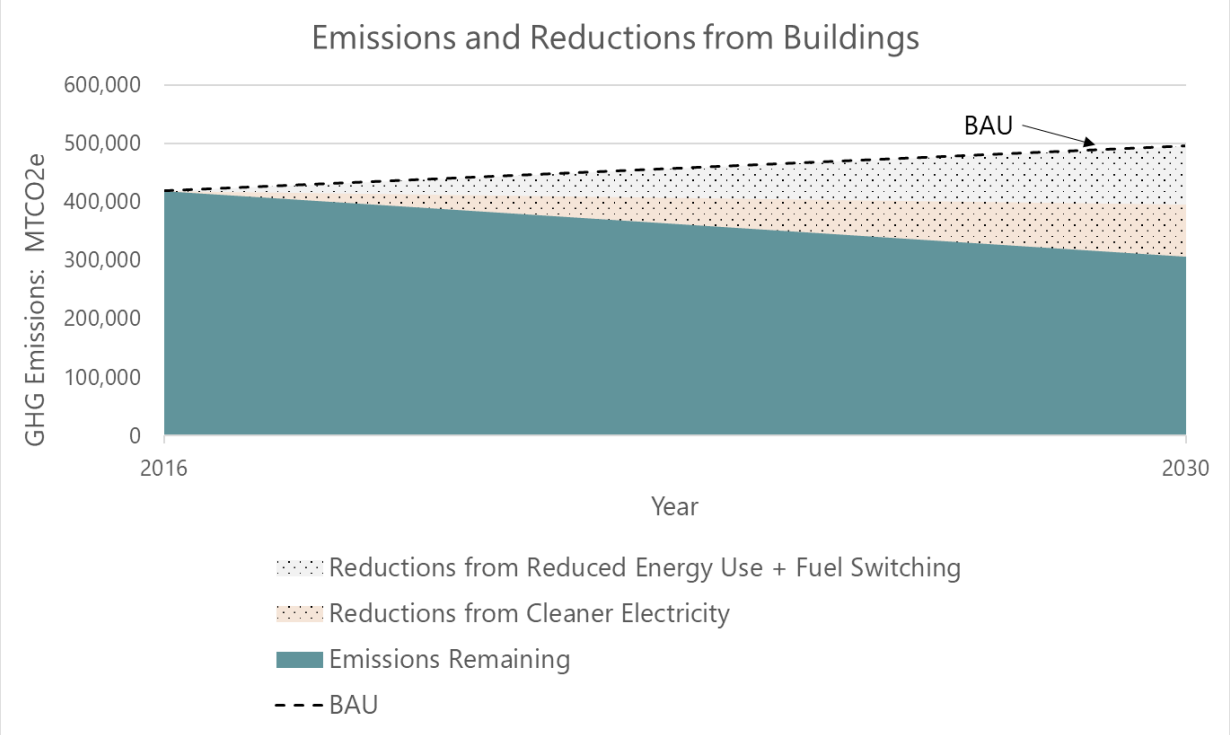
While electric vehicles appear to have the inside track for capturing the market on passenger and light-duty vehicles that produce zero tailpipe emissions, vehicles fueled with hydrogen represent another emerging technology that may also play a role. The City will actively monitor advances in technology,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

Connections to the Flagstaff 2018 Climate Action and Adaptation Plan:

Transportation and Land Use Strategy 3: Support the use of clean, energy -efficient vehicles

Clean Electricity

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



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 42 and Electric Mobility on page 65).

Emissions from electricity currently constitute approximately 25% of all community emissions. This means that even without making any other changes (see the Sections Reduced Building Energy Use, Building Fuel Switching and Electric Mobility, starting on page 83, 75, and 65, 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). Unfortunately, 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 community. The negative impacts of wind and solar 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. The City will consider short- and long term impacts to the environment and our community when proposing 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.[15]) 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 (traditional community solar would require a change in State laws) to achieve even greater near-term emissions reductions. 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. 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.

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 hydroelectric power, may be incorporated during Plan implementation.

[15] https://www.aps.com/en/About/Our-Company/Doing-Business-with-Us/Resource-Planning

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.

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. Install solar at landfill when sections get capped to support City energy usage and eventually connect to grid.
4. Update the City of Flagstaff Sustainable Building Resolution, requiring that newly constructed municipal buildings be built to net zero energy standards.

Project in the Pipeline:

Utility-scale Solar Installation at Red Gap Ranch - The primary intention of this project is to first satisfy the 100% renewable electricity for the municipality by 2025 goal.

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. [16]

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

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.

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

This development 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.

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

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

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

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).

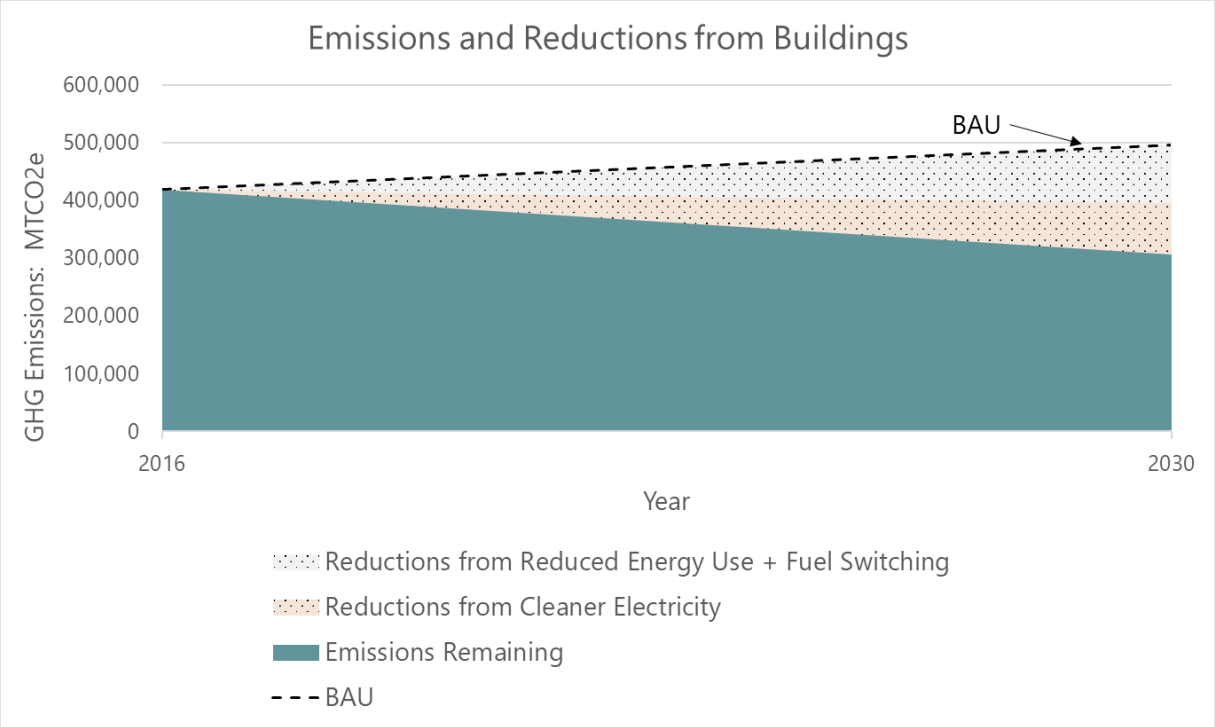
The City of Flagstaff should also encourage the ACC and DOE to renew and increase renewable energy production incentives for residential and commercial solar and other distributed generation and storage projects, without additional metering fees or other disincentives.

Connections to the Flagstaff 2018 Climate Action and Adaptation Plan:

Energy Strategy 2. Expand renewable energy generation and use.

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.



WHAT IT MEANS

Building fuel switching 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 Section on page 38) 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 Section on page 46) 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[6], 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."*
> *– Rocky Mountain Institute.*[7][17]

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.

[17] 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.[18]

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 24 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 Social Cost of Carbon on page 40).

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 section on page 83).

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

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 1 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 1 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, or only, power 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.

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.[19]" 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.

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.

Legislative change

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

Connections to the Flagstaff 2018 Climate Action and Adaptation Plan:

Energy Strategy 2. Expand renewable energy generation and use.

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

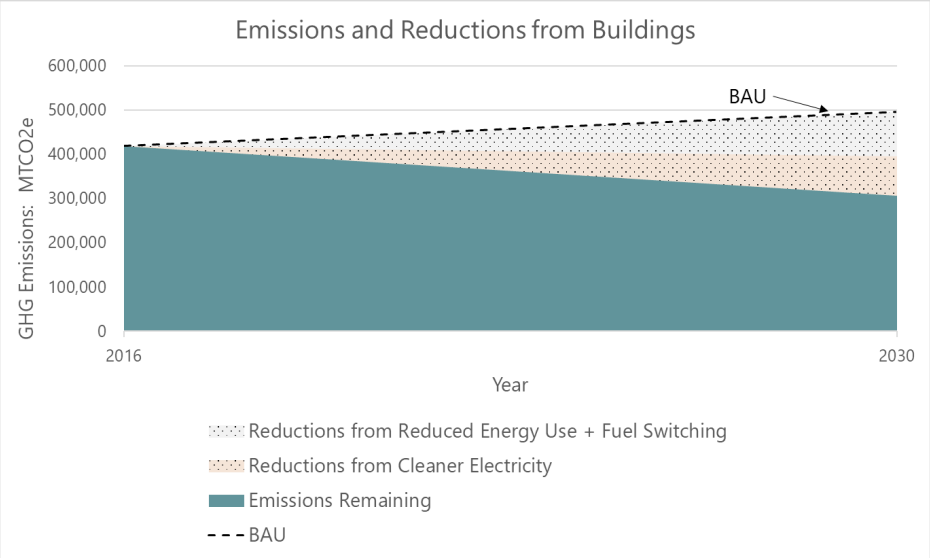
Focus Three: Our Consumption

We will manage our consumption through:

- Reduced building energy use
- Sustainable consumption and waste management

Reduced Building Energy Use

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



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.[20]

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 69), reducing building energy demand will also improve the ability of the 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 on page 75 and page 65, respectively). Fuel switching without energy efficiency measures will increase

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

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.

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, today's existing building stock 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: Purchasing new, energy efficient technology can take a significant amount of financial resources. Policies in this target area will need to prioritize low- and middle-income households to provide emissions and cost-saving benefits equitably throughout the community.

Adaptation: More efficient buildings can prepare Flagstaff for more extreme events, like extreme heat or extreme cold.

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

BE-1: Achieve net zero 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.

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.[21] 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."**[22] 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.[23]

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.

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

Legislative change

This strategy would benefit from enabling legislation to allow:

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

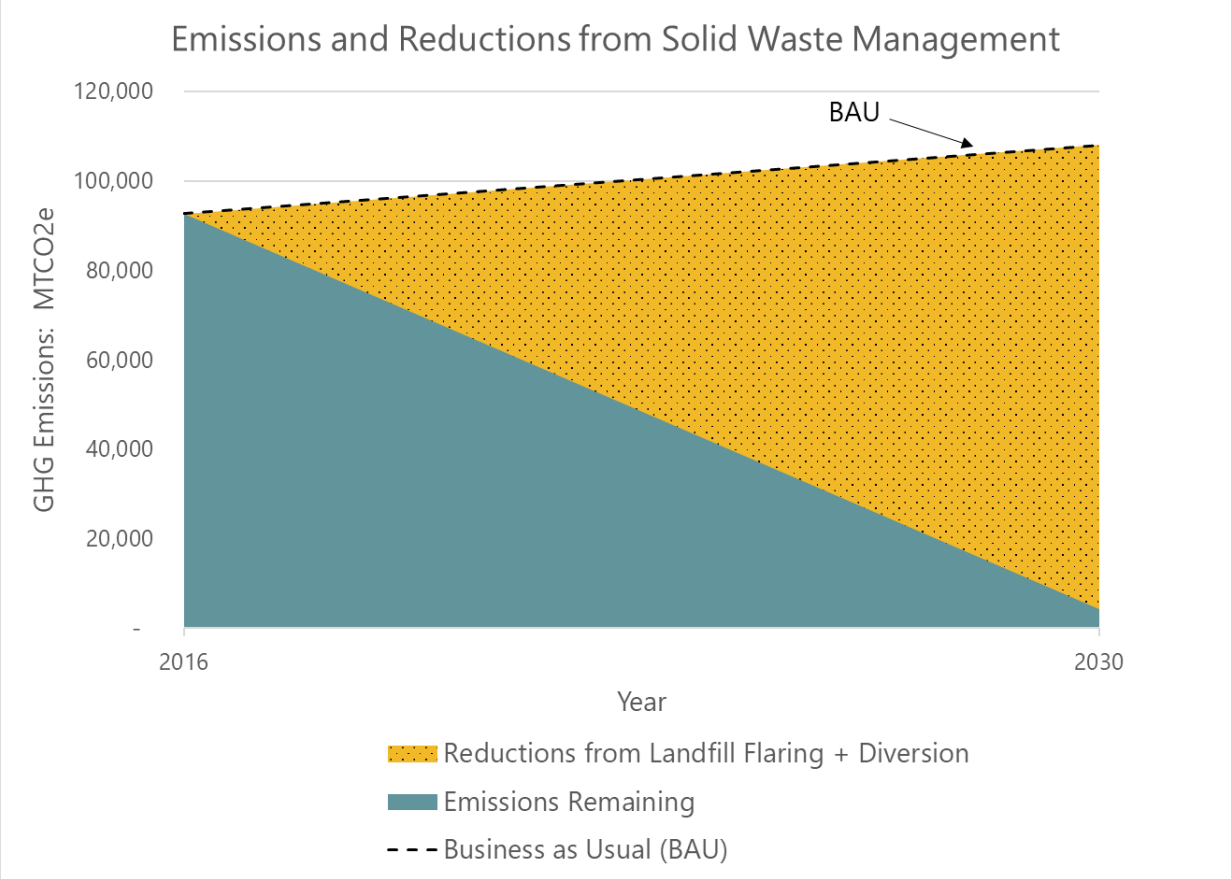
2). An Arizona PACE program to encourage property owners to make energy-related investments and upgrades to buildings using a special property assessment, for both residential and commercial properties.

Connections to the Flagstaff 2018 Climate Action and Adaptation Plan:

Energy Focus Area Strategy 1. Improve energy efficiency in all sectors.

Sustainable Consumption and Waste Management

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



WHAT IT MEANS

Given our current sector-based inventory methods (see page 102), 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.[24]

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

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 on page 103). 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.

> 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.

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.

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

MM-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.

MM-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.

MM-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.

MM-4: Reduce organic waste going to the landfill and feed hungry people.

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.

Connections to the Flagstaff 2018 Climate Action and Adaptation Plan:

Waste and Consumption Strategies:

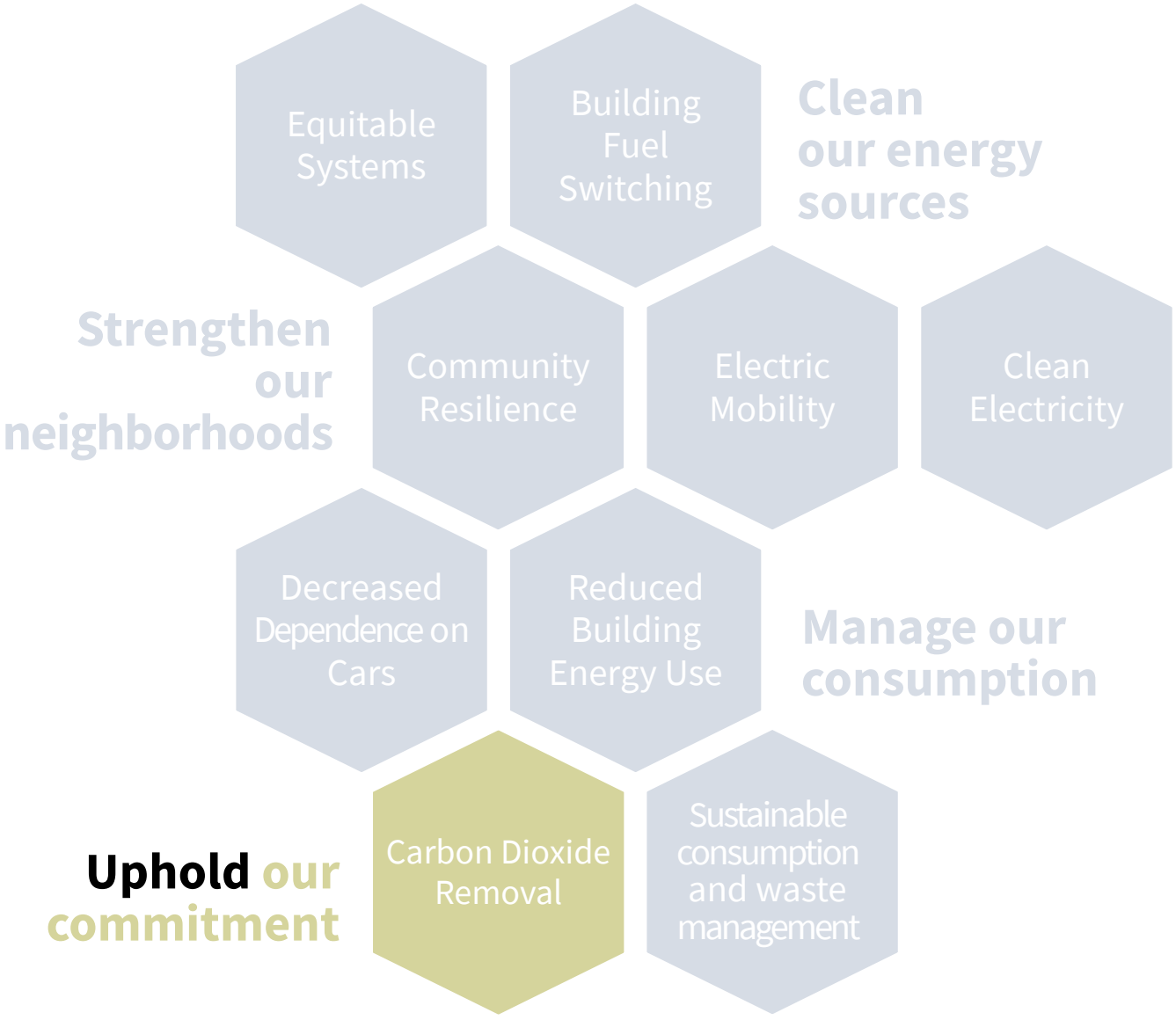
Strategy 1. Increase waste diversion

Strategy 2. Support sustainable and accessible production and consumption.

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

Strategy 4. Improve data collection on consumption, waste, and diversion.

Focus Four: Our Commitment



We will uphold our commitment through:

- Carbon dioxide removal

Carbon Dioxide Removal

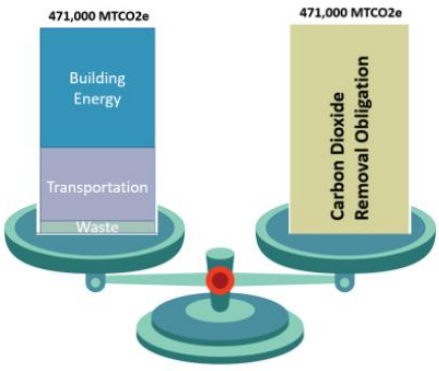
Flagstaff will achieve carbon neutrality by first measuring the remaining emissions produced by our community each year, and then balancing with an equivalent amount of carbon dioxide removal (CDR) through local and regional initiatives. If local and regional initiatives are unable to fully satisfy the 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 related to costs, location suitability, 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.



Year 2030

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 Principles25 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.

[25] 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 vulnerable 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.

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.

Connections to the Flagstaff 2018 Climate Action and Adaptation Plan:

Natural Environment Strategy 1. Protect existing forests, resources, and meaningful open spaces.

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. At this time, we have a sense of how much CDR is likely to be necessary to achieve carbon neutrality, based on the emissions reductions anticipated. And so now we need to start doing 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.

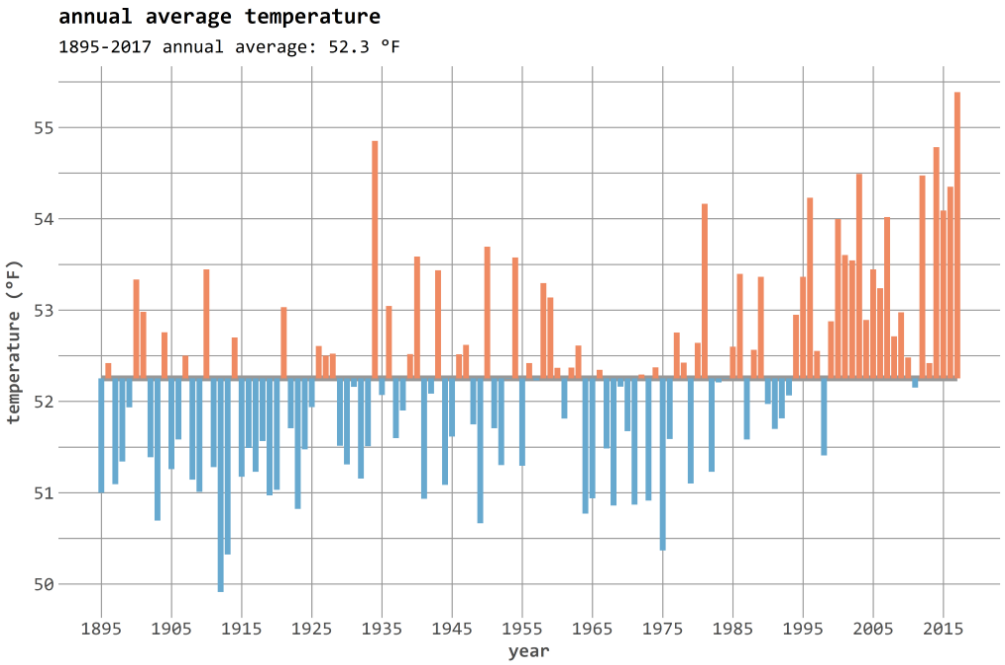
ENVIRONMENTAL CHANGES

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.[26]

[26] 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.



SOCIAL SYSTEMS CHANGES

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

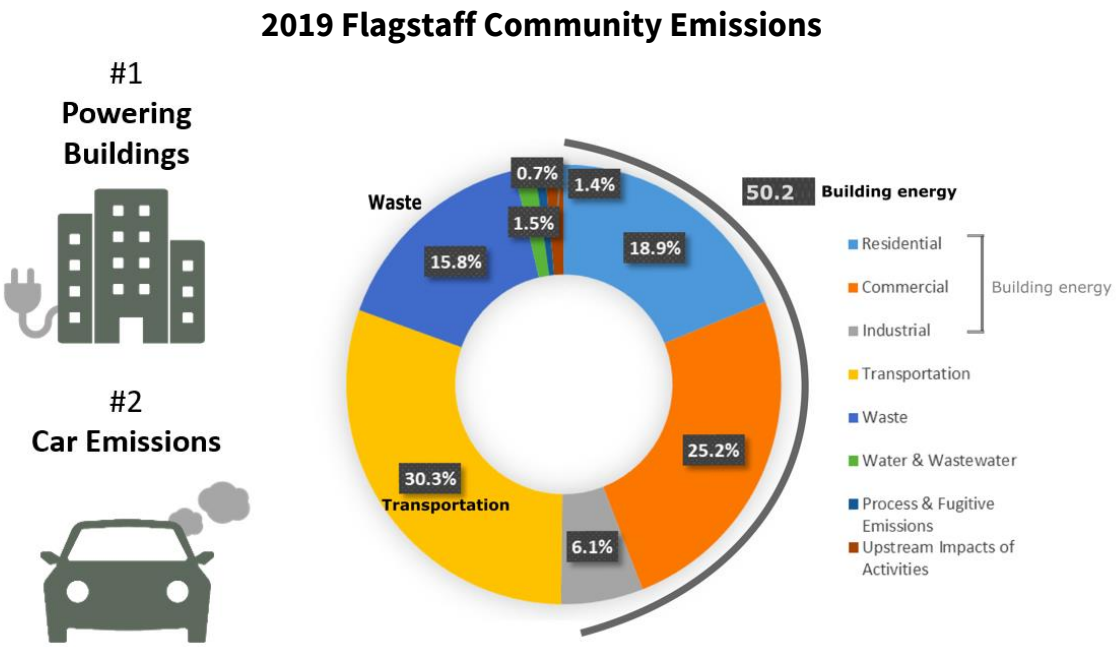
- Increased allergens and longer allergy seasons
- Increased susceptibility to insect-borne illness
- Decrease visitation for snowplay
- Heat-related illnesses
- Regional growth that stresses Flagstaff's housing

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 Program 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.



Our Greenhouse gas emissions fall into three 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. **Other emissions** are produced from solid waste (16%), water and wastewater treatment (2%), upstream impacts of activities (1%), and process and fugitive emissions (0.7%). While smaller relative to other sectors, these categories are all important to measure and manage to achieve our emissions reduction goals.

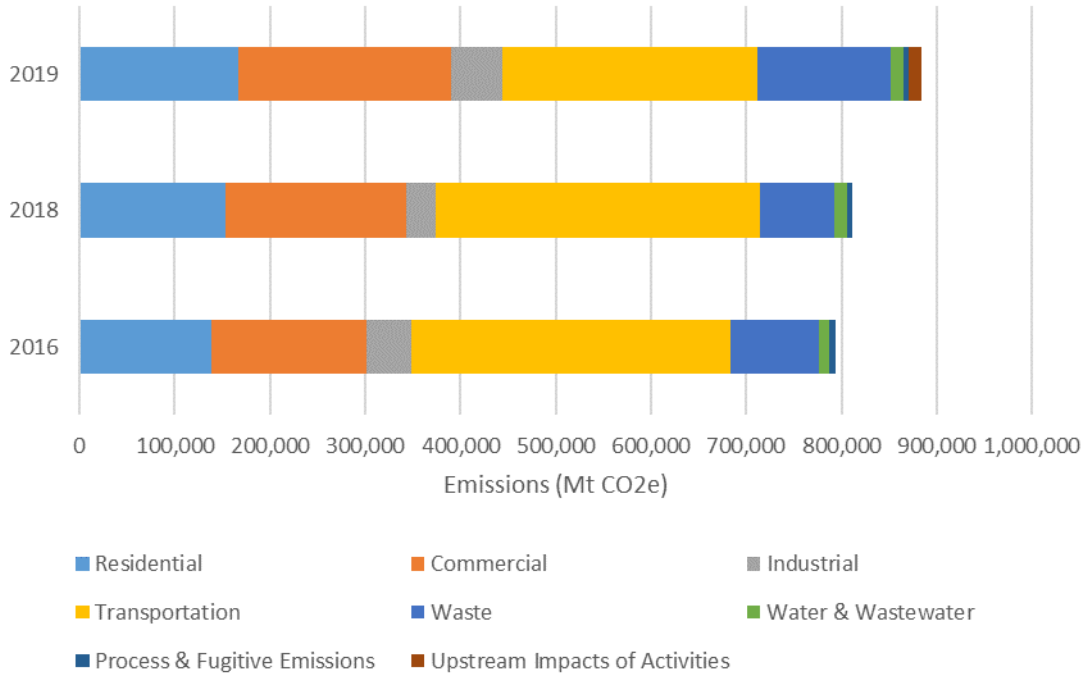
A SECTOR-BASED GREENHOUSE GAS INVENTORY

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.[27]

BASELINE: COMMUNITY EMISSIONS BEFORE CLIMATE ACTION

The City of Flagstaff has been tracking community greenhouse gas emissions since 2006. Since then, the way we track emissions has evolved. Today, 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.

The following graph shows the greenhouse gas emissions by sector for 2016, 2018, and 2019.



The apparent jump observed in 2019 should be considered with the following factors in mind. In 2019:

- Contractual natural gas was accounted for the first time, increasing the emissions of the industrial and commercial sectors.
- The treatment of daily vehicle miles traveled (VMT) was updated, resulting in a net reduction in transportation emissions.
- The protocol for the waste sector was updated from an in-jurisdiction protocol to a methane-commitment protocol, increasing the annual emissions accounted and creating a framework with greater impact potential for waste diversion efforts.
- 2019 was the first year that Upstream Impacts of Activities were included in the Flagstaff inventory.

Each year, the annual greenhouse gas inventory methodology will be updated to utilize the best available 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, to be more consistent with the 2019 data and methods for buildings and transportation, the 2016 baseline used for the carbon neutrality modeling was amended to 759,000 MTCO2e. This is a lower baseline than was reported in the 2018 Climate Action and Adaptation Plan. (See Projected Emissions Reduction From Plan Implementation on page 10.)

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 first 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.

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.[3]

THANK YOU

Climate Emergency Steering Committee

- Rick Barrett, City of Flagstaff
- Greg Clifton, City of Flagstaff
- Justin Emerick, City of Flagstaff
- Dan Folke, City of Flagstaff
- Joe Galli, Chamber of Commerce
- Geoffrey Gross, Coconino County
- Todd Hanson, 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, City of Flagstaff
- Kate Morley, Mountain Line
- Matt Muchna, Northern Arizona University
- Amanda Ormond, Ormond Group, LLC
- Judson Tillinghast, APS
- Jed Westover, Loven Contracting

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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 (i.e. number of retrofits) that were used to arrive at our carbon neutrality calculations.

Path to Carbon Neutrality – outcomes modeled	Example COF 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 light duty COF Fleet vehicles EV or ZEV starting 2021 *50 EVCS provided by COF for community. *Additional EVCS 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 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
COF 100% renewable electricity by 2025 (likely to require 25-30MW); + EE and FS 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 EE 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 flare is online	*COF installs system when current sequences are capped.