THE FLAGSTAFF CARBON NEUTRALITY PLAN

MARCH 2021 DRAFT

An update to the
2018 Flagstaff Climate Action and Adaptation Plan

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KEY TERMS

A few key climate terms are used throughout this Plan. We have defined these terms below to clarify what these words mean in the context of Flagstaff's work.

- **Carbon neutrality:** Reducing as many carbon emissions as possible and then balancing those that cannot be eliminated through emissions removal.
- **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).
- **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 energy in the atmosphere, causing extreme weather events like drought, rising sea levels, and catastrophic wildfire.
- **Electrification**: Converting appliances, machines, and systems that rely on natural gas, oil, or coal to operating on electrical power.
- **Carbon Sequestration:** Capturing carbon emissions from the atmosphere and storing the emissions in terrestrial, geological, and oceanic reservoirs or products.
- **Mitigation:** Actions that increase the ability to withstand, respond to, or cope with climate change impacts.

Note: Pages 2 and 3 have been omitted as they are no longer relevant. Page numbers have not been adjusted, to ensure this version matches prior draft copies.

INTRODUCTION

Climate change, driven largely by human-caused greenhouse gas emissions, is disrupting global weather patterns and threatening communities worldwide. 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. In June 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.

This 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 our buildings, travel from place to place, and dispose of waste. These shifts must occur at multiple levels within our community, as well as the state, country, and world. This Plan includes seven 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 centering equity in our climate work.

The Flagstaff community will be an integral voice in deciding how the City of Flagstaff reaches the Plan's goals. The road to carbon neutrality will not be easy and will require perseverance and creativity. But each step closer to carbon neutrality offers hope for a healthier, safer, and more prosperous future for the Flagstaff community—and the world.

ACKNOWLEDGEMENTS

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
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Technical emissions analysis provided by the Cascadia Consulting Group

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.

CARBON NEUTRALITY: OUR CURRENT FOCUS

This Carbon Neutrality Plan implements Section 7 of the Declaration: it updates the Climate Action and Adaptation Plan's mitigation goal to carbon neutrality by 2030. Achieving carbon neutrality will require more ambitious action on a more aggressive timeline than the 2018 Climate Action and Adaptation Plan.

For more information on carbon neutrality and our emissions, see the Carbon Neutrality and Greenhouse Gas Emissions sections on page 10 and 19, respectively.

Vision and Goals

OUR 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, and centers vulnerable communities in an equitable transition towards carbon neutrality.

GOALS

Goal 1: **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 local emissions reductions and negative emissions initiatives to offset the remaining community emissions that the City does not eliminate. For more information, see the Carbon Neutrality section on page 12.

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

By 2030, Flagstaff will not be able to reduce 100% of our community emissions. Rather, this Plan envisions a 44% decrease in local emissions from the business as usual projections by 2030. Despite the efforts of this Plan, some vehicles will still use gasoline and diesel, natural gas will still be used in some appliances and buildings, and electricity usage will continue to create some emissions that must be accounted for. The remainder of emissions will be accounted for through sequestration or offsets.

Goal 2: **Prepare the City's communities, systems, and resources to be more resilient to climate change impacts.**

The first two goals of this Plan focus on mitigation, also known as reducing our greenhouse gas emissions. However, mitigation is not enough to address changes that have already happened, and the climate changes we know are coming. We must also focus on adaptation, or strengthening our community's systems, so they are better equipped and more resilient to both short-term shocks and long-term change.

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. Historical and political systems play a significant role in creating this disparity and will not be dismantled easily. The City of Flagstaff must center equity in its climate action decisions to ensure all communities in Flagstaff can benefit from a carbon-neutral future.

Our Path to Carbon Neutrality

To reach carbon neutrality, we will…

TARGET AREAS OF ACTION

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

- Strengthen **our neighborhoods**:
  - Decreased Dependence on Cars
  - Community resilience
  - Equitable systems
- Clean **our energy sources**
  - Clean electricity
  - Building Fuel Switching
  - Electric Mobility
- Manage **our consumption**:
  - Reduced Building Energy Use
- Sustainable consumption and waste management Uphold our commitment:
  - Sequestration, Certificates, and Offsets

These target areas and supporting actions are detailed starting on page 24. We have summarized the most critical results of these efforts in the table below.

Doing the math: Key shifts contributing to our reduced emissions
On Road Transportation: Vehicle Miles Traveled (VMT) set to be held at 2019 levels [**1.59M/day (internal)**].
30% of our miles traveled will be in electric vehicles (or have zero tailpipe emissions).
2000 home solar systems installed (5kW each) for 10MW distributed residential.
Commercial Sector Brings on 10MW Solar by 2030.
Industrial Sector Brings on 5MW Solar by 2030.
Includes a 50MW Solar installation at Red Gap Ranch + 10MW solar at landfill; assumes 25MW goes to make all City of Flagstaff (COF) electricity renewable. Assumes half of the remaining solar to be attributed to the commercial/residential sectors at 7.5MW/10MW split.
COF 100% renewable electricity by 2025 (likely to require 25-30MW); + energy efficiency and fuel switching across the municipality by 2030.
12,500 total residential retrofits ~50% of existing homes. City directly supports between 4000 – 5500 of these retrofits.
25% of all commercial accounts get a deep energy efficiency retrofit (NOT including COF or NAU).
15% of commercial accounts/establishments fully electrify (not including COF or NAU).
Landfill gas collection and flare is online.

PROJECTED EMISSIONS REDUCTION FROM PLAN IMPLEMENTATION

The strategies described in the target areas of actions above will lead to a 44% reduction in emissions from the business as usual (BAU) projection. This results in estimated total community emissions of 471,319 metric tons of carbon dioxide equivalent (MTCO2e) in 2029.

To achieve carbon neutrality, the city will need to sequester 471,319 MTCO2e, comprising over half (56%) of the total emissions reduction/removal required.

The two graphs below display these emission reductions, in different ways.

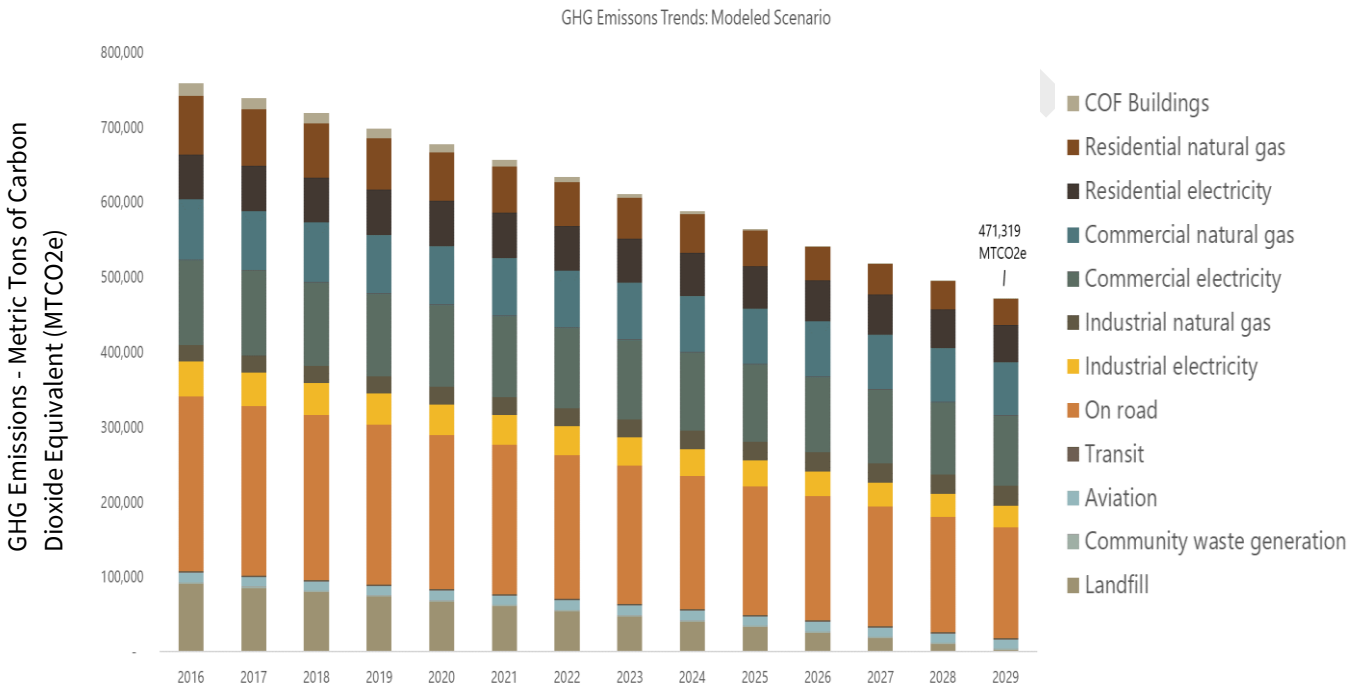


Image B: Remaining Emissions: Total and Sector

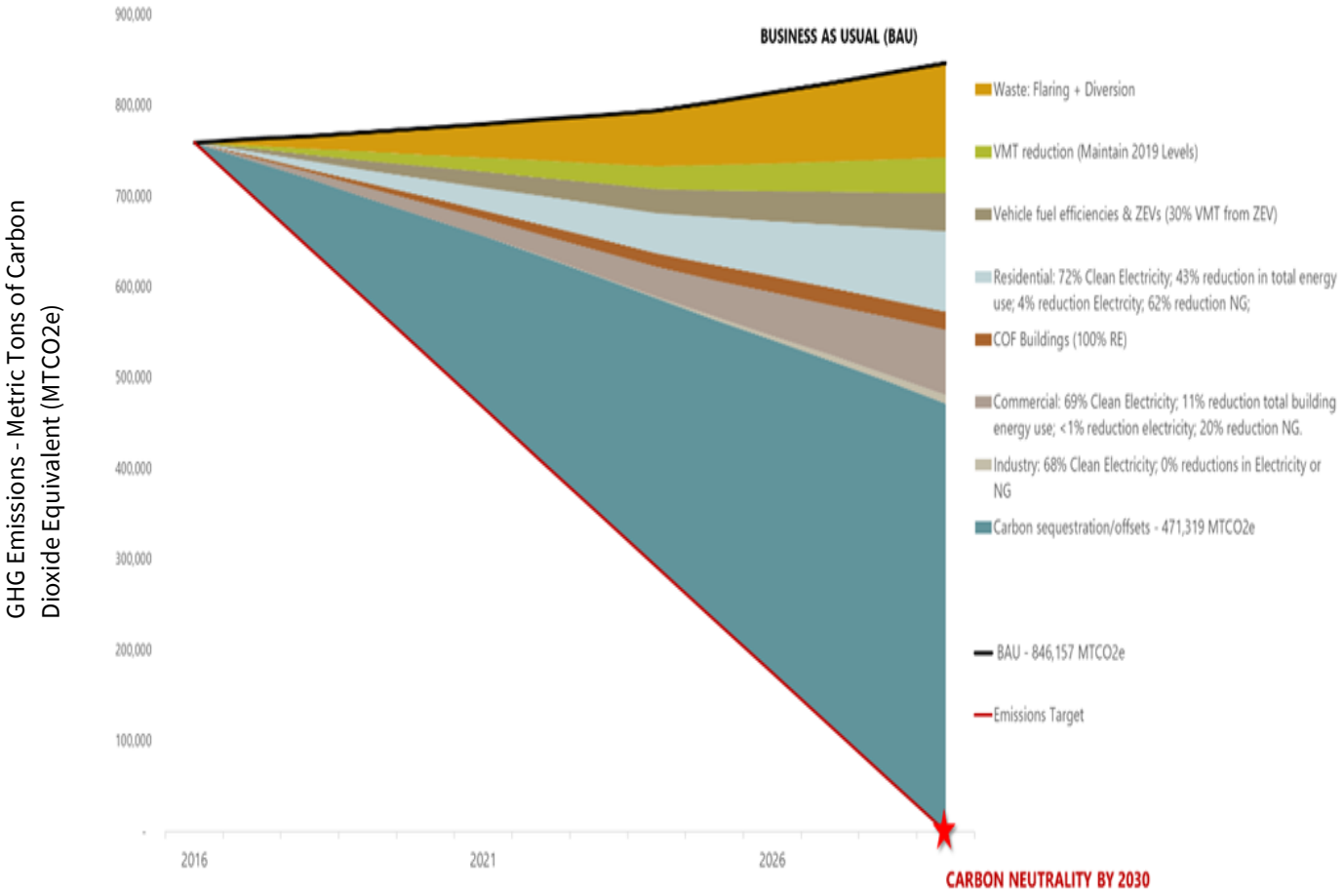


Image C: Wedge graphic of carbon neutrality: Inferred emissions reductions and carbon sequestration required (equivalent to measured emissions remaining) to achieve net-zero emissions by 2030.

Our Approach

COMMUNITY-DRIVEN

On September 20th, 2019, Flagstaff community members gathered on the City Hall lawn for the Global Climate Strike. At the strike, 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 September 24th, 2019, and on January 28th, 2020, hundreds of Flagstaff community members, organized coalitions from farmers and doctors to students and grandparents, provided over three hours of public comment at the City Council meeting. Finally, on June 23rd, 2020, the Climate Emergency Declaration was adopted unanimously by the Flagstaff City Council.

For more information on community involvement in the development of this Plan, see page 16.

Climate Change in Flagstaff

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

The 2018 Climate Action and Adaptation Plan details the many changes expected in Flagstaff due to global warming and climate change. We encourage you to references the 2018 Climate Action and Adaptation Plan or the City of Flagstaff climate website for additional information and details on expected changes to

CARBON NEUTRALITY – A FRAMEWORK OF ACCOUNTABILITY

The 2018 Climate Action and Adaptation Plan set an overarching goal to reduce greenhouse gas emissions by 80% by 2050. Goals like this, based solely on emissions reductions, provide little accountability for failure to deliver.

Carbon neutrality, on the other hand, is a framework of accountability by design. To be carbon neutral, each year, we will first measure Flagstaff's community emissions – those that we were not able to eliminate. Once we have measured the remaining emissions produced by our community, we will then have to remove an equal amount of greenhouses gases from the atmosphere in order to arrive at net-zero

emissions." If we fail to meet our emissions reduction goals, then our sequestration/removal obligation will increase proportionally.

In this way, the carbon neutrality framework has a built-in accountability feature. It ensures that regardless of emissions reductions, we can still reach carbon neutrality through negative emissions initiatives. This framework will help us uphold our commitment, primarily through carbon sequestration. Read more about our plans for sequestration on page 53.

THE BIG SHIFT

With the framework of carbon neutrality in place, the 'rules of the game' have been established. Ultimately, our community and our leadership will decide the 'gameplan.'

As we began development on the 2030 Carbon Neutrality Plan, we started by asking the question, "What level of emissions reductions might be possible, IF our leadership and community were truly committed to prioritizing this effort locally?" This question resulted in an initial model that showed Flagstaff could reduce local emissions by 80% if we committed to ambitious, transformative change, and then everything goes exactly right. Many of the actions in this maximum reduction scenario are critical but not especially noticeable in terms of how they might impact someone's daily life. For example, when you turn on the faucet and feel warm water, you cannot tell whether that water is heated by a fossil fuel like natural gas or by a clean source like renewable electricity. Likewise, an electric car is still a car, and the day to day

experience of operating either an electric vehicle (EV) or car fueled with gasoline is basically indistinguishable.

Other actions in this 'maximum reduction scenario' would be more noticeable, especially if only thinking about the end result and glossing over the years-long transition. Many people will think that these noticeable impacts are beneficial and even preferred, while others are likely to be more skeptical if not outright unconvinced. Actions related to the key strategy of reducing dependence on personal vehicles are likely to be the most noticeable. Imagine cutting in half, or more, the total mileage you drive in town while still getting to socialize, shop, and otherwise meet all of your daily needs. This outcome would 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 the guiding principle, rather than supporting the continued growth of the automobile. We would build our neighborhoods so that they were more connected and complete; it wouldn't be necessary to travel across town as often because people can get what they need nearby. This would entail growing the housing options, density, and businesses or services available in and around our neighborhoods. These and other actions that truly maximize emissions reductions by considering aspects of community design have been dubbed locally as the "Big Shift.".

The alternative to the "Big Shift" might be framed as the "behind the scenes" scenario. In this alternative scenario, there is less tolerance for "noticeable" or "disruptive" actions, and there is a considerably higher tolerance for paying third party groups to complete the reductions that we are unable or unwilling to achieve for ourselves. In this alternative scenario, significant local emissions reduction potential will go unrealized in favor of familiarity, particularly in the transportation sector. The only realistic way to significantly reduce transportation emissions by 2030 is to make it possible for people to accomplish all of their needs while driving far less – which would require the "Big Shift" to accomplish. Indeed, if we remove the strategy of reducing dependence on personal vehicles from the preliminary model, the amount of carbon sequestration required to achieve carbon neutrality in 2030 would nearly double - as would the annual price tag for sequestration. The tradeoff for this higher tolerance – less disruption to our approach to local transportation and the design of our streets, neighborhoods, and community.

EQUITY AND ADAPTATION

Equity and adaptation are core objectives of the 2018 Flagstaff Climate Action and Adaptation Plan. Their importance is maintained in our Carbon Neutrality work.

The 2018 CAAP outlines the three overarching goals of mitigation, adaptation, and equity. These interconnected goals continued to be guiding principles in the development of this Carbon Neutrality Plan, both at the staff level and from the perspective of the Steering Committee. Since the framework of carbon neutrality is specific and quantitative in nature, attention to the numeric mitigation impacts has been necessarily spotlighted in some sections. However, the focus on mitigation to satisfy the quantitative framework cannot be, and has not been, so focused as to lose sight of these other guiding principles.

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

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

In many cases these guiding principles are highly synergistic. Actions that reduce emissions often have adaptation and equity co-benefits. This can be particularly apparent when such mitigating actions serve disadvantaged communities first while also increasing individual, family, and community resilience. For example, a large-scale effort to support the retrofitting of homes occupied by low and middle income (LMI) residents to reduce their energy demand

a) reduces emissions (mitigation)

b) increases the resilience of the homes, the community, and the energy infrastructure to withstand shocks (adaptation) and

c) improves the affordability/accessibility of the retrofit for the LMI occupants, making them more comfortable and decreasing the monthly operating expenses of the homes (equity potential).

Still, other mitigating actions offer fewer adaptation and equity co-benefits. When identified, our Steering Committee advised that such actions are be given less emphasis and resources. For example, transitioning to Electric Vehicles (EV) was acknowledged as a piece of the puzzle for reducing transportation emissions. However, our Steering Committee cautioned that too strong an emphasis on municipally supported EV adoption for individuals could be a distraction to more impactful, equitable strategies that would benefit and be *accessible* to the larger community - —not just 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 guidance given was that the City's focus and resources should be prioritized on 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 the Target Areas related to transportation – Decreased Dependence on Cars and Electric Mobility.

This is just one example that illustrates how the guiding principles of equity and adaptation were used to evaluate proposed mitigation strategies, with the level of perceived co-benefits used to either elevate or temper the amount of emphasis and resources committed by the City. Going forward, this Plan will be subject to review by an Equity Review Committee, as will every subsequent annual update.

About this Plan

The Benefits of a Plan

Climate change is bringing changes in temperature, snowpack, water availability, and wildfire risk to Flagstaff. These changes threaten Flagstaff's natural resources, economy, infrastructure, and quality of life. This Carbon Neutrality Plan will guide the Flagstaff community in achieving more aggressive carbon neutrality goals to prepare for climate risks, reduce greenhouse gas emissions, and protect the wellbeing of residents for decades to come.

The economic damages from climate change will increase the longer action is delayed – climate change is a threat multiplier. On the other hand, climate action has co-benefits ranging from economic development and jobs, to financial benefits from investments. Climate action can benefit families, when energy efficiency improvements reduce monthly costs, while accessible trails can improve mental and physical health.

How this Plan was developed

This Plan was created based on technical analysis, best practices from peer cities, and feedback from Flagstaff community members.

Community organizers and residents led the creation of the Climate Emergency Declaration, and their involvement has continued throughout the development process for this Plan. A Steering Committee of community members was formed to guide Plan development and incorporate resident voices from the start. Sustainability staff have engaged with over 1,500 people in Flagstaff. Community members have completed four different surveys, attended over 30 virtual Forums and Open Houses, and created videos for the Climate Emergency Open House website.

Community partners played an integral role in advising the Plan and inviting their networks provide input. These actions allowed Sustainability staff to understand the priorities of community members and incorporate them into this Plan.

A Call for Partners

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 alone -- the actions of residents and collaborative partnerships will be crucial.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.

Regional, federal, and state actions and market shifts are all necessary to move Flagstaff in the right direction. 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).

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.

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

This document builds on the 2018 Climate Action and Adaptation Plan– also known as the CAAP.

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

When we started to write the 2018 CAAP, it aligned with the best available science that was the foundation for the Paris Climate Agreement. One month before adoption, the scientific community updated its recommendations on the pace of action needed to avoid catastrophic climate change. The Intergovernmental Panel on Climate Change (IPCC) published a report: Global Warming of 1.5° C, saying that more needed to be done, much more quickly, across the globe. Council adopted the CAAP in late 2018, acknowledging that this was a first step and that community conversations around this IPCC report were needed. Community members brought this conversation back to City Council with their request for a Climate Emergency Declaration.

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

Yet, the climate emergency 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 justice.

A Living Document

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. 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, jobs and visitation 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 will be updated on an annual basis. This will allow shifts in tactics and creative partnerships as needed to meet the City's goals.

Flagstaff's Greenhouse Gas Emissions

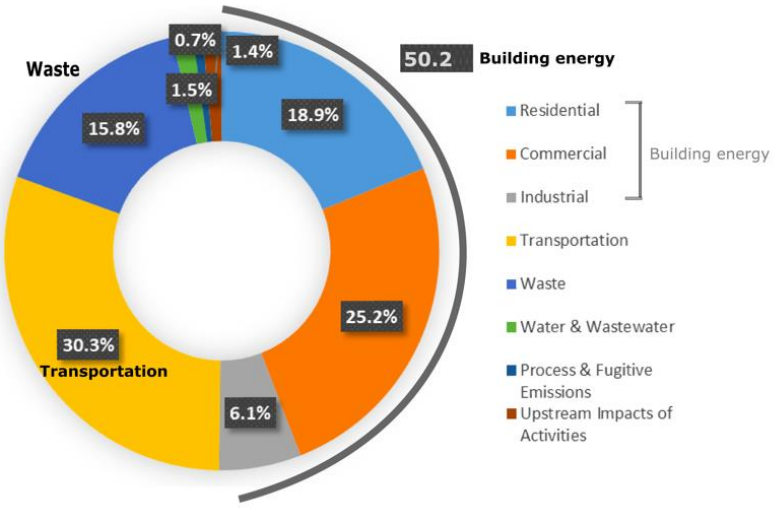
HOW WE CONTRIBUTE TO CLIMATE CHANGE

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.

2019 Flagstaff Community Emissions

#1
Powering Buildings

#2
Car Emissions



Our Greenhouse gas emissions fall into three main categories:

1. **Building Energy** contributes to 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 30% of our emissions. This 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.

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.[1]

A SECTOR-BASED GREENHOUSE GAS INVENTORY

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.

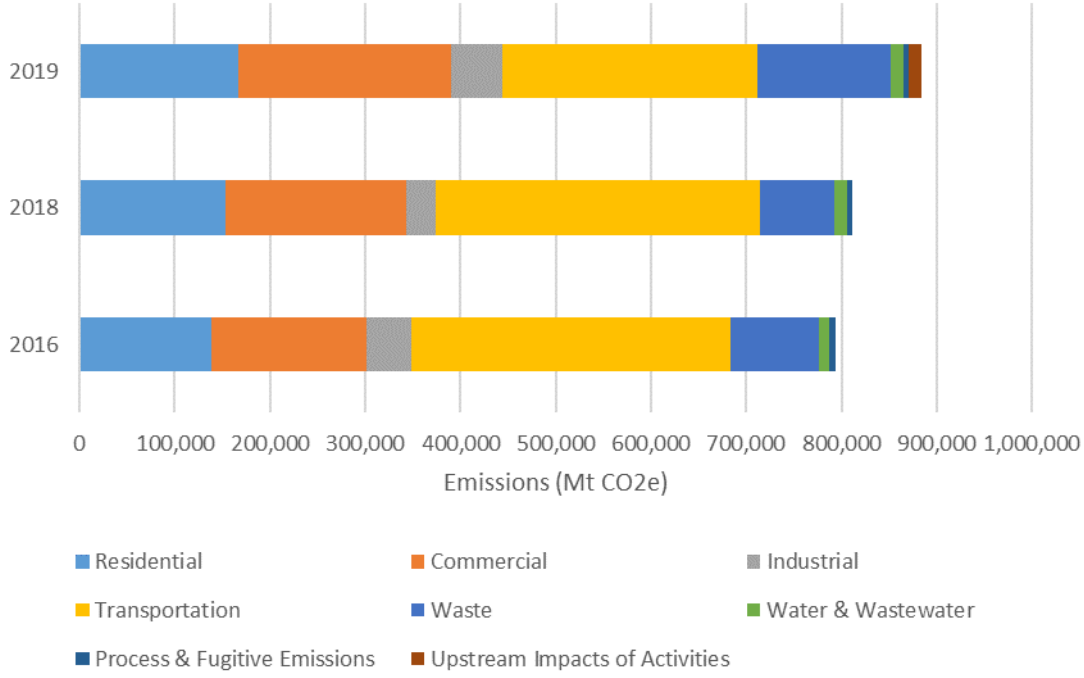
Currently our inventory methods do not allow us to account for the imported or embedded emissions in the products that we consume. For example, an apple grown in Washington state and consumed in Flagstaff will have embedded emissions associated with the growing, picking, packaging, and transportation 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.[2]

[1] https://www.c40.org/researches/consumption-based-emissions

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 758,796 MTCO2e. (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]

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

IMPLEMENTATION STRATEGY

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 communities, Black, Indigenous, and People of Color, and those experiencing poverty** central to all transition and 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.

THE PATH TO CARBON NEUTRALITY

To achieve deep emissions reductions and carbon neutrality, we have developed a framework of target areas of action:

- **Our neighborhoods**:
  - Decreased Dependence on Cars
  - Community resilience
  - Equitable systems
- **Our energy sources**
  - Clean electricity
  - Building Fuel Switching
  - Electric Mobility
- **Our consumption**:
  - Reduced Building Energy Use
  - Sustainable consumption and waste management
- **Our commitment**:
  - Sequestration, Certificates, and Offsets

These same areas of action show up in the climate action plans of cities around the world. They may get combined or split, re-packaged or reframed from city to city, but at a high level, it is generally known what needs to be done to achieve aggressive climate goals.

The first six target areas above focus on reducing emissions through *prevention*. The last target area aims to further reduce community emissions by literally *extracting and storing* emissions 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.

Focus One: Our Neighborhoods

We will strengthen our neighborhoods through:

- Decreased dependence on cars
- Equitable systems
- Community resilience

Decreased Dependence on Cars

Flagstaff will depend far less on cars, reducing the number of miles we travel by car 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 an also-necessary transition to clean, low-/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 climate action.

HOW WE'LL GET THERE

Vehicle emissions are a result of a combination of factors: 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 (EV's) is not enough to decarbonize the transportation sector completely in the near-term and therefore it's important that while Flagstaff implements EV's, action is taken to simultaneously reduce vehicle miles traveled through better land use planning and encouraging modes other than -single-occupancy vehicles such as transit, walking, and biking.

Transportation costs are a significant expense for households and car ownership can often be a burden or inhibitor for low-income families. Personal single-occupancy electric vehicle adoption does nothing to address these existing inequities. Furthermore, transportation costs tend to be lower for those living in neighborhoods where it's 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 make walking and biking the default choice. This will happen through alignment with and implementation of the forthcoming Active Transportation Master Plan. he City of Flagstaff will partner 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. These projects align with the goals of the most recent Regional Transportation Plan (2017), which projects VMT more than doubling over the next 70 years.

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

The emphasis of our transportation planning must pivot from congestion mitigation to mobility improvement - to improve the way community members move around town, outside of their cars. As Flagstaff grows, we have a choice: we can invest in building more roads and more lanes to attempt to make traffic better, 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 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. Density reduces emissions from building energy use and transportation, while also contributing to more lively, welcoming, and diverse neighborhoods.

Flagstaff is growing and will continue to do so – see the box to the right. 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 apartment buildings and tall buildings where appropriate.

Flagstaff is Growing

Flagstaff is projected to grow significantly in the coming decades – even without the influence of climate change. 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.

Transportation solutions range from converting lanes into micro-mobility zones, allowing neighborhoods to reclaim their streets through slow zones, and prioritizing transit over car movements. Land use solutions are complementary to our transportation actions, and impact our ability to achieve our transportation and emissions goals.

Flagstaff can learn from some of the most successful transportation cities in the world, who are focusing on converting car space into 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.

Flagstaff residents deserve what are called 15-minute neighborhoods: places to live where you can meet many 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. Southside similarly has access to jobs, a small neighborhood store, dining, and a community center within their neighborhood. 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.

Through these shifts, we will be able to achieve deep reductions in greenhouse gas emissions from our transportation sector while improving livability, health, and community resilience in Flagstaff.

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

STRATEGIES

DD-1: Transform our transportation and land use systems.

Opportunity for action:

1. Commit to the big shift, as outlined on page 27.

DD-2: 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. Encourage the rapid development of carbon-neutral Accessory Dwelling Units (ADUs) to increase the housing stock.
3. Lower parking minimums for new developments to decrease housing costs, decouple rent from parking costs, reduce impervious surfaces, and create more walkable neighborhoods.
4. Change City policies to increase cottage housing, transit-supportive density, redevelopment, infill development, mixed housing types, multiple story buildings, and mixed-use transit nodes throughout Flagstaff.

DD-3: 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 streets to multi-modal, 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-4: 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.

DD-5: 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.
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 Transportation Impacts 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 Carbon Neutrality Plans for new large buildings and new neighborhood developments, to increase communication and collaboration between developers and the City on how developments contribute to the City's carbon neutrality goals and how the property will work to manage transportation demand. 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.
5. When working with developers on new large developments, analyze and balance community priorities when making requests for infrastructure improvements.

DD-6: Support transit operations.

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. Incorporate transit analysis and requests into analysis performed for new large developments, incorporating transit needs into our conversations surrounding transportation system needs.

DD-7: Avoid Congestion Mitigation and Air Quality (CMAQ) non-attainment status.

Opportunities for action:

1. Create a local ordinance to protect air quality and prevent Congestion Mitigation and Air Quality (CMAQ) non-attainment status, to support and fund mobility enhancement.

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 route, 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 considering enhancing bus, 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, and 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 providing in-house incentives for employees who switch from driving to public transit.

Equitable Systems and Community Resilience

Flagstaff will incorporate equity and resilience principles into its climate actions, while working towards transformative systems 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.

Resilience is the ability of communities to anticipate, accommodate, and positively adapt to and thrive amidst changing climate conditions or hazard events and enhance quality of life, reliable systems, economic vitality, and conservation of resources. Resilience is often grouped with a similar concept, adaptation.

Equitable Systems and Community Resilience are not target areas like transportation or clean energy. Rather, they are overarching principles 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.

HOW WE'LL GET THERE

Equity and resilience are reflected in two overarching goals of this plan:

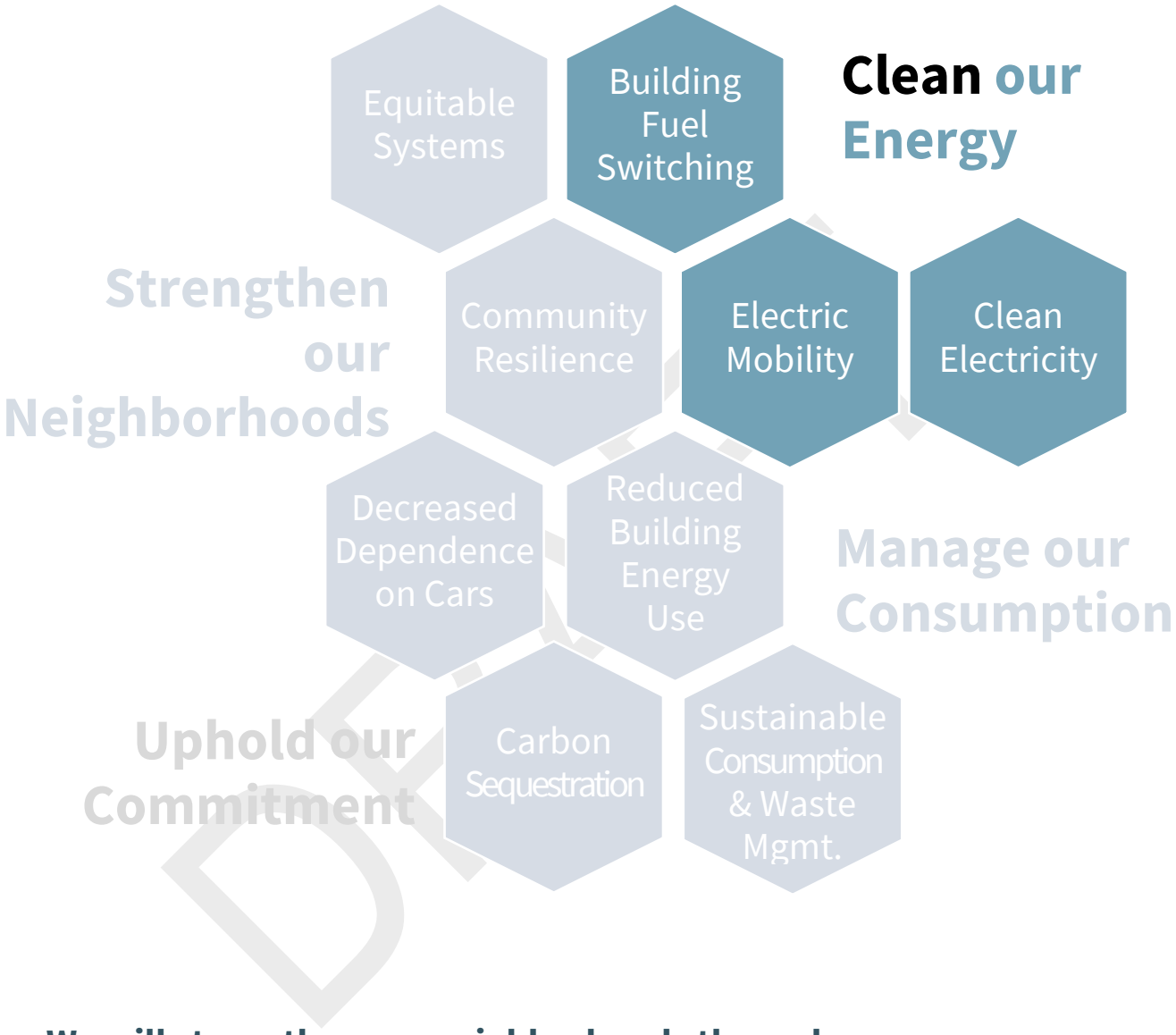
Goal 2: **Prepare the City's communities, systems, and resources to be more resilient to climate change impacts.**
This preparation will help the City and its residents to be better equipped and prepared to handle both short-term shocks (such as flooding or a wildfire) and long-term change (such as rising 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.

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.

Equity and resilience will be the guiding principles of Plan implementation. City staff will create accountability systems to ensure these principles are incorporated into all aspects of our carbon neutrality work. Activities to reduce emissions can be designed to have equity, resilience, and adaptation co-benefits – see page 14 for a discussion of how these concepts are interconnected.

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.

Focus Two: Our Energy



We will strengthen our neighborhoods 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 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 and decreasing community-wide vehicle miles traveled (VMT). Transportation related emissions accounts for approximately 30% of Flagstaff's community-wide GHG emissions, so 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 and while educating, encouraging and helping to facilitate partnerships so that other local fleets might also make the transition over time to be electric. 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. i.e. 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 in place, a considerable amount of the momentum for EV adoption will come from external sources and factors. 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.

GOALS

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

STRATEGIES

EM-1: Electrify busses 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.

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 affordable, low-carbon transportation options.

EM-3: Support Flagstaff residents, companies 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 light-duty City fleet vehicles to be electric vehicles starting in 2022, complemented by aggressive goals to test, evaluate, and, where feasible, acquire electric vehicles for medium and heavy-duty fleet vehicles and equipment categories.
5. Encourage and incentivize existing multi-family housing to offer electric vehicle charging stations.

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 35.

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 24), 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.

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.[4]) 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.

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

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

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.

Net zero energy buildings – Regular grid-tied homes that are so air-tight, well insulated, and energy efficient that they 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.[5]

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.

CE-3: Support solar installations on existing 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 cheapest 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 cheap 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.

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

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 electricity on everything from water heaters and stoves to industrial processes, enabling us to take advantage of increasingly cleaner electricity.

WHAT IT MEANS

Fuel switching requires transitioning buildings from appliances, processes and generators that directly combust fossil fuels on-site (including natural gas, propane and diesel) to ones that utilize decarbonized electricity (see the Clean Electricity Section on page 38) as well as solar thermal and other renewable sources of heat and energy. These on-site fossil fuels include natural gas, propane and diesel. While switching technology to run on clean electricity, it will also be necessary to ensure that that buildings are well sealed and energy efficient (see Reduced Building Energy Use Section on page 46) to manage total electrical demand and costs.

According to RMI[6], Arizona has already passed the breakeven or tipping point in the decarbonization of the electricity grid so switching from natural gas to electricity-based space and water heating will have an immediate emissions benefit. Additionally, compared to a gas furnace, a heat pump installed in 2020 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.* [7]

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 set the stage for a quick and painless transition from natural gas and other on-site fossil fuels to clean electricity. This 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

[6] https://rmi.org/its-time-to-incentivize-residential-heat-pumps/
[7] https://rmi.org/all-electric-new-homes-a-win-for-the-climate-and-the-economy/

electric-only new construction, which has been shown to offer net savings in development and construction costs.

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

STRATEGIES

FS-1: Support fuel switching in existing buildings.

Opportunities for action:

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

FS-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: 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. 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.

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.

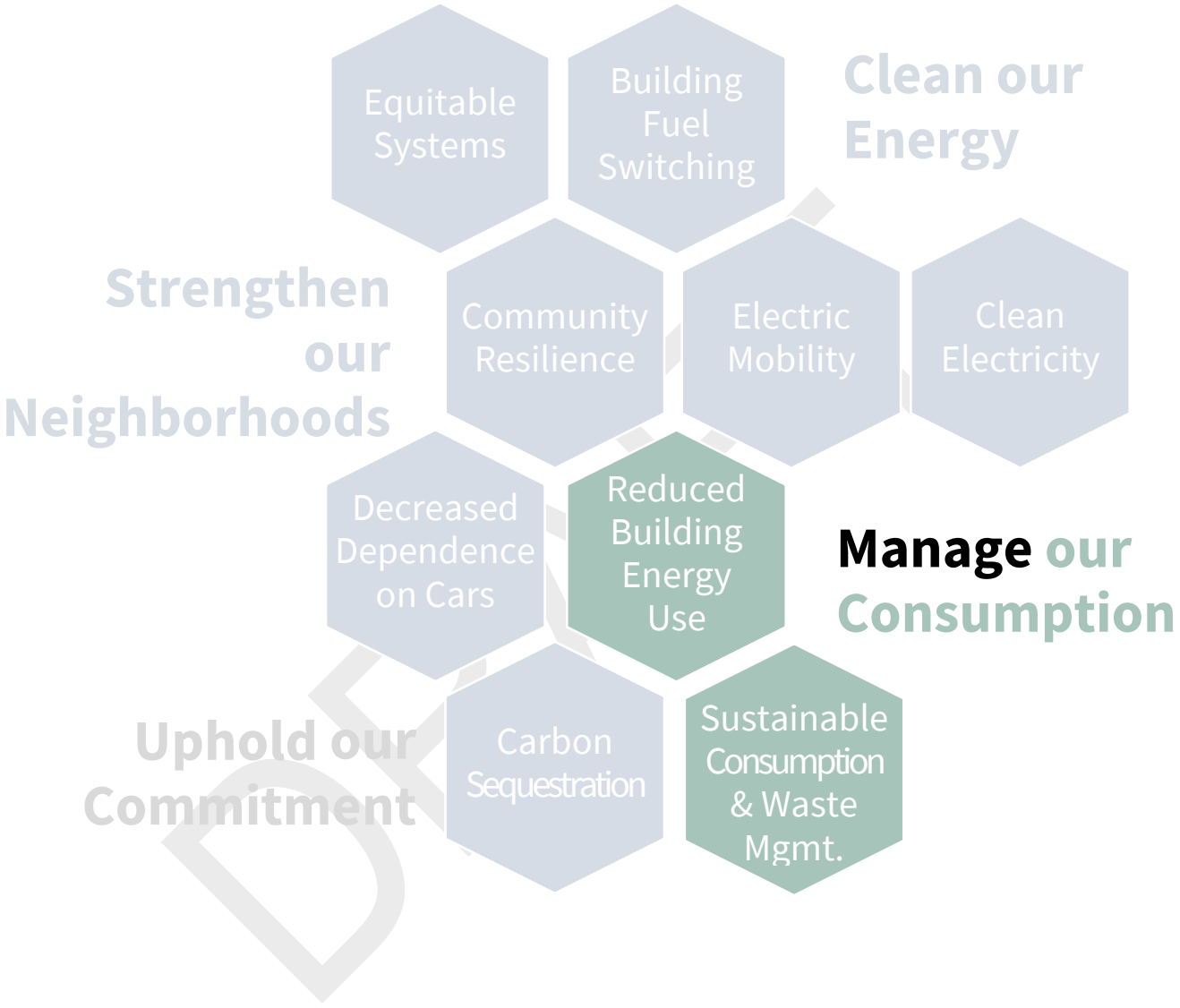
Legislative change

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.

Focus Three: Our Consumption



We will strengthen our neighborhoods 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.[8]

Reductions in building energy demand will provide immediate emission 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 38), 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 35). Fuel switching without energy efficiency measures will increase electrical demand significantly. Fuel switching combined with energy efficiency can temper or even reduce electrical demand, thus making it easier and cheaper 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)

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

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.

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 energy homes in Flagstaff.

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 Carbon Neutrality Plans for new large buildings and new neighborhood developments, to increase communication and collaboration between developers and the City on how developments contribute to the City's carbon neutrality goals.

BE-2: 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.

BE-3: Achieve net zero City of Flagstaff facilities by 2030.

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. Require new City of Flagstaff Affordable housing sites to be net zero energy.
3. Retrofit existing City of Flagstaff Affordable housing sites to be net zero energy.

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 20), 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.[9]

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 20). 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 a gas collection and flaring system once the currently open sequences at the Cinder Lakes landfill are closed and capped. This is expected to occur between 2026-2029. Flaring was chosen over other potential options (i.e. gas to energy) after assessing the expected returns and determining that they did not justify the increased price. Flaring has been shown to have a 98% destruction efficiency.

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. 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 below should be considered a starting point and sneak peek for some of the updates to come in the ReThink Waste Plan.

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

GOALS

Goal	YEAR
Reduce emissions from the landfill by 98%	2030
Provide equal access to recycling services at all properties that currently utilize City services for trash and/or recycling.	2030
80% community waste prevented and diverted from landfill	2030

STRATEGIES

MM-1: Manage emissions from the Cinder Lakes Landfill.

Opportunities for action:

1. Establish a gas capture and flare system at the Cinder Lakes Landfill, anticipating a 98% destruction efficiency.
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:

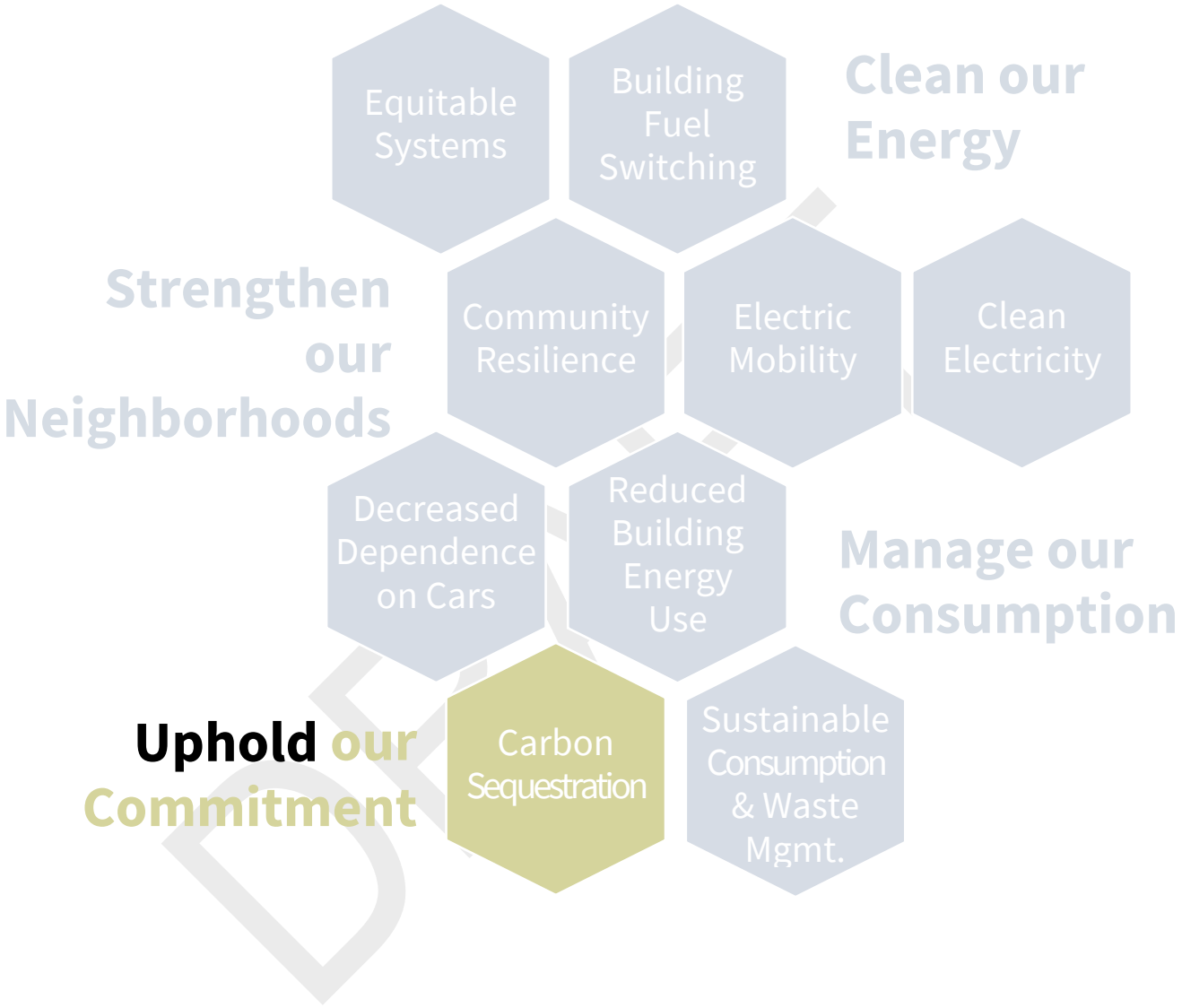
Strategy 1. Increase waste diversion

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 sequestration

Carbon Sequestration, Certificates, and Offsets

Flagstaff will ultimately achieve carbon neutrality by first measuring the remaining community emissions produced each year, and then balancing with an equivalent amount of removal through negative emissions initiatives such as carbon sequestration.

WHAT IT MEANS

Carbon sequestration is the process of capturing and storing atmospheric carbon dioxide. Captured carbon can be stored in terrestrial, geological, and oceanic reservoirs and can also be stored in products. Each approach is associated with a different deployment maturity, permanence of storage, drawdown potential, as well as costs, location suitability, co-benefits, risks, and uncertainties.

HOW WE'LL GET THERE

Since a 100% reduction in local emissions is infeasible by 2030, negative emission strategies such as sequestration will be necessary to achieve carbon neutrality. The magnitude required will ultimately depend on, and be equivalent to, the amount of unavoided emissions measured 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.

As a City and community, we might first investigate the feasibilities of standing up and supporting local sequestration and negative emissions initiatives. These could include local initiatives related to urban trees, regenerative agriculture and soils, biochar and more. They could also include setting up various funds and programs to achieve guaranteed future local reductions.

If we are unable to meet our negative emissions obligation locally, we will also have to consider paying into third party programs – Certificates and Offsets- to perform the sequestration on our behalf. The markets for Certificates are in their infancy 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 ineffective at best.

Therefore, it is widely recommended that communities pursuing carbon neutrality prioritize local reductions to minimize their negative emissions obligation, and then investigate options that prioritize equity and efficacy. The prioritization of investing in local reductions (for example retrofitting additional homes to be more efficient and affordable to operate) rather than Certificates or Offsets also advances the co-benefit of increasing resilience, both for individuals as well as our community.

GOALS

Goal	YEAR
Offset approximately 471,000 MTCO2e on an annual basis through sequestration. This number can be reduced each year as greater local reductions continue to be achieved.	2030

STRATEGY

CS-1: Establish and support a portfolio of negative emission initiatives in Northern Arizona to handle the majority of Flagstaff's carbon sequestration needs.

Opportunities for action:

1. The City's Red Gap Ranch property east of Flagstaff on the I-40 corridor is a possible site for an innovative high desert 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 sequestration.
4. Establish a local emissions reduction fund and establish protocols that would allow donations and dedicated funding to reduce verifiable quantities of emissions.

Connections to the Flagstaff 2018 Climate Action and Adaptation Plan:

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

APPENDIX A

At the March 9th 2021 Flagstaff City Council meeting, staff presented two scenarios for action to the Council. These two scenarios are Scenario A and Scenario B. Both scenarios achieve carbon neutrality by 2030, and use similar strategies and approaches. Scenario A and Scenario B *differ* significantly in terms of ambition with regard to local emissions reductions achieved. **On March 9th, the Council gave direction for staff to move forward with scenario A.**

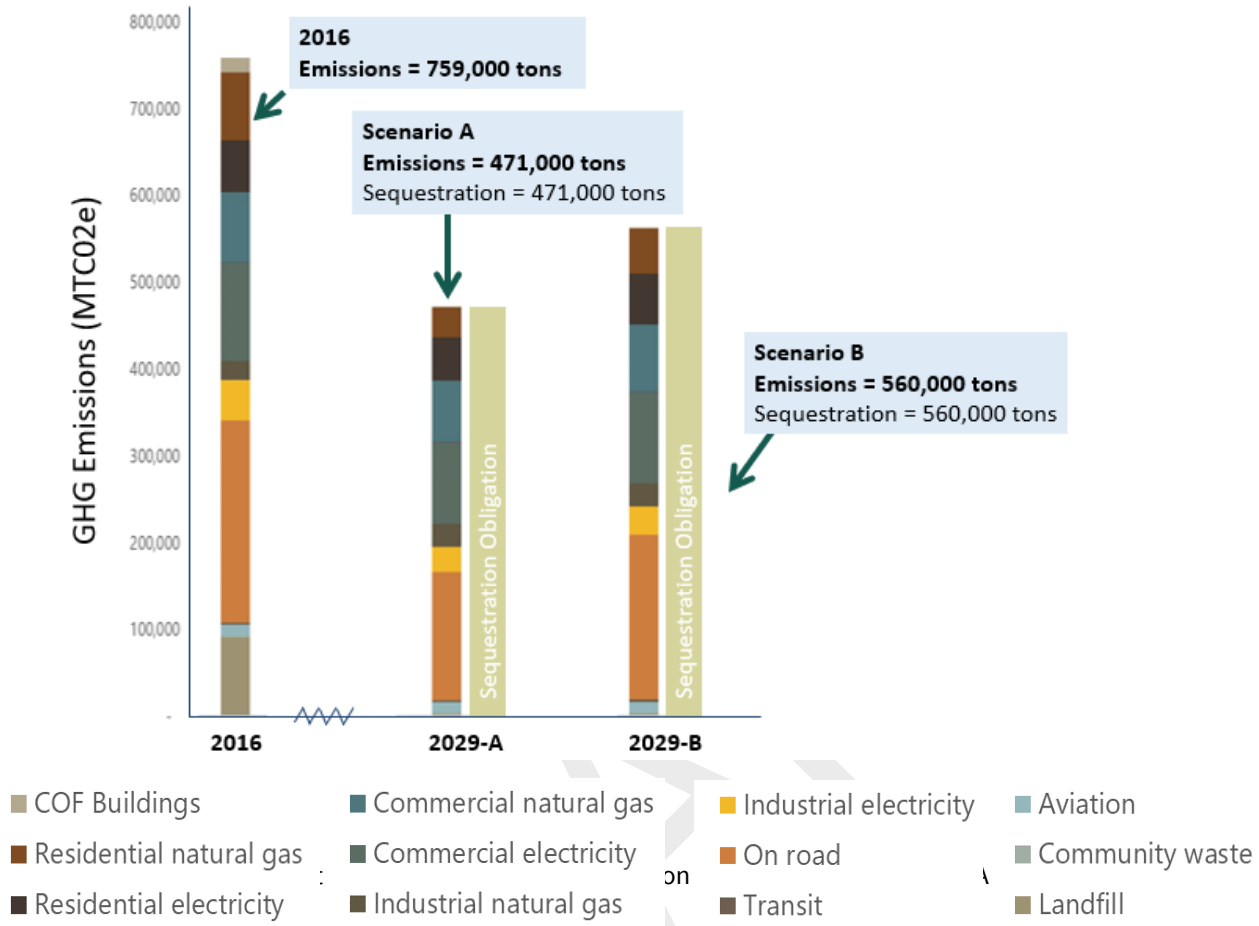
Because this Draft Plan already reflected Scenario A proposed actions and emissions data, this document did not change significantly after the scenario choice was made by Council.

We have continued to include scenario A and scenario B information in this Appendix, to provide readers with context for the options presented to Council. 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 the outcomes for two emissions scenarios.

IMPORTANT NOTE FOR READERS OF THIS DRAFT PLAN

City staff have developed two scenarios for action. These options are described below in **Scenario A** and **Scenario B**. Both scenarios achieve carbon neutrality by 2030, and use similar strategies and approaches. Scenario A and Scenario B *differ* significantly in terms of ambition and the local emissions reductions achieved.

The core differences between scenario A and scenario B are below.



Proportion of total emissions reductions

Sector	Scenario A	Scenario B
Building energy	22%	17%
Transportation	10%	5%
Consumption	12%	12%
Sequestration required	56%	66%

Projected Outcomes for Scenario A and Scenario B. To get a flavor of the magnitude and type of supporting actions that lead to these differentiated Outcomes, see the expanded tables in the pages that follow.

Scenario A	Scenario B
On Road Transportation: Vehicle Miles Traveled (VMT) set to be held at 2019 levels [**1.59M/day (internal)**].	On Road Transportation: Vehicle Miles Traveled (VMT) increase 12% from 2019 values [**1.78M/day (internal)**]; this is a 7% reduction from BAU.
30% Remaining miles electric (or zero tailpipe).	15% Remaining miles electric (or zero tailpipe).
2000 home solar systems installed (5kW each) for 10MW distributed residential.	1000 home solar systems installed (5kW each) for 5MW distributed residential capacity.
Commercial Sector Brings on 10MW Solar by 2030.	Commercial Sector Brings on 5MW Solar by 2030.
Industrial Sector Brings on 5MW Solar by 2030.	Industrial Sector Brings on 0MW Solar by 2030.
Includes a 50MW Solar installation at Red Gap Ranch + 10MW solar at landfill; assumes 25MW goes to make all City of Flagstaff (COF) electricity renewable. Assumes half of the remaining solar to be attributed to the commercial/residential sectors at 7.5MW/10MW split.	Includes 25+ MW solar installation at Red Gap Ranch + 10MW solar at landfill; assumes 25MW goes to make all City of Flagstaff (COF) electricity renewable. Assumes any remaining unavailable to community attribution.
COF 100% renewable electricity by 2025 (likely to require 25-30MW); + energy efficiency and fuel switching across the municipality by 2030.	COF 100% renewable electricity by 2025 (likely to require 25-30MW); + energy efficiency and fuel switching across the municipality by 2030.
12,500 total residential retrofits ~50% of existing homes. City directly supports between 4000 – 5500 of these retrofits.	6,250 total residential retrofits ~25% of existing homes. City directly supports between 2000 – 3500 of these retrofits.
25% of all commercial accounts get a deep energy efficiency retrofit (NOT including COF or NAU).	10% of all commercial accounts get a deep energy efficiency retrofit (not including COF or NAU).
15% of commercial accounts/establishments fully electrify (not including COF or NAU).	7.5% of commercial accounts/establishments fully electrify (not including COF or NAU).
Landfill gas collection and flare is online.	Landfill gas collection and flare is online.

Readers will note that there are a handful of outcomes in the tables below which have identified 'Impact Gaps.' This means that a *goal* was modeled even if the proposed City actions alone wouldn't accomplish the outcome.

For example – when considering the remaining miles driven by electric vehicles (EV) in Scenario B, it is NOT expected that the steady electrification of the COF Fleet + 25 public Electric Vehicle Charging Stations (EVCS) provided by the municipality would be nearly enough arrive at an outcome of electrifying 15% of our vehicle miles traveled. Ultimately there will be many variables beyond COF action – including actions from utilities, the State Government, the Federal Government, and the market – that impact EV adoption between now and 2030. We researched base-case scenarios, beyond these modest actions taken by COF,

and arrived at a feasible outcome of 15% of VMT being electrified by 2030. The 30% observed in Scenario A scales with COF action and ambition – not only installing 2x the number of publicly available EVCS, *but especially* the work done to maintain 2019 levels of vehicle miles travelled. It will not be as big a lift to electrify 30% of the fewer daily miles in Scenario A as compared to Scenario B. Likewise, the increase in residential density in Scenario A compared Scenario B would unlock more opportunities for electric ride/car share, as well as better access to and service from electric transit. In this way, the target for the % of remaining miles electrified for each scenario is connected to, and scales with, the ambition in each scenario's total VMT target. The upper range of electrifying 30% of remaining vehicle miles is consistent with projections made by other ambitious communities: https://www.goevcity.org/

Similarly, the outcome of 6,250 residential retrofits in Scenario B will not be accomplished by the proposed COF actions alone. Again, the utilities, State Government, Federal government, and the market will all have a role to play. However, as COF action and ambition scales from Scenario A to Scenario B, so too does the projected outcome. As municipal leadership, commitment and resources scale so too does local market development, workforce development and job creation, and the local capacity to leverage other resources and opportunities.

In short, for these and other examples in the tables below that highlight an "Impact Gap," the projected outcome scales with, but it not fully satisfied by, the ambition and resources provided by the City. The gap will ultimately need to be filled for the model to be realized, either by Utility, State or Federal programs/funding, by the market, by additional support from the City, or a combination of all these options.

Scenario A - Outcomes	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)	*Assumes VMT levels held at 2019 levels. *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.** This gap will need to be filled by: • Utility, State, Federal programs/funding • The market • Additional support from COF • Or a combination of these options

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.** This gap will need to be filled by: • Utility, State, Federal programs/funding • The market • Additional support from COF • Or a combination of these options.
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.** This gap will need to be filled by: • Utility, State, Federal programs/funding • The market • Additional support from COF • Or a combination of these options.

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.** This gap will need to be filled by: • Utility, State, Federal programs/funding • The market • Additional support from COF • Or a combination of these options.
Landfill gas collection and flare is online	*COF installs system when current sequences are capped.

Scenario B - Outcomes	Example COF Supporting Actions in the Model
On Road Transportation: Vehicle Miles Traveled (VMT) increase 12% from 2019 values [**1.78M/day (internal)**]; this is a 7% reduction from BAU	*10% increase in residential density *12% decrease in distance to transit *ATMP adopted but not fully implemented or funded by 2030; Primary Bikeways Network still in progress
15% Remaining miles electric (or zero tailpipe)	*Assumes VMT levels increase 12%. *All new light duty COF Fleet vehicles EV or ZEV starting 2021 *25 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 15% goal was modeled.** This gap will need to be filled by: • Utility, State, Federal programs/funding • The market • Additional support from COF • Or a combination of these options.
1000 home solar systems installed (5kW each) for 5MW distributed residential capacity.	*Facilitate an annual Northern Solar Co-op with SUN *New home building codes
Commercial Sector Brings on 5MW Solar by 2030	
Industrial Sector Brings on 0MW Solar by 2030	
Includes 25+ MW Solar at RGR + 10MW Solar at Landfill; Assumes 25MW goes to make all COF electricity renewable. Assumes any remaining <u>unavailable</u> to community attribution unless/until policy changes with ACC/APS.	*COF works with APS to get utility scale solar at RGR
COF 100% renewable electricity by 2025 (likely to require 25-30MW); + Energy Efficiency and Fuel Switching across the municipality by 2030	*See utility scale solar above *Complete COF municipal energy audit and ESCO
6,250 Total Residential Retrofits ~25% of existing homes Note: This plan includes actions whereby the City directly supports between 2000 – 3500 of these retrofits.	*Relaunch and retool the ARRA era residential retrofit program: design program for 2000 retrofits. *Revolving loans funds *Rebate programs **Impact Gap! Some of these have to happen without COF support. **The 6250 goal was modeled.** This gap will need to be filled by:

	• Utility, State, Federal programs/funding • The market • Additional support from COF • Or a combination of these options.
10% 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 10% goal was modeled.** This gap will need to be filled by: • Utility, State, Federal programs/funding • The market • Additional support from COF • Or a combination of these options.
7.5% 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 7.5% goal was modeled.** This gap will need to be filled by: • Utility, State, Federal programs/funding • The market • Additional support from COF • Or a combination of these options.
Landfill gas collection and flare is online	*COF installs system when current sequences are capped.