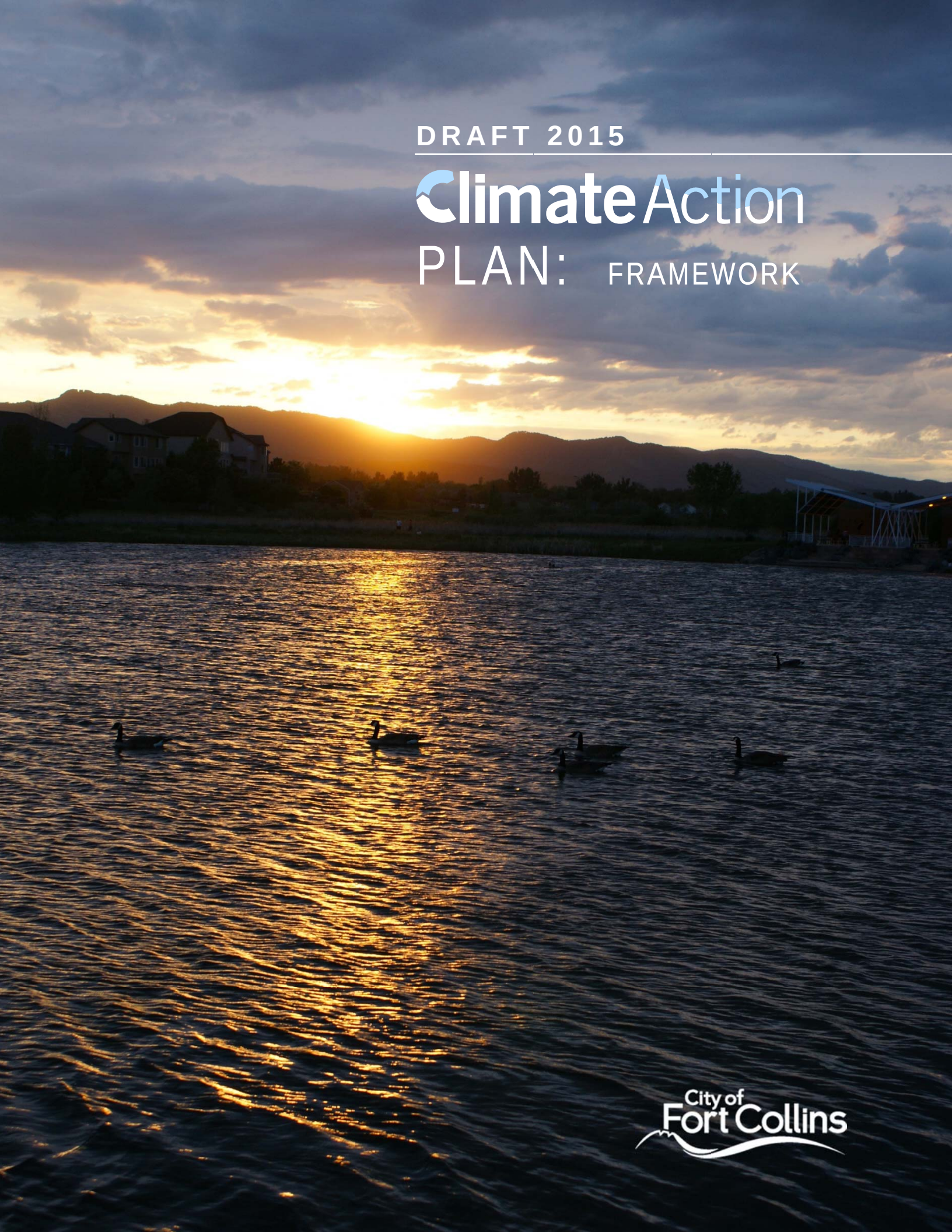

DRAFT 2015

Climate Action PLAN: FRAMEWORK

City of Fort Collins

Fort Collins
2015 Climate Action Plan

FRAMEWORK

DRAFT – February 25, 2015

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Executive Summary

The science is clear - climate change is already occurring and is no longer a distant threat. And the cost of inaction is unacceptable. Globally, the rise in temperatures has profound implications for natural resources, economic prosperity, health and human development. Fort Collins has long committed to reduce community greenhouse gas (GHG) emissions and to increasingly monitor local vulnerability to higher temperatures and actively explore ways to adapt and become more resilient. Since 1999 Fort Collins has pursued deliberate actions to reduce community GHG emission and make a difference within our community that has global benefits. To date, Fort Collins has reduced its greenhouse gas emissions five % below 2005 by partnering, educating and inspiring the community. Now , pursuant to City Council Resolution 2014-028, this Climate Action Plan (CAP) Framework has been developed to explore what it would take to achieve reductions in community GHG emissions of:

- 20 percent below 2005 by 2020,
- 80 percent below 2005 by 2030,
- and carbon neutrality by 2050.

EMISSIONS TRENDS AND PREVIOUS TARGETS

Fort Collins has calculated and reported its community GHG emissions since 1999 and focused its GHG reduction efforts on its largest emissions sources: electricity, natural gas, ground travel, and solid waste. Overall emissions are down 5% since the baseline year 2005, with the largest improvement seen in reducing emissions from community-generated solid waste. It is significant that these decreases occurred over a period of sizeable growth in population (16%) and economic prosperity (22% as measured by sales and use tax collections).

FIGURE 1. FORT COLLINS COMMUNITY GREENHOUSE GAS EMISSIONS

* Airline travel has been removed from the community greenhouse gas inventory.

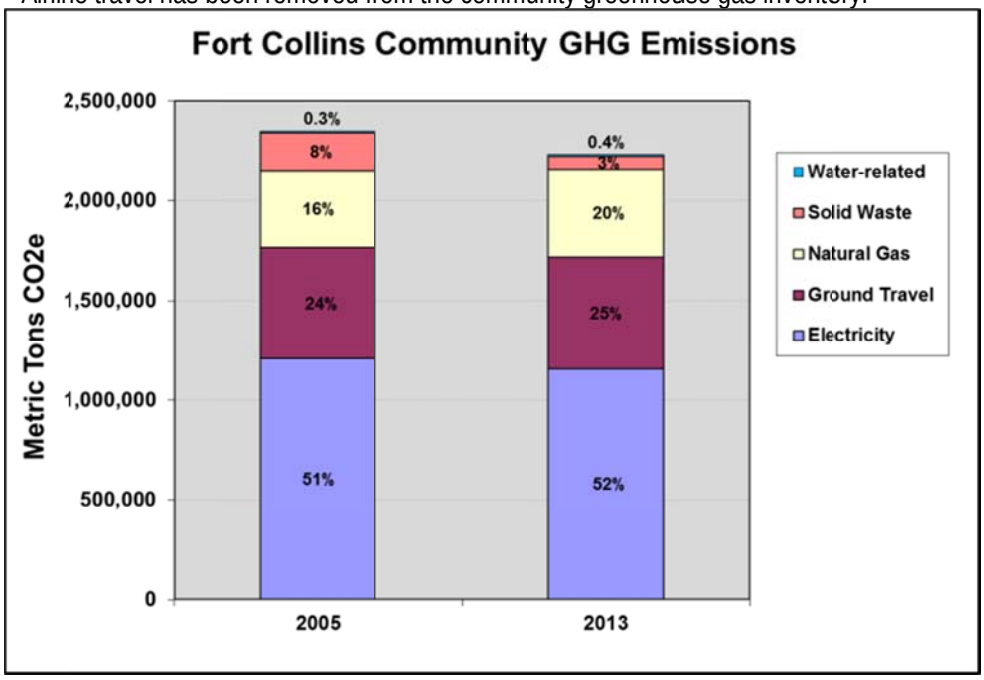
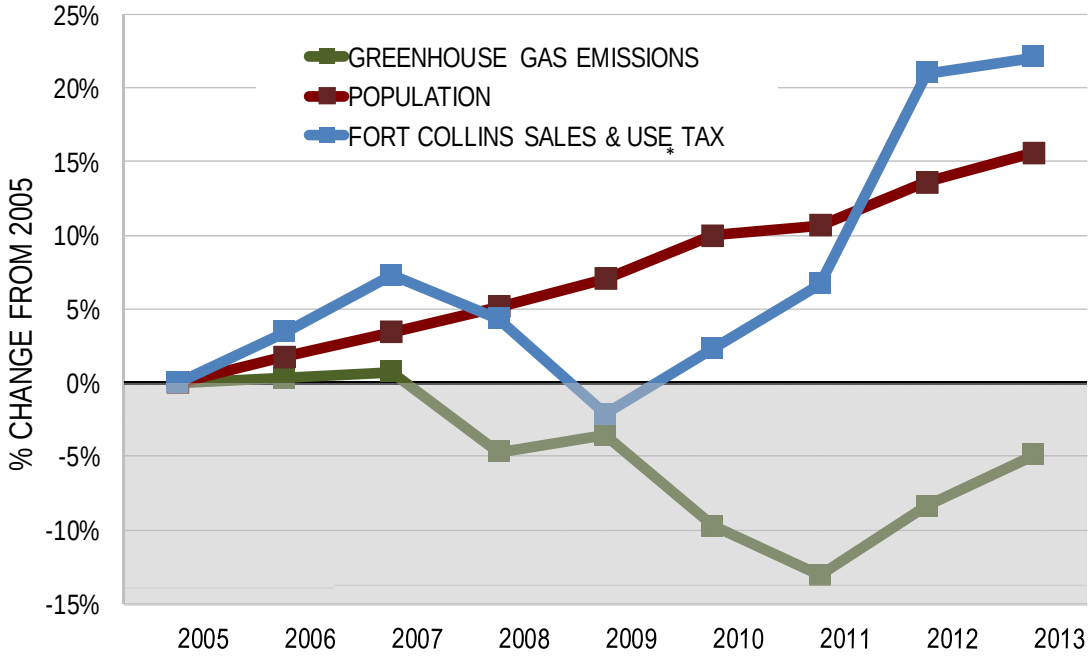


FIGURE 2. FORT COLLINS GREENHOUSE GAS EMISSIONS, SALES & USE TAX* AND POPULATION

*Does not include the Keep Fort Collins Great tax collections.



From 2008 through 2014, Fort Collins City Council targeted community GHG reductions at 20% below 2005 levels by 2020 and at 80% below 2005 by 2050. Our recent experience suggests that reaching an additional 15% carbon reduction in five years remains a challenge unless we rethink our approach. While no single step can reverse climate change effects, Fort Collins can pursue more reduction strategies, take advantage of leading edge technologies, and engage more citizens across our community in this effort to reduce carbon pollution.

SETTING NEW GOALS

Comparing the trend in community GHG emissions to the 2008 goals, it has become increasingly clear that additional strategies are needed to spur additional action. Fortunately, targeting higher GHG reductions and accelerating our actions to achieve these reductions provides a range of benefits that can appeal to all segments of the community. Many residents choose to live in Fort Collins because of its natural beauty and their enjoyment of an active outdoor lifestyle, and therefore will continue to support increased pedestrian and bicycling transportation options and access. Businesses are attracted to the local innovative, entrepreneurial spirit and are willing to embrace new technologies that help reduce use of energy and other resources. Citizens of all ages want to see increased local job opportunities arise out of greening our buildings, generating energy from renewable sources, and creating transportation systems that serve more while using fewer fossil fuels. Many may enjoy opportunities to improve the comfort of their homes while reducing utility usage and costs through their retirement years.

In 2014 City Council demonstrated a willingness to consider more aspirational GHG reduction goals of:

- 20% below 2005 levels by 2020
- 80% below 2005 levels by 2030
- 100% below 2005 levels by 2050 (carbon neutral)

City Council then acted by authorizing formation of a citizen advisory committee to explore what it would take to meet these objectives, and directing staff to conduct analyses of the steps necessary to meet these GHG reduction objectives.

The value of goal setting cannot be underestimated. By setting a goal that makes Fort Collins a leader in the transition to a clean energy economy, the City may stimulate local innovation and entrepreneurial activity, attract new partners and outside capital, and encourage funding for cutting edge research and development. Community-wide goals provide a framework for public and private stakeholders to collaborate, and also encourage coordinated actions that simultaneously boost the community's engagement, competitive spirit, and sense of pride.

2015 CLIMATE ACTION PLAN FRAMEWORK

This document provides a framework for climate action planning to guide implementation of a new set of strategies that strive for more dramatic GHG reductions in Fort Collins. It is the result of a 9-month planning effort that engaged a core analytical team, a Citizen Advisory Committee, and input from experts across the nation to investigate state-of-the-art reduction tactics, and existing and best practices. The research and preliminary numerical modeling that was conducted to investigate strategy interrelationships and community impacts provides an initial understanding of what is possible. More detailed planning for implementation will be required for each strategy that incorporates emerging technologies, pricing and market information, and available financing tools. We will also learn through piloting new programs and projects. Each implementation step will build upon previous steps and incorporate lessons learned.

Of course, there are associated costs and risks tied to both pursuing aggressive climate action and to not taking these actions or delaying them. We must be mindful to not deploy technologies before they are fully developed or have become cost effective, and deliberate about ensuring the reliability of our electric supply. Investments into the solutions will be required. We have a responsibility to manage initial costs to lessen upfront impacts and avoid inequities. But doing nothing or delaying accelerated reduction scenarios runs the risk of continued fossil fuel dependence, with its impending carbon regulations. At the same time, inaction can lead to even greater traffic congestion and worsening air quality.

The City's communications strategy is vital to the success of these planning efforts. We need to continue the steady, responsible actions already underway to reduce GHG emissions while engaging even more residents and businesses in Fort Collins. The new strategies described in this framework plan will bring more choices to more people, and these opportunities should be communicated broadly to Fort Collins' citizens to ensure successful adoption.

ESTIMATED EMISSIONS REDUCTIONS BY STRATEGY

The estimated total carbon reductions for the suite of strategies and tactics described in this framework plan come within 10 to 15% of City planning objectives to reduce emissions 20% below 2005 levels by 2020, 80% below 2005 levels by 2030 , and achieve carbon neutrality by 2050.

FIGURE 3. ESTIMATED PERECENT OF TOTAL EMISSIONS REDUCTIONS FROM CAP FRAMEWORK STRATEGIES BELOW ADJUSTED BUSINES AS USUAL FORECAST

	2020	2030	2050
Buildings: Boosting Efficiency, Comfort and Health			
Build in Efficiency From the Start	3%	2%	3%
Make Existing Homes More Efficient	20%	15%	21%
Increase Energy Efficiency in the Institutional, Commercial, and Industrial Sectors	27%	18%	21%
`Advanced Mobility: Making Transport Faster, More Convenient and Cleaner			
Shift Land Use Patterns to Shorten Trips and Reduce the Need to Drive	7%	4%	5%
Drive Adoption of Multimodal Transport	3%	3%	3%
Accelerate Adoption of Fuel Efficient and Electric Vehicles	2%	2%	6%
Energy Supply and Delivery: The Shift to Renewable Energy Resources			
Advance Utility-Scale Renewable Energy Supply	0%	30%	11%
Advance Residential and Commercial Solar Adoption	18%	14%	10%
Shift Heating Loads to Biofuels, Geothermal, and Electrification	3%	4%	12%
Waste Reduction and Materials Regeneration			
Road to Zero Waste /Carbon Sequestration	17%	7%	9%
Carbon Sequestration	<1%	<1%	<1%
TOTAL ESTIMATED MTCO2e REDUCTION FROM STRATEGIES	**272,000**	**1,119,000**	**1,192,000**
Estimated Percent Reduction from 2005 Baseline	**32%+**	**73%+**	**86%+**

FROM PLANNING TO ACTION

An appropriate next step will be to compile a 2020 Climate Action Implementation Plan that outline actions required to meet community GHG goal for 2020 and put Fort Collins on a trajectory to meet an aspirational 2030 GHG reduction objective. Detailed steps that lay out schedules, milestones, resources, and metrics will be developed to ensure proper sequencing and integration of strategies. Determining critical timing and funding strategies for key strategies must be coordinated across City departments and support must be sought from community businesses and leaders. And perhaps most importantly, community awareness raising and engagement must be successful in order to put the Implementation Plan into motion.

A ROLE FOR EVERYONE

Every community member has a stake in this effort. We all can play a role – be it small or large – to building a new pathway towards a more sustainable future. It could be a simple as installing a smarter and simpler-to-use programmable thermostat that cuts your energy use, or riding the bus or your bike more often. Others might consider investing in an electric vehicle (EV) or residential rooftop solar. Businesses might invest in rooftop solar or offer their employees new opportunities that address carbon reduction, ranging from EV charging stations and ride share programs to make it easier to commute while reducing the number of miles driven. We have individual opportunities to seek solutions to this community issue and invest in those solutions, we can all derive multiple benefits socially, economically, and for our environment now and into the future.

CHAPTER 1

Need for Climate Action

Widespread consensus exists that human-caused emissions of greenhouse gases (GHG) are impacting Earth's climate system, causing the potential for unprecedented, large-scale, adverse health, social, economic, financial, security, and ecological effects. The risks associated with climate change have prompted many cities to plan differently for the future, Fort Collins among them.

The time to act is now

The Intergovernmental Panel on Climate Change (IPCC) released a final summary report in Copenhagen in November 2014. This report underscores three major facts about climate change:

- Climate change is human-caused and is already having dangerous impacts across the world;
- If the world community acts now, warming can still be kept below the politically agreed upon "safe" limit of two degrees Celsius;
- The ability to secure a safe climate future is not only possible but also economically viable.

The summary report also recognizes that

"Mitigation can be more cost-effective if using an integrated approach that combines measures to reduce energy use and the greenhouse gas intensity of end-use sectors, decarbonize energy supply, reduce net emissions and enhance carbon sinks in land-based sectors."

This is the premise upon which Fort Collins' Climate Action Plan Framework is built.

WHY CLIMATE CHANGE MATTERS IN FORT COLLINS

Here's what the Fort Collins region can expect from climate change unless greenhouse gas emissions are dramatically reduced:

- Soaring summer temperatures. Days in which the thermometer climbs past 90 degrees F, once rare, will become commonplace. Climate models, down-scaled for our region, predict it is highly likely our summers will be up to 6^{O}F higher by 2040.[1] Increased heat can exacerbate ground level ozone and smog, worsen visibility and affect citizens' health.
- Longer and more intense droughts. These will have cascading negative effects on all environmental fronts, from native trout viability to urban and national forest productivity.
- Less snowpack, with earlier snowmelt runoff. This means reduced stream flows and soil moisture in summer months, so that water may not be available when it is most needed.
- Despite the increasing frequency of drought conditions, the rainfall that does come may be more concentrated in heavy downpours, increasing the risks of flooding.
- Higher temperatures and lower soil moisture will increase the threats to forests from fire, insects, and disease, affecting recreation, the timber industry, and air and water quality.
- More severe heat waves and storms will threaten human health, perhaps even human lives. The Fort Collins "Extreme Heat" report documents the occurrence of more hot days and heat waves this century than in earlier decades.[2] With continued climate change, the forecast is for much more extreme heat, especially if future emissions of heat-trapping pollution are high.

[1]Climate Change Primer for Fort Collins, 2013. (http://www.fcgov.com/climateprotection/pdf/fortcollinsclimatechangeprimer2013.pdf)

Fort Collins and the State of Colorado have already caught possible glimpses of the disasters that may come without quicker action to cut emissions. The 2012 High Park and Waldo Canyon wildfires, and the 2013 Black Forest fire, were the most destructive in the state's history, destroying hundreds of homes. The September 2013 flood swept away roads, bridges and homes along the Big Thompson River and other areas, and caused more than $2 billion in regional damage. The August 2013 heat wave forced the community's schools to close. And the mountain pine beetle, unleashed by milder winters, has decimated more than 4 million acres of forest across the state.

These predicted and actual impacts illustrate what Fort Collins has at stake as humans change the climate and why reducing climate-changing pollution matters.[2]

MULTIPLE CO-BENEFITS OF CLIMATE ACTION

Studies continue to illustrate that taking action to address climate change can be beneficial. In 2013, the Carbon Disclosure Project, along with the C40 Cities Climate Leadership Group, found that, of the 110 global cities reporting, 91% say that tackling climate change presents economic opportunities. Sixty-two percent of the reported reduction activities being undertaken by cities have the potential to make cities more attractive to businesses, with the largest attractors being energy efficiency actions and development of infrastructure for non-motorized transport.[3]

The Fort Collins community could realize significant ancillary economic, environmental and social benefits by undertaking responsible steps to combat climate change.

- Support local businesses and stimulate economic development
- Provide economic stimulation of research and development activities
- Reduce home and business energy costs for heating, cooling and lighting
- Reduce home and business motor vehicle fuel costs
- Reduce dependence on foreign fuel sources
- Reduce vulnerability to energy price increases and volatility
- Reduce peak energy demand and improve utilization of the electricity system
- Diversify energy supply and reduce loads on transmission system
- Reduce air pollution emissions including ozone precursors and fine particles
- Improve public health
- Improve local visibility
- Reduce waste and increase landfill diversion rates
- Reduce vehicle miles of travel and road congestion
- Reduce water consumption in the community
- Increase Fort Collins' ability to adapt to a changing climate
- Provide opportunities for regional, state and national leadership and recognition

Local governments have strong financial incentives to address climate change. Reducing local carbon emissions means pursuing a variety of programs and practices that are energy prudent, and thus ultimately fiscally responsible.

[2] "Extreme Heat in Fort Collins", 2014 (*http://www.fcgov.com/climateprotection/pdf/heat-report-jan-2014.pdf*)
[3] https://www.cdp.net/CDPResults/CDP-Cities-2013-Global-Report.pdf

ROLE OF CITIES

With more than 80% of Americans living in urban areas, cities play a pivotal role in addressing climate change. The design of cities—what we consume, how we design our buildings, how we develop our land, how we get around, and how we deal with our waste—significantly determines the amount of energy we use, the greenhouse gas emissions we produce, and the risks of disruption from climate-related weather events.

While Fort Collins' impact on global greenhouse gas emission is very small, leadership action is a powerful force that can be multiplied many times over. This capacity to inspire change is further complemented by the City's control of local electricity and water utility operations. Cities like Fort Collins, and other leading cities, have the opportunity to demonstrate to the nation and the world that it is possible to dramatically reduce greenhouse gas emissions, while maintaining and enhancing its position as a healthy, prosperous and resilient place to live, work, and play.

Cities and communities are today at the forefront of practical, meaningful climate action. Many cities and some states are taking action. In a recent survey of 288 major cities, more than half (53%) had committed to reducing greenhouse gas emissions[4]. National and international networks of cities, including 100 Resilient Cities, International Council for Local Environmental Initiatives, C40 Cities, and many others are sharing best practices and comparing results.

Local planning enables communities to craft policies that are best adapted to local values, opportunities, constraints, and economic considerations. Communities and states that have been proactive in formulating policies to address climate change, like Fort Collins and the State of Colorado, will be better prepared to meet the EPA's proposed carbon emissions regulations under Section 111(d) of the Clean Air Act.

FORT COLLINS' CLIMATE COMMITMENT

Fort Collins has been a leader in climate protection for almost two decades, starting with the first "Local Action Plan to Reduce Greenhouse Gas Emission" adopted in 1999. Through leadership and involvement by many, emissions are below 2005's baseline, at the same time that population and economy have grown. This CAP framework is the latest in a series of progressive actions that the Fort Collins community has taken over the past two decades to respond to increasing concerns about climate change and its global and local impacts. The goals in this framework plan are among the most ambitious in the nation.

[4] http://usmayors.org/pressreleases/uploads/2014/0422-report-climatesurvey.pdf

FIGURE 3. FORT COLLINS' CLIMATE COMMITMENT

WHY ACCELERATE FORT COLLINS' CLIMATE ACTION GOALS

In April 2014, Fort Collins City Council passed Resolution 2014-028, calling for an ad hoc citizen advisory committee to develop, for City Council's consideration, an updated Climate Action Plan that described the steps our community will need to take to achieve community-wide GHG reduction goals of:

- 20% below 2005 levels by 2020
- 80% below 2005 levels by 2030
- 100% below 2005 levels by 2050 (carbon neutral)

Why? Because:

- Fort Collins is especially vulnerable to the effects of climate change, so enhanced actions to reduce emissions and prepare for climate change are needed.
- New opportunities have emerged to reduce local emissions since the 2008 Climate Action Plan was adopted.
- Fort Collins is uniquely positioned to demonstrate to other communities how deep reductions in GHG emissions can be made while remaining economically vibrant.

Most countries have acknowledged the threat of climate change and are making commitments, or issuing rules and regulations, to reduce emissions. Some community climate action plans, such as Fort Collins' 2008 plan, call for an 80% reduction in carbon emissions by 2050 in an effort to limit global warming to two degrees centigrade (3.6 degrees F). However, many scientists believe that this goal is simply not aggressive enough, calling a 2-degree global warming limit a "prescription for disaster."

A clear, long-term goal allows Fort Collins to determine in advance the major efforts and initiatives it must undertake as a community over the next two to three decades, and to identify and prioritize near term actions. By setting a goal that makes Fort Collins a leader in the transition to a clean energy economy, the City has the potential to stimulate local innovation and entrepreneurial activity, attract new partners and outside capital, and encourage funding for cutting edge research and development. Such an aspirational goal may drive more action to reduce emissions than would occur without a goal and plan and could boost the community's engagement, competitive spirit, and sense of pride.

United action could bring many benefits to Fort Collins—and make a compelling case for other communities to quickly follow suit. The benefits of a long-term aspirational goal and a Climate Action Plan framework include:

- opportunity to analyze options and prioritize actions
- establish a process for tracking, evaluating, and recalibrating
- provide clarity and inspiration to the community and other potential partners/allies
- align and combine the strengths of the private/public sectors

THE RISKS

Accelerating the City's emissions reductions targets is not without cost or risk. At the same time, the risks of *not* taking aggressive action against climate change are significant. Fort Collins is now largely dependent on coal and natural gas to generate electricity and heat for homes, and on oil to fuel vehicles. Simply maintaining the current electricity grid, local residential/commercial building stocks and transportation system to 2030 and 2050 is expensive. Delaying implementation strategies may not be fiscally prudent. As the U.S. and other countries move towards mandatory curbs on greenhouse gas emissions, the costs associated with carbon-generating activities will increase. Some of the risks are outlined below.

FIGURE 4. TO ACT OR NOT TO ACT - BOTH CHOICES HAVE RISKS AND COSTS

Risks of inaction (business as usual)	Risks of accelerated climate action
▪ Significant opportunity cost: Fort Collins loses its position as a leader in the clean tech market and misses out on opportunities to attract funding, investor capital and innovative businesses. ▪ Greater congestion and worsening air quality: Failure to significantly reduce onsite combustion from transportation reduces Fort Collins' quality of life and attractiveness as a community. ▪ Carbon regulation (and costs) imposed on Fort Collins: New national rules could impact citizens and businesses by applying a cost to carbon emitting activities. ▪ Continued fossil fuel dependence: Fossil fuel price spikes and fuel supply shocks may hurt the local economy.	▪ Investing too early: Technologies may not yet be fully developed or cost-effective. ▪ Inequitable impacts: Costs may not be borne equally across the community, leading to inequities. ▪ Less reliable electricity: Adding lots of renewable electricity to the grid could result in instability if not properly managed. ▪ Higher costs: Steps to boost efficiency and add renewable power will require increased upfront investment by the City and its businesses and taxpayers. (

Care must be taken to manage the risks outlined above. Risks of accelerated action must be managed through careful program design, pilot testing and refinement where appropriate, and vetting with the community and stakeholder groups.

WHY FORT COLLINS CAN SUCCEED

Achieving aspirational, long term greenhouse gas reduction goals will not be easy. It will require community involvement and ownership in seeking and implementing solutions. It will require finding new and innovative ways to finance upfront costs. However, Fort Collins is well positioned to be among the leaders in advancing greenhouse gas reduction at the community level for several reasons, outlined below:

- A strong foundation of existing community, City and utility programs ,such as an award-winning Utility that consistently provides highly reliable power, the recent successful Renewable and Distributed System Integration (RDSI) project, Advanced Metering Fort Collins (AMFC) rollout, existing extensive pedestrian- and bicycle-friendly infrastructure and a transit oriented development/land use code. The City offers a comprehensive portfolio of efficiency programs garnering savings that are amongst the best in the country and regularly enhances programs to enable additional community participation.
- A highly engaged and collaborative business community. Numerous local businesses already have voluntarily committed to reduce GHG emissions through City programs. Among them are several prominent leaders whose standing in the community and focus on sustainable initiatives make them effective drivers of change. The business sector leads the way in annual efficiency savings, with over 40% of community businesses participating in programs and services provided by Fort Collins Utilities.

- Owning an electric utility with a collaborative regional power supply partner. Municipal ownership brings greater control of energy decisions, access to low-cost capital and flexible financing, and potential for collaboration with other communities. The City of Fort Collins has ownership in Platte River Power Authority (Platte River), along with three neighboring communities (Longmont, Estes Park, and Loveland), which further provides benefits in regional decision-making that guides generation production, as detailed in Fort Collins Utilities Energy Policy.
- *A partnership with Colorado State University.* As a leader in climate change research and education, CSU can help Fort Collins shape and implement its energy transformation. The University has its own aggressive goals to achieve carbon neutrality (and alone accounts for about a fifth of Fort Collins' population).

- *A Platinum Bike Friendly Community.* Bicycling has become a primary means of transportation for many, a major form of recreation for most, and a significant factor in attracting new businesses and new residents to Fort Collins. The 2014 Bicycle Master plan sets a vision for the year 2020, whereby one in five people will ride a bike, and bicycle-related crashes will be fewer than today.
- *Citizen surveys show interest in taking action to address climate change .*The 2011 Fort Collins Air Quality/Recycling survey indicates that a resounding 86% of citizen agree or strongly agree that "governments should offer voluntary programs that enable citizens and businesses to reduce climate change". Another 74% agree or strongly agree that "governments should enact legislation and regulations intended to reduce climate change".
- *Continued support from philanthropy and other levels of government.* Foundations like the New Belgium Family Foundation and the Argosy Foundation have already begun to invest in strategies described in the CAP framework in anticipation of significant future social and economic benefits to the community.
- *Tangible experience being on the innovation edge of climate action.* The City has launched landmark local initiatives like the FortZed zero energy district and the plan for Zero Waste by 2030. It has also contributed to national programs like the USDA's Climate Hubs program and the Presidential Task Force on Climate Preparedness and Resilience, in which the mayor was an active participant. Fort Collins was a founding member of the Colorado Clean Energy Cluster and the Water Innovation Cluster, whose initiatives are advancing innovative climate solutions locally.

CHAPTER 2

Framework for Action

THE PROCESS

This Climate Action Plan framework has been developed in response to Resolution 2014-028. The City first established a 23-member Citizens Advisory Committee and assembled a team of expert analysts and advisors, including members of City staff and outside consultants. The Committee and the experts then assessed how the City could achieve the ambitious goals, and also estimated the costs and benefits to the community of doing so. Key elements for developing the framework included::

- A core analytical team, led by the City and supported by Brendle Group and Rocky Mountain Institute (RMI), assessed the implications of using different strategies to achieve the goals. In addition, Platte River has analyzed scenarios indicating changes in power production required to meet the City's electricity supply needs in support of an updated CAP.
- A Citizens Advisory Committee (CAC), comprised of members from many different parts of the Fort Collins community, met nine times to provide ideas, input and guidance.
- Ideas for strategies and tactics to achieve climate action goals were generated from the CAC, the core team, and interviews with more than 40 leading experts and specialists from Fort Collins and around the nation.
- A preliminary triple bottom line evaluation was applied to assess potential aspects of the framework plan's economic, environmental and social implications.

The journey toward a2030 goal of reducing emissions by 80%, and a 2050 goal for carbon neutrality is a long one, which will require adjustments over time. Strategies and tactics will inevitably shift and evolve, even as the long-term target remains the same. A key element of this plan, therefore, is to provide a framework to periodically reevaluate—and alter as needed— actions that the City is taking.

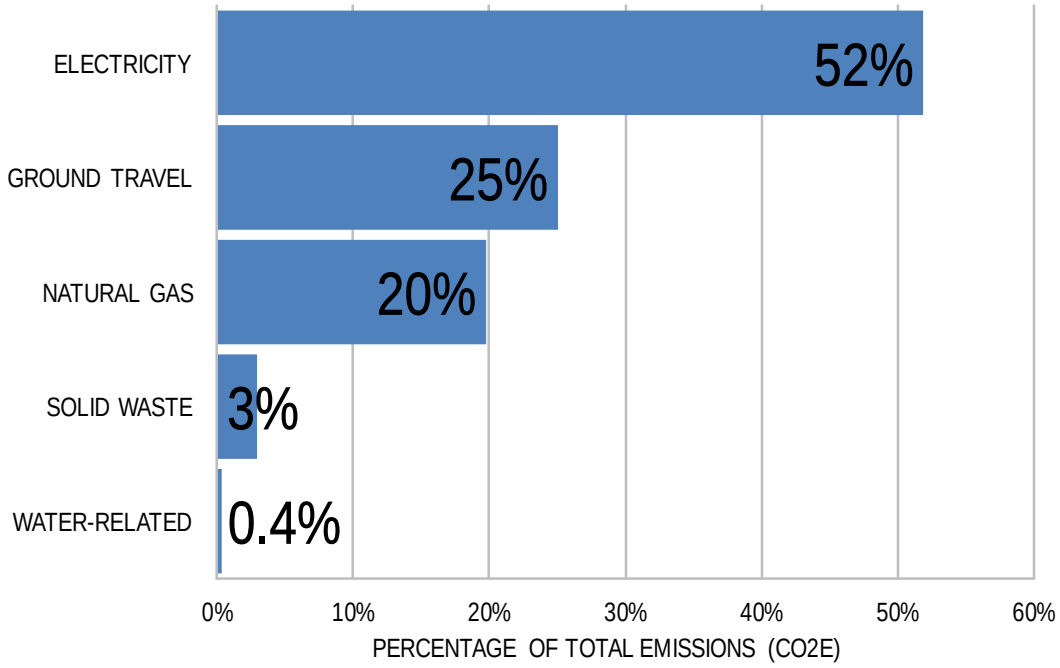
WHERE ARE WE STARTING?

Currently, 97% of GHG emissions are generated by burning coal, oil and natural gas (Figure 5). Natural gas accounts for 20% of emissions, almost all of it from the gas used to heat our buildings, cook our food and power industrial processes. Meanwhile, the petroleum that fuels our cars, buses, trucks and other vehicles is responsible for another25% of total emissions.

Fort Collins' community GHG accounting follows standardized accounting protocols for communities, which is "production based", focusing on fossil fuel combustion directly associated with community activities. Although it does not incorporate the life-cycle emission embodied in all the products and materials we use in our daily lives ("consumption-based" accounting), information about the carbon footprint of products is important to share with citizens, further empowering their choices to reduce their carbon footprint.

FIGURE 5. FORT COLLINS COMMUNITY 2013 GREENHOUSE GAS EMISSIONS BY SOURCE*

*Airline travel excluded.



Fort Collins emits about 14.7 metric tons of CO_2equivalent per capita annually, down from 18.0.tons per capita in 2005. Fort Collins' emissions are lower than national averages for the U.S. as a whole and for Colorado, thanks in part to deliberate efforts undertaken in recent years to reduce emissions. But our dependence on fossil fuels remains high, and our overall emissions exceed those of a majority of the world's population on a per capita basis, including some cities with significantly higher per capita gross domestic product (GDP) than Fort Collins.

PROJECTED FUTURE EMISSIONS

Fort Collins' community total GHG emissions are projected to increase 16% by 2030 and 39% by 2050, above 2005 levels, in the absences of additional actions to curb them. This projection is referred to as the "Business As Usual" forecast.

Fortunately, some actions are anticipated that will lower emissions as a result of actions that are outside the direct control of the Fort Collins community or City government. Increased federal standards for vehicle fuel efficiency (Corporate Average Fuel Efficiency, or CAFE) are expected to lower emissions in the Fort Collins community by 12% by 2050. Greenhouse gas emissions from Fort Collins' electric supply could drop if Platte River decides to proceed toward the guidelines established by the Platte River board in 2013. These guidelines were established for a study of options that could: (1) reduce emissions 20% below 2005 levels by 2020 and 80% by 2050, (2) achieve 20% energy supply from renewable sources by 2020 (not including existing hydropower), (3) maintaining reliability through minimum 15% reserve margin, and (4) remaining the lowest cost wholesale electric supplier located in Colorado. Since 2013, Platte River has already added 60 MW of new wind generation and the Board has approved installation of up to 30 MW of solar generation at the Rawhide site. Additional changes may be considered over time based on Platte River's ongoing resource planning efforts.

Subtracting the anticipated benefits of the CAFE vehicles standards and assuming CO2 reductions associated with Platte River's study guidelines are implemented, total Fort Collins projected emissions could drop. This is referred to as the "Adjusted Business As Usual" scenario. Note that no changes to electric supply from Platte River have been approved, but are assumed to have been implemented in this Adjusted Business As Usual scenario. The strategies identified in this CAP framework strive to fill in the gap between the "Adjusted Business As Usual" emissions level and what would be needed to accomplish emissions reductions of 20% by 2020, 80% by 2030, and carbon neutrality by 2050.

FIGURE 6. FORT COLLINS GHG EMISISONS FORECAST AND REDUCTONS NEEDED (MTCO2E)

	2005	2020	2030	2050
Business As Usual Forecast Emissions (with projected heat increase)	2,343,000	2,433,000	2,711,000	3,265,000
Adjusted Business As Usual Reductions - federal vehicles fuel efficiency standards - Platte River Power Authority 2013 study guidelines		- 567,000	- 951,000	-1,739,000
Adjusted Business As Usual (ABAU) Forecast Emissions		1,866,000	1,760,000	1,526,000
Target % (below 2005)		20%	80%	100%
Target Emissions		1,874,000	469,000	0
Needed Reductions from ABAU		-8,000	1,291,000	1,526,000

CHAPTER 3
Emissions Reduction Strategies

This chapter describes a framework of actions the community can take to substantially meet accelerated greenhouse gas reduction goals. The selection of strategies and tactics included in this framework plan is based on research and analysis covering all emissions categories. More than 100 individual tactics were evaluated, from City-led efficiency programs to entrepreneurial mobile applications and services. They were based on interviews with more than 40 local, regional and national experts and analysis by independent consultants.

The strategies and tactics described here are grouped in four major sectors:

- reduce energy use in buildings
- reduce energy use in transportation
- reduce emissions from electricity
- Reduce waste and eliminate landfill emissions by recycling or composting

FIGURE 7. ESTIMATED PERECENT OF TOTAL EMISSIONS REDUCTIONS FROM CAP FRAMEWORK STRATEGIES BELOW ADJUSTED BUSINES AS USUAL FORECAST

	2020	2030	2050
Buildings: Boosting Efficiency, Comfort and Health			
Build in Efficiency From the Start	3%	2%	3%
Make Existing Homes More Efficient	20%	15%	21%
Increase Energy Efficiency in the Institutional, Commercial, and Industrial Sectors	27%	18%	21%
`Advanced Mobility: Making Transport Faster, More Convenient and Cleaner			
Shift Land Use Patterns to Shorten Trips and Reduce the Need to Drive	7%	4%	5%
Drive Adoption of Multimodal Transport	3%	3%	3%
Accelerate Adoption of Fuel Efficient and Electric Vehicles	2%	2%	6%
Energy Supply and Delivery: The Shift to Renewable Energy Resources			
Advance Utility-Scale Renewable Energy Supply	0%	30%	11%
Advance Residential and Commercial Solar Adoption	18%	14%	10%
Shift Heating Loads to Biofuels, Geothermal, and Electrification	3%	4%	12%
Waste Reduction and Materials Regeneration			
Road to Zero Waste /Carbon Sequestration	17%	7%	9%
Carbon Sequestration	<1%	<1%	<1%
TOTAL ESTIMATED MTCO2e REDUCTION FROM STRATEGIES	**272,000**	**1,119,000**	**1,192,000**
Estimated Percent Reduction from 2005 Baseline	**32%+**	**73%+**	**86%+**

BUILDINGS: BOOSTING EFFICIENCY, COMFORT AND HEALTH

The building sector is the Fort Collins community's top energy consumer and its number one contributor to greenhouse gas emissions. While Fort Collins' current retail electricity and natural gas prices are low compared to national averages, most efficiency measures may be even cheaper to employ. This section describes strategies to reduce energy use in existing buildings and reduce energy use in new buildings. Although energy efficiency alone will not enable Fort Collins to reach an 80% reduction in GHG emissions by 2030, efficiency and conservation measures are typically the most cost-effective approach to reduce emissions and represent the best place to start and/or expand programs. By reducing the overall demand for energy, building efficiency also makes it more feasible to transition to a carbon-neutral energy system.

BENEFITS OF GREEN BUILDINGS

Research on the benefits of increasing building energy efficiency (incorporating green building concepts into our new and existing homes and businesses) shows tremendous social and economic benefits. When green built schools provide more daylight for the learning environment, children progressed through school curricula 20 to 26% faster[5]; the net economic and health benefits of green schools has been reported to be $63/square feet.[6] Retail stores that installed skylights have reported 40% increases in gross sales.[15] Increased worker productivity has been well documented for LEED-certified, ENERGY STAR, and other high performance green commercial and industrial buildings. Studies have demonstrated that green buildings provide up to 18% lower employee turnover, 21% higher employee morale, 22% easier recruiting of employees, and 23% more effective client meetings.[7] The benefits derived from higher ventilation rates promoted in green buildings are especially important in high density buildings such as hospitals, nursing homes, and childcare facilities and can account for 50% to 370% reductions in rates of respiratory illnesses.[8] Two studies documented a 7.1% rental premium for LEED-certified retrofit buildings[9] and a 16% rental premium for new LEED-certified buildings.[10]

Challenges to accelerated action in the building sector include developing financing programs and business models that enable more cost-effective and broader uptake of efficiency measures without impacting affordability in Fort Collins, addressing issues unique to rental properties, finding solutions to address the unique

[5]Heschong, Lisa. HeschongMahone Group. "*Daylight and Retail Sales*." California Energy Commission: Pacific Gas and Electric Company. Fair Oaks, California, 2003: *http://www.terrapinbrightgreen.com/reports/the-economics-of-biophilia/#footnote-22.*

[6]Greening America's Schools, Cost and Benefits, Gregory Kats, October 2006.

[7]CBRE and USD Survey Data 2009; U.S. Bureau of Labor and Statistics 2008; Occupational Employment Statistics, 2009 - Miller N.G., Dave Pogue, Quiana D. Gough, and Susan M. Davis; Green Buildings and Productivity (Vol. 1, No. 1-2009, Journal of Sustainable Real Estate).

[8]Elzeyadi, I. "*Daylighting-Bias and Biophilia: Quantifying the Impacts of Daylight on Occupants Health*", Thought and Leadership in Green Buildings Research;Greenbuild 2011, Proceedings, Washington, DC: USGBC Press. 2011 (http://www.terrapinbrightgreen.com/reports/the-economics-of-biophilia/#footnote-22).

[9]Kok, N., Miller, Norman G., and Morris, Peter, 2012, The Economics of Green Retrofits, Journal of Sustainable Real Estate.

[10]Eichholtz, Piet M.A., N. Kok, and J.M. Quigley. Doing Well by Doing Good: Green Building Attributes. Building and Environment, 45:11, 2553-2561 as cited in Kok, N., Miller, Norman G., and Morris, Peter., 2012, The Economics of Green Retrofits, Journal of Sustainable Real Estate.

needs of commercial and industrial facilities, and successfully raising awareness and motivating citizens and business to understand the benefits of energy efficiency and invest in those solutions.

2030 Buildings Vision

Annual reductions in buildings' energy use reaches 3% percent per year by 2030.

Existing homes and businesses will use 36% less energy than today.

New construction will use ~30% less energy than under today's code.

FIGURE 8. SUMMARY OF ESTIMATED GHG BENEFIT OF BUILDINGS STRATEGIES (MTCO2E)

	2020	2030	2050
Buildings: Boosting Efficiency, Comfort and Health			
Build in Efficiency From the Start	8,000	24,000	34,000
Make Existing Homes More Efficient	55,000	165,000	247,000
Increase Energy Efficiency in the Institutional, Commercial, and Industrial Sectors	73,000	207,000	252,000

Strategy: Build in Efficiency from the Start

Fort Collins' many historic structures show that buildings can have useful lives for scores or even hundreds of years. That longevity emphasizes the importance of designing new construction to be as energy efficient as possible. Building it right the first time locks in energy savings and that brings benefits for decades to come. By 2030, the following actions could reduce energy consumption in this new construction by 30% compared to business as usual.

This framework plan builds on the City's longstanding green building efforts by continually raising the bar for high performing buildings while supporting and rewarding beyond-compliance efforts. Tactics under consideration include:

Increase energy efficiency in new construction

- Continue to adopt the latest energy codes for new residential and commercial buildings along with specific local requirements to exceed minimum standards.
- Engage local builders to determine best practices for meeting and exceeding code requirements, and connect contractors with the training and resources needed to deliver efficiency savings at the scale required to meet the goals.
- Ensure new buildings meet codes to realize the expected savings.
- Reward builders who go beyond the efficiency codes with incentives programs.

Encourage "demand-response" for new residential construction

- Consider incentives or requirements for demand-response, which calls for home energy management systems to be built into all new residential construction. Combined with `smart' appliances, demand-

response enables voluntary or programmed pauses in appliance use during peak times, and helps encourage residents to re-schedule tasks for periods of low demand.

- Consider establishing variable energy pricing, so the price of energy rises and falls depending on demand. This provides an incentive for homeowners to adjust their energy use help and lower the peak demand in the community. It also gives homeowners the chance to save substantial amounts of money—and to benefit the entire system—by moving tasks, such as washing clothes, to periods of lower demand and thus of cheaper electricity.

Strategy: Make Existing Homes More Efficient

The majority of homes in 2030 and 2050 will be buildings that already standing today, so it is crucial to boost the energy performance of today's existing homes. Fort Collins' citizens will reap additional benefits of efficient homes, such as improved comfort and indoor environmental quality. A two-pronged approach to reducing energy use in existing homes will be most effective; first by retrofitting homes to be more energy efficient, and secondly by conducting educational campaigns to help residents learn to live more efficiently in their homes.

Boost energy efficiency in existing homes

- Continuously improve efficiency programs to be more effective, and ensure adequate funding to meet interest from customers.
- Develop new service and product models that enable homeowners to participate in energy efficiency improvements without upfront costs, by allowing improvements to be paid back over time in utility bills.
- Promote new technologies for efficient consumer products and smart homes.
- Consider requirements for rating and communicating the efficiency of homes for sale and for rent.
- Provide tools and resources to help households manage their energy use.
- Build on Fort Collins' strong sense of community with a public awareness and educational campaign that helps citizens take action.

Strategy: Increase Energy Efficiency in the Institutional, Commercial, and Industrial Sectors

Boosting efficiency of commercial buildings requires a more tailored approach, compared to residential homes, because the uses and requirements of businesses vary so widely. Tactics for non-residential buildings include policy mechanisms, innovative business models, and a range of potential programs that target small and mid-sized businesses as well as the largest commercial property owners and the highest energy users in industry.

- Lead by doing. By setting a goal of cutting the energy use in municipal government buildings by upwards of 30 percent by 2030, the City will set an example to the rest of the community. The City can test efficiency approaches and funding models applicable to commercial buildings in the private sector.
- Collect and publicize data on energy use. Explore requirements for the annual energy consumption of large public, commercial and multi-family properties to be reported and made available to the public. A number of cities, including New York and Seattle, already require public disclosure of energy use.
- Raise standards. Buildings can be assessed and compared by their annual energy use per square foot, a measure called Energy Use Intensity (EUI). The City should ensure that each of its municipal buildings in a particular category achieve a reasonable level of EUI.

- Create innovative new approaches to provide energy efficiency programs to customers. Business models being considered streamline the process for individuals to sign up, and cut down on costs, from initial contracting, to installation, to periodic measurement and verification.
- Provide expert advice. The City can work with the largest industrial facilities in Fort Collins to identify and engineer changes that significantly reduce buildings' energy use.
- Implement new rules. The City could look at a variety of new building construction codes, including: installation of efficient lights in non-residential spaces; ensure the energy use of individual tenants in commercial and retail buildings is metered and billed to the tenants; require that buildings be re-commissioned once every decade to ensure that basic systems are operating at optimal performance levels; and, require commercial customers to participate in demand-response programs.
- Training and required certification of building operators. Making sure that building operators have the necessary technical expertise to help keep systems running at maximum efficiency.
- Build awareness. An educational campaign focused on businesses can help incentivize and motivate the private sector to take a significant role in the community-wide effort to cut greenhouse gas emissions.
- Continually Improving. Business savings from efficiency have led the way for community savings since 2004. Continue to improve the programs for assessments, incentives and technical assistance to reach all types of businesses.

ADVANCED MOBILITY: MAKING TRANSPORT FASTER, MORE CONVENIENT AND CLEANER

Fort Collins consumed 62 million gallons of gasoline and diesel in 2013 as people drive to work and school, deliver products and services, run errands, and perform the daily tasks required to keep commerce and life running smoothly. Fort Collins' street system, buses, and pedestrian and bicycle infrastructure are designed and maintained to meet the highest standards. But in addition to the many benefits it provides, Fort Collins' transportation system also comes with significant costs. All told, transportation accounts for 25% of Fort Collins' total greenhouse gas emissions, and is responsible for significant financial, as well as health and societal, impacts.

In addition to generating GHGs, burning gasoline and diesel to fuel vehicles is also the major source of local "criteria" air pollutants like NO_x, SO_2, and particulate matter. Air pollution contributes to asthma and other illnesses in Fort Collins, where one in four residents have respiratory problems.[11] In addition, transportation energy is an expensive drain on the local economy.[12]The infrastructure necessary to support combustible fuels will continue to be capital-intensive, and future fuel costs will continue to be volatile. In contrast to buying homegrown products and services, money spent on gasoline and diesel flows out of the community to refineries and producers elsewhere in the country or the world, contributing to global political and security risks from importing oil.

The good news is that the transportation sector is already on a path to reduce GHG emissions and other pollutants because of aggressive new national fuel economy standards set in 2012, which require 54 MPG average gas mileage for new vehicles by 2025. In order to meet these targets, all cars and trucks will be required to be more aerodynamic, and lighter, with improved engine technology. Increases in electric vehicle adoption are also anticipated.

This framework plan includes strategies that have the potential to reduce Fort Collins' transportation energy use even further. Strategies in the plan put more dollars back in people's pockets in saved fuel costs, while also providing greater transport options, ease, and convenience to the community. As described in Fort Collins' 2011 Transportation Master Plan,[13] the City is already pursuing a number of interventions to capture these benefits.

Accelerating these activities and adopting more aggressive community-wide goals will reduce transportation emissions of GHGs even further and result in a net savings in fuel costs and avoided vehicle maintenance for

[11] Reference: *Breathe Wheezy*, Scientific American, Jan 9 2013, http://www.scientificamerican.com/article/traffic-pollution-and-asthma/ .

[12]The costs of congestion and air pollution alone, aside from the other external costs of motor vehicle traffic, are estimated at $260,000 each year in Fort Collins, according to Victoria Transportation Institute, *Evaluating Public Transit* Benefits (2014), http://www.vtpi.org/tranben.pdf, .

[13]"Fort Collins Transportation Master Plan," City of Fort Collins, 2/14/11. http://www.fcgov.com/PlanFortCollins/pdf/tmp.pdf

the community. Transitioning to a more advanced, low carbon transport system will also reduce significant additional external costs the community pays for transport today, which include the cost of accidents, parking, congestion, road facilities, roadway land value, traffic service, air pollution, noise, water pollution, and other resource externalities which can add $0.202/passenger mile.[14]

Challenges to accelerated action in this area include continuing to raise awareness and build community support for increased infill densities, addressing barriers associated with infill development, informing consumers about the life-cycle costs of transportation choices, and funding infrastructure needs associated with transit expansion.

FIGURE 9. SUMMARY OF ESTIMATED GHG BENEFIT OF TRANSPORTATION STRATEGIES (MTCO2E)

	2020	2030	2050
Advanced Mobility: Making Transport Faster, More Convenient and Cleaner			
Shift Land Use Patterns to Shorten Trips and Reduce the Need to Drive	19,000	45,000	54,000
Drive Adoption of Multimodal Transport	9,000	31,000	38,000
Accelerate Adoption of Fuel Efficient and Electric Vehicles	5,000	21,000	71,000

BENEFITS OF ACCELERATED TRANSPORTATION ENERGY SAVINGS

The benefits of accelerating Fort Collins' transportation energy savings extend beyond costs savings. With enhanced urban planning and smart growth, people can get places faster and more conveniently. The strength of Fort Collins' biking network will continue to be a boon not only to its bikers, but to residential property values in the city.[15] Increased retail spending per month has been shown to increase when customers travel by bike ($75.66) rather than by car ($61.03)[28]. The demand for transit has been growing in Fort Collins as evidenced by 70% growth between 2000 and 2014, and 14% growth between 2013 and 2014. Less driving means less congestion, and consequently, improved local air quality. Cumulative vehicle miles traveled (VMT) savings of over 158 million from several transportation strategies in this plan translates into a total health cost savings of over $17 million from reduced air pollution for Fort Collins' citizens in the 16-year period between 2014 and 2030[16]. Continuing the work the City has already started will also continue to build on one of the community's greatest strengths—being a bike-able, walkable city. There's even a potential benefit for the electricity sector from greater adoption of electric vehicles.

[14]Litman, Todd, Aug 31, 2014. Evaluating Public Transit Benefits and Costs, Best Practices Guidebook.

[15]People for Bikes and the Alliance for Biking and Walking, *Protected Bike Lanes Mean Business*, pp10, https://www.sfbike.org/wp-content/uploads/2014/04/Protected_Bike_Lanes_Mean_Business.pdf

[16] Transportation Cost and Benefit Analysis II – Air Pollution Costs, Mar 16, 2011, Victoria Transport Policy Institute

2030 Transportation Vision

Reduce vehicles miles travelled by 29%.
Expansion of transit network.
One in two new passenger cars purchased will be electric by 2030.
The remaining new vehicles purchased will be 40% more efficient than the average new stock by 2030.

Strategy: Shift Land Use Patterns to Shorten Trips and Reduce the Need to Drive

This strategy supports land use changes that shorten vehicle trips and reduce the need for vehicle transport. Perhaps more than any other factor, land use determines individuals' transportation habits. Tactics include:

- *Pursue a "complete streets" approach for new road construction*. Development should account for the needs of pedestrians and bicyclists as well as cars, through features like well-placed bike lanes and crosswalks.

- *Evaluate parking requirements.* For Fort Collins' development is deliberately designed to support higher land use intensity. The "market" needs to assign more accurate value to what is currently a highly community-subsidized commodity: the parking space. Changing the number of parking spaces required for new construction projects allows developers to have more autonomy in designing projects.

- *Evaluate approaches such as retrofitting, charging for, and reducing on-street parking.* Improvements in current parking conditions can be made by installing parking meters, establishing district permitting, and creating "smart parking" initiatives (like mobile parking payments, meter-based parking sensors, and responsive pricing,. Improved city parking – both on-street and off-street – can cover its own costs and encourage development and behavior that accounts for the cost of parking.

Strategy: Drive Adoption of Multimodal Transport

This strategy includes tactics to reduce the demand for, and use of, personal vehicles and to increase the use of alternative modes, including transit, biking, carpooling, and walking. Tactics include:

- Coordinate and expand local and regional mass transportation options for commuters
- Offer static and real-time public transit data, along with other transportation information, to third-party developers through an open data platform that supports web-based or mobile transit apps. Fort Collins has implemented both web-based and a mobile transit app containing real-time bus arrival information, and plans to release GTFS (transit feed data) publically for use by developers once a license agreement has been completed. These new tools make it simple for commuters and other travelers to walk, bike, or use mass transit while on the go.
- Facilitate and support the growth of car share or ride share programs. Clear, coherent policies on the part of the City will help foster emerging transit systems like car share and ride share enterprises.

- Continue to implement and expand bike-share programs. In addition to health benefits and reduced traffic congestion, bike share systems provide vital last/first-mile links for transit users and alternative travel options for visitors.
- Develop corporate engagement and incentive programs to provide public transit access, and to encourage employee bicycling and walking to reduce vehicle miles traveled from commuting.
- Campaign to increase awareness of how transportation costs factor into the total cost of living. Many people are unaware of how the costs of driving (e.g.,vehicle maintenance, fuel, and insurance) add up over time and compete with alternative travel options, which leads to a persistent preference for automobiles despite their costs and risks. Creative tactics can be communicated to help citizens understand the real value of alternative transit and the true cost of driving.

OPEN TRANSIT DATA: Leveraging the Ingenuity of the Private Sector to Improve Transit Services

One of the most promising, cost-effective tactics available for reducing vehicle miles and thereby emissions is to make transit schedules, stops, prices, and real-time data on the actual location and estimated arrival/departure times more readily available to the public. When data are made available to the public and to third-party developers, or "opened," municipalities can leverage the skills, resources, and momentum of the private sector to help improve transit services and ridership. Outcomes can include:

- Increasingly more effective interfaces and apps that help users figure out what transport options they have, with improved capability over existing City transit sites.

--New transit enterprises that provide car and bike-shares where they are needed most, beyond what the City can offer.

-New transit solutions provided by the private sector and entrepreneurs

-Opening real-time transit data has been shown to increase transit ridership and to significantly improve rider satisfaction by reducing wait times and improving transit reliability.[17] With the right hardware and software, the generation of real-time transit data can be relatively inexpensive and sharing that data can be very low cost. Existing research has shown a 2.5% increase in ridership as a result of open real-time transit data, and there is reason to believe that percentage could be much higher among young technology adopters (e.g., students at CSU) and will continue to grow as technology improves.[18]

Strategy: Accelerate Adoption of Fuel Efficient and Electric Vehicles

This strategy is focused on improving the performance of vehicles so that when people do drive, there are fewer resulting carbon emissions and decreased impacts to local air quality.

Personal Vehicles

Fort Collins has already made significant progress in the adoption of hybrid and electric vehicles (EVs); northern Colorado sells about 20% more EVs than the national average. There are already 25 public charging stations in

[17]Candace Brakewood, *Quantifying the Impact of Real-time Information on Transit Ridership*. Forthcoming dissertation, Georgia Institute of Technology, Jan 2015.
[18]Ibid

place (including four DC fast-charging stations), meaning that access to charging for EV drivers is never more than six miles away. Drive Electric Northern Colorado, a regional non-profit dedicated to widespread deployment of EVs, is helping to create influential advocates through its Drive Leadership program and is bringing workplace charging to more than 12,000 employees in Fort Collins. Specific tactics under consideration include:

- Develop and execute a campaign to provide decision makers and the public opportunities to drive an EV and experience its benefits.
- Build on already successful programs to ensure even more electric vehicle charging stations are available, including public charging stations in highly visible, frequently visited locations, workplaces and residences.
- Provide incentives that benefit users and owners of alternative-fuel vehicles, encouraging their adoption.
- Aggregate and incentivize bulk purchases of electric vehicles for fleet, car-sharing, or individual use to drive prices lower.
- Work with local automobile dealerships to increase electric vehicle stock, and improve training and incentives for EV sales.
- Provide time-of-use pricing and utility programs to incentivize EV charging during off-peak hours.
- Provide a central market to buy and sell used EV batteries which will unlock significant value from second use of the battery.

Commercial and Municipal Fleet System

Compared with individual consumers, fleet managers are more cost conscious, more data driven and more willing to make investments with a longer payback. Commercial fleets can also take advantages of economies of scale such as centralized charging, optimized utilization and aggregated purchasing. As a result, owners and operators of commercial fleets are, in many ways, more suitable candidates for transition to electric vehicle adoption. Indianapolis is leading the way, moving toward 100% EVs for their city fleet by 2025 (500+ vehicles). Tactics being considered to encourage efficiency, demand reduction, and electrification of commercial and municipal fleets include:

- Facilitate access to third-party leasing agents who can provide EVs, maintenance, charging and financing in one turnkey, cost-effective package.
- Align City budgeting (when necessary) under a single point of contact for fleet purchasing/procurement and operational expense decisions to streamline and accelerate the transition to EVs.
- Support fleet decision-making by optimizing EV driving schedule and usage for shorter, local trips and use hybrids or existing fleet vehicles for longer trips where charging is impractical.
- Encourage the electrification of commercial fleets and point-to-point mobility service providers (e.g., airport shuttles, Uber, Ram Rides).
- Encourage the mild-hybridization of special-use vehicles (e.g., fire trucks, police cruisers) to reduce idling emissions.

ELECTRICITY SUPPLY AND DELIVERY: THE SHIFT TO RENEWABLE ENERGY RESOURCES

Transitioning Fort Collins' energy supply to clean, renewable resources is a central part of the Climate Action Plan framework. Today, electricity supply accounts for more than half of Fort Collins' CO_2 emissions. The opportunities for increasing renewable electricity generation from resources such as wind, solar, biomass, and hydroelectric power are abundant and increasingly cost competitive. Prices for wind and solar have been falling sharply in recent years, and northern Colorado's access to these resources is excellent. By integrating local and centralized renewables, Fort Collins can implement a diversified strategy to reduce emissions, stimulate local investment, and support increased electricity use in the transportation sector. As the transition occurs, impacts to rate-payers' bills must be managed to ensure continued alignment with community values.

This section describes strategies and tactics in three areas to achieve these goals.

- Advance utility-scale renewable energy
- Advance local residential and commercial solar adoption
- Reduce emissions from remaining natural gas heating and industrial process loads through combined heat and power, biofuels and renewably sourced electricity.

FIGURE 10. SUMMARY OF ESTIMATED GHG BENEFIT OF ENERGY SUPPLY STRATEGIES (MTCO2E)

	2020	2030	2050
Energy Supply and Delivery: The Shift to Renewable Energy Resources			
Advance Utility-Scale Renewable Energy Supply	0	336,000	126,000
Advance Residential and Commercial Solar Adoption	49,000	158,000	119,000
Shift Heating Loads to Biofuels, Geothermal, and Electrification	9,000	49,000	146,000

2030 Electric Supply and Delivery Vision

Carbon intensity of utility-scale electricity will be 80% lower in 2030 than 2005 level.

50% of new construction in the year 2030 will have enough solar PV to achieve net zero energy use.

By 2030, 22% of existing homes and 50% of existing businesses will have installed solar.

Strategy: Advance Utility-Scale Renewable Energy

Progress to Date

Platte River is already taking steps to diversify its energy supply mix and reduce carbon emissions by increasing the shares of wind and solar power in its supply portfolio. Platte River added 60 megawatts of wind energy from projects in Logan County, Colorado, bringing its total wind energy supply to about 13% of total energy consumption by the four municipalities it serves. In addition, Platte River's board authorized the acquisition of up to 30 MW of solar energy resources from a facility to be built at the Rawhide Energy Station north of Wellington, CO. With the addition of these resources, the non-fossil fuel proportion of Platte River's energy supply portfolio to the municipalities will exceed 30%.

Modeled analysis

In support of the City considering an update to Fort Collins' Climate Action Plan, Platte River produced a set of theoretical analytical scenarios to meet the new proposed CAP goal of 80% greenhouse gas reduction by 2030. The CAP Framework has incorporated results from this "FC80" scenario that models a 20% reduction by 2020, and an 80% reduction by 2030 for electric system-related CO_2 emissions (compared to 2005).

The FC80 scenario includes various assumed adjustments to the City's and Platte River's electric systems including increased electricity demand from electric vehicle (EV) charging and fuel switching (from natural gas to electric), as well as reduced electricity demand from energy efficiency actions, new amounts of distributed solar energy production, and new levels of investment in distributed combined heat and power (CHP).

The FC80 scenario includes theoretical changes in Platte River's generating system necessary to accommodate the City's greenhouse gas reduction goals (though the Platte River Board has made no commitment to implement this scenario). Through ongoing resource planning efforts,

As modeled, the FC80 scenario contains the following assumptions:

- The Craig coal units 1 & 2 (approx. 154 MW) both retire at the end of 2019, rather than running to their planned retirement date of 2042.
- The Rawhide coal unit capacity factor falls from about 90% to about 60% by 2029 in response to increased distributed generation.
- Rawhide (approx. 280 MW) is theoretically retired from the fleet in 2029, rather than running to its planned retirement date of approximately 2046.
- Platte River's surplus sales drop by approximately 60%; these sales provide financial benefits to Fort Collins and if reduced, would increase electric costs;
- Platte River adds about 200 MW of reciprocating natural gas engines to provide a portion of energy needed when wind, solar, and distributed resources are not sufficient to meet City needs;(purchases are also required as indicated below)
- It is assumed that a portion of the PV solar produced during periods of high total generation could be sold to the surplus market – to ensure that hydropower is delivered as required by contract, additional sales of renewable supply must be assumed to balance the system
- It is assumed that large volumes of purchases and sales can be made to and from the regional electric market to allow balancing of the added renewable resources;

Multiple questions remain about the viability of implementing the FC80 scenario. Alternative pathways may be available for Fort Collins to reach an 80% reduction in electric supply emissions that merit further exploration as energy technologies, pricing, and regulations continues to evolve.

Fort Collins CAP Modeling Analysis Caveats

Platte River has identified several potential limitations of the Fort Collins CAP analysis that could require further investigation before implementing such large levels of renewables and removing existing resources. It is not clear if the proposed new systems can be integrated effectively, or can meet electrical safety and reliability standards.

Detailed electric system modeling is needed

- Wholesale level – renewables integration / reliability
- City distribution level – operations / reliability / renewables integration
- Analysis to date has considered only hourly increments – need to do sub-hourly
- Additional modeling needed to consider integration of wholesale/retail systems

City level PV solar capacity added is assumed roughly equal to the peak load

- This level of renewable additions is unprecedented

No storage is assumed for PV solar integration at the distribution level

Uncertainties exist regarding permitting of combined heat & power sources

- No emissions are currently produced in the City from electric generation
- NOx emissions limits constrain the size of generation that can be added
- Other permitting issues not yet considered – land, water, etc.

Future wholesale wind and solar balancing costs unknown

- Model assumes costs are covered by Xcel – current scenario (low renewables)
- Additional new resources or electric storage may be required – at added cost

All federal hydropower allocations cannot be delivered at high solar levels

- Excess solar is assumed sold to the market when not needed – validity uncertain

Large wholesale market purchases are required to serve load when solar not available

- Amounts to nearly 20% of total deliveries to the City – unrealistic
- CO2 emissions are not currently included – source evaluation needed

When solar and wind are at high levels – large sales to the market are required

- Such sales may not be possible – market and other constraints

Transmission may not be available for large amounts of wind and solar

- It is assumed that purchases are possible using transmission
- More regional transmissions studies are needed to evaluate true costs

Stranded fixed costs are not included for the existing system:

- Decommissioning of coal units / fuel supply agreements / other factors; Need more time to evaluate these costs

Construction times required for adding new resources is constrained

- Financing and installation of renewable resources
- Decommissioning of existing resources
- Electrification infrastructure challenges – EV's and electric appliances

Strategy: Advance Residential and Commercial Solar Adoption

This strategy focuses on increasing the total amount of solar installations for both residential and commercial buildings. Many customers would like the opportunity to receive their energy from renewable sources, but do not own their own home or business or do not have proper orientation and exposure. This strategy also allows more people to adopt solar energy through community solar installations.

Tactics to achieve this strategy involve targeting key commercial customers, developing policies that encourage solar in homes, developing or identifying resources and incentives for solar, and educating the community about on-bill financing, "power purchase" agreement options, and existing rebates. Additionally, tactics will address barriers to participation or installation, such as permitting processes and available installation expertise. The following tactics are being considered to help advance residential and commercial solar adoption.

Utility-facilitated, locally sited solar

- Expand the pilot Solar Power Purchase Program (SP3), whereby Utilities and Platte River coordinate via power purchase agreements for "in-front of the meter" solar systems installed on commercial rooftops or ground sites.
- Develop a utility-owned option for traditional "net metered" solar installations.
- Expand community solar options allowing residential and commercial customers to participate and purchase solar power as part of a larger system.

Solar for existing commercial

- Continue to provide funding and incentives for commercial solar projects to meet demand from customers.
- Consider an Integrated Utility Services (IUS) program wherein the utility facilitates solar purchases and consumers can finance PV projects in a number of ways while minimizing impacts on their bills.
- Aggregate demand among small and medium sized commercial users and connect them to developers and PV projects.
- Use Property Assessed Clean Energy (PACE) financing to fund solar PV installations for small and medium-sized businesses.

Solar for existing residential

- Continue to provide funding and incentives for commercial solar projects to meet demand from customers.
- Consider an Integrated Utility Services (IUS) program wherein the utility facilitates solar purchases, and consumers can finance PV projects in a number of ways while minimizing impacts on their bills.
- Offer programs to engage and inform customers and expand pricing transparency and competitiveness about solar PV installations.
- Launch Green Neighborhood and EcoDistrict initiatives.

Strategy: Shift Heating Loads to Biofuels, Geothermal, and Electrification

This strategy encourages customers to switch from natural gas for heating their buildings to less fossil fuel intensive alternatives such as geothermal, combined heat and power, biofuels, or electrification (when the electricity is supplied by fossil free sources such as solar, wind, etc.). Tactics under consideration include:

Develop utility programs that encourage fuel switching for renovations and replacements in existing homes and businesses

- Provide consulting services to determine appropriate technologies and whole home performance.
- Offer fuel switching along with energy efficiency, demand response and solar offerings.
- Consider new rate and rebate programs to incentivize adoption.

Adopt standards and/or codes for major renovations to increaseuseof non-natural gas heating loads

- Set renewable heat standards that require (or incentivize) a percentage of all new homes' thermal loads to be generated renewably, (e.g., (solar thermal, heat pump, biomass boiler).
- Leverage home-builder networks to build new homes with little to no natural gas load.

WASTE REDUCTION / MATERIALS REGENERATION

The CAP framework focuses mostly on reducing the Fort Collins community's emissions from fossil fuel combustion associated with direct energy use (electricity, natural gas, and petroleum fuels for transportation.) However, there are important indirect energy and greenhouse gas implications from the use of materials throughout their life cycle, including eventual recycling, composting, or landfill disposal. Reducing, reusing, recycling, recovering energy, and composting deliver multiple benefits to our ecosystems and the economy in addition to greenhouse gas (GHG) reductions.

This chapter discusses qualitative and quantitative strategies that can reduce Fort Collins' carbon footprint through waste reduction, composting, tree-planting, soil management activities, and promoting local food. The Road to Zero Waste Strategy is quantified as part of this framework plan's quantified reductions. Other strategies such as elements of carbon sequestration and local food are not quantified but are anticipated to deliver GHG reduction benefits in Fort Collins as well as across the region. Challenges and opportunities lie in finding solutions to address the unique needs of larger waste generators, and developing regionally coordinated solutions to manage waste streams.

WASTE REDUCTION VISION

Increase waste diversion to 75% by 2020.

Increase waste diversion to 90% by 2025; achieve per capita waste generation levels of 2.8 pounds/person/day

Achieve zero waste by 2030.

FIGURE 11. SUMMARY OF ESTIMATED GHG BENEFIT OF WASTE REDCUTION AND CARBON SEQUESTRATION STRATEGIES (MTCO2E)

	2020	2030	2050
Waste Reduction and Materials Regeneration			
Road to Zero Waste	45,000	82,000	104,000
Carbon Sequestration	200	1,000	1,000

Strategy: Road to Zero Waste

Fort Collins' waste stream is responsible for three percent of its community greenhouse gas emissions. These GHG emissions come primarily from decay of organics in the landfill. Fort Collins has aggressive waste reduction goals in place. Achieving these waste diversion goals will support Fort Collins' path toward accelerated community greenhouse gas reduction goals.

In 2013, the Fort Collins City Council passed a goal of recycling or composting 75% of the community's discards by 2020, 90% by 2025, and working toward zero waste by 2030. These ambitious goals were developed in tandem with a variety of programs and strategies outlined in the *Road to Zero Waste Plan*, which describes steps to meet the goals.

One of the strong motivations to adopt a zero waste strategy is its impact on the local economy. As noted in the *Road to Zero Waste Plan*, the Fort Collins community throws away roughly $6.5 million worth of valuable resources in the landfill every year. By reusing, recycling, recovering energy from, or composting these materials instead, that value would be retained in the local economy.

One of the greatest waste diversion opportunities for the Fort Collins community is in composting organic materials. Paper, yard trimmings, and food scraps make up over 50% of the materials currently being landfilled. These materials could all be composted, either in traditional windrow composting, or through anaerobic digestion. Anaerobic digestion provides the double benefit of generating useful compost that can be applied to soils, as well as generating methane that can be collected and used as an energy source. Like most materials, it is important to keep in mind that organics are generated throughout the entire region. Regional-scale facilities such as anaerobic digesters could be developed to take advantage of economies of scale and could compost organic materials generated throughout northern Colorado, including agricultural wastes.

The *Road to Zero Waste Plan* outlines steps to achieve the waste diversion goals adopted by City Council. Some of the actions would be implemented by the private sector and some by the City.

CITY ACTIONS:

- Complete the Community Recycling Center to offer a one-stop-shop for traditional recyclables, yard waste, and hard-to-recycle materials such as wood, concrete, asphalt and metal
- Consider a Universal Recycling Ordinance, which would create easier access to recycling for multi-family residents and businesses
- Support a culture change by applying community-based social marketing and providing other outreach and education
- Use a systems approach to evaluating waste materials, in alignment with Sustainable Materials Management principles
- Advance the municipal organization's readiness to engage in waste-to-clean-energy activities
- Pursue a regional approach to developing infrastructure for Zero Waste activities
- Seek funding support for a Resource Recovery Park
- Add curbside yard trimmings collection for single-family residents
- Consider expansion of Universal Building code amendments for construction and demolition waste
- Promote materials reuse by construction of a re-use warehouse
- Coordinate and participate in regional land conservation efforts that will provide greater opportunities for carbon sequestration.
- Act as a catalyst in researching and promoting agricultural practices that contribute to greater soil resiliency and crop health, as well as greenhouse gas reductions.

Private Sector Actions:

- Help develop mixed construction and demolition (C&D) materials sorting facility in region

- Help develop food scraps composting and anaerobic digestion facilities
- Help develop glass sorting facility in region

BENEFITS OF WASTE DIVERSION

There are many benefits to the community that could come from pursuing higher waste diversion goals and helping both businesses and residents be more sustainable and efficient, including:

Local jobs and economic development from conserving and using resources locally rather than landfilling them

Promoting the health and fertility of local soils and improving opportunities to cultivate nutritious, locally grown produce

Postponing the construction of new landfills by prolonging the life of existing landfills, which helps limit risks of pollution to groundwater from landfills that may fail in the future

Producing clean energy through anaerobic digestion

Reducing, reusing and recycling materials and products conserve 3-5 times the amount of energy that could be produced by burning those materials.

Decreasing water use by using compost in landscaping and gardening applications

Improving air quality and reducing mobile emissions through more local use of resources

Reducing the use of pesticides and herbicides; soils that are amended with compost produce healthy plants that require less chemical application

Protecting and restoring habitat, biodiversity and open space through decreased need for mining and resource extraction

Providing "green" marketing edge for local businesses and Colorado State University.

Strategy: Carbon Sequestration

There are two major aspects that humans can impact in carbon cycling: the anthropogenic release of greenhouse gases into the atmosphere and aiding the removal of those gases by carbon sinks such as vegetation and soils. The tactics included in this section address management and conservation techniques to enhance natural systems that store and sequester carbon. Carbon sequestration tactics also provide opportunities for establishing carbon credits or offsets as well as other environmental co-benefits such as improved air and water quality and reduced water, fertilizer, and pesticide use.

PRESERVE AND CONSERVE SUITABLE LANDS FOR CARBON BENEFIT

Opportunities exist to enhance soil carbon sequestration by identifying and protecting vulnerable lands with high soil carbon storage potential. This could include protecting native prairie grasslands from being plowed under for high intensity crops, protecting rangeland from development or overgrazing, or reforestation of recently burned areas. Additionally, these practices can be encouraged by documenting carbon credits that can be used or sold as offsets.

- Support and enhance initiatives through the Nature in the City project that establish baseline data for land use categories and climate change indicator species and characteristics. Support future initiatives to establish periodic data collection and land acquisitions that maximize carbon sequestration opportunities.

- Support and enhance Poudre River Restoration projects that include restoring natural vegetation and riparian habitats along the river corridor that have the potential to maximize carbon sequestration opportunities.
- Support initiatives, in addition to Nature in the City and Poudre River Restoration, that develop and preserve open space including grasslands, agricultural lands, wildlife habitat and corridors, wetlands, watersheds, and groundwater recharge areas that remove and sequester carbon from the atmosphere.

- Support acquisition or protection of land for local agriculture and food production that results in net carbon benefits through decreased transportation or production emissions.

- Support acquisition or protection of land for onsite generation of renewable energy.

PROMOTE AGRICULTURAL MANAGEMENT TO OPTIMIZE SOIL CARBON SEQUESTRATION

Support conservation efforts that remove or reduce atmospheric greenhouse gases including methane, nitrous oxide as well as carbon dioxide and instead stores carbon in natural carbon sinks. Promoting these agricultural operations can also provide economic opportunities and environmental co-benefits to land owners and farmers. Encourage soil carbon sequestration techniques such as conservation tillage best practices and planting year round cover crops.

PROMOTE FOREST AND RANGE MANAGEMENT TO OPTIMIZE CARBON STORAGE AND SEQUESTRATION

Forest and rangeland management techniques for carbon sequestration are relatively low-cost, low technology ways of mitigating climate impacts and offsetting carbon emissions. Many of the techniques can be implemented immediately, including tree planting within the urban forest.

PROMOTE CONTINUING RESEARCH INTO SOIL AMENDMENTS AND BEST SOIL MANAGEMENT PRACTICES

Encourage ongoing research into sustainable sources of organic soil amendments that may promote increased soil carbon sequestration without sacrificing soil fertility, soil water retention, the health of the soil microbial community, or the productivity of crops or native plant communities.

Qualitative Strategy: Local Food / Urban Agriculture

The importance of a vibrant local food system has become increasingly evident in addressing a number of prevalent issues including climate change, public health, food insecurity, and sustainable economic development. Most of our food is grown from sources thousands of miles away via a highly industrialized, fossil-fuel based (i.e., synthetic fertilizers and pesticides), globalized supply chain. By buying locally, we save agricultural land and reduce truck traffic and carbon emissions from transport, packaging production, and refrigeration of our food.

The food system is a significant emitter of greenhouse gases in the United States, along with energy production and transportation. Increasing local food production is a practical and simple way to mitigate this. Recent studies have demonstrated other pressing issues related to food. For instance, one of every seven children in Fort Collins faces some form of food insecurity. Additionally, roughly one in four children in Fort Collins is overweight or obese. Increased access to local foods and wellness programs can improve the health of our children. Although the greenhouse gas reduction benefits of local food production are not quantified in this framework

plan, expanding local food initiatives serves to lower the carbon footprint of the food we consume and increase access to healthier food.

Northern Colorado Local Food Cluster. Build on the efforts to develop and support a Local Food Cluster to enhance a resilient food system through economic, regulatory, and engagement activities that promote local food consumption, production, and distribution.

Farm Incubator and Conservation Easements. The Natural Areas Department is developing a pilot program to identify select City properties to use for local food production through a land bank and young-farmers mentorship program. Natural Areas is utilizing conservation easements to conserve agricultural properties with the assistance of existing federal funding sources such as the Farm and Ranchland Protection Program.

Lead by Example. The City of Fort Collins set a local food goal for municipal operations that 20% of food purchased by City staff for City functions will be grown within 50 miles or prepared by a local business.

Urban Agriculture in Fort Collins. The City has developed new ordinances that permit urban agriculture in every zone district in the City. This includes allowing chickens, ducks, and goats to be raised for increased self-sufficiency; allowing farmers markets in more zone districts; and, supporting year-round growing efforts by excluding hoop houses from building regulations

Qualitative Strategy: Inspiring Successful Implementation

Community support, engagement and partnerships will be essential if Fort Collins is to meet aspirational greenhouse gas reduction goals. To successfully connect with the public in climate change communications, the City must associate with people's values and world views. Personally relevant solutions are needed to relate climate change to the networks within this community. As global warming impacts increasingly make the news, it is clear that the time to act is now.

Engagement strategies must frame the issue and actions in a way the makes sense to people, help people overcome apathy and/or despair when faced with the large issue of climate change, and develop and promote a community vision for systemic, transformative change that addresses triple bottom line needs. Capitalizing on Fort Collins' strong sense of community pride and sense of place, and leveraging Fort Collins' volunteerism will be critical.

Methods for motivating the public to embrace the strategies in this framework plan must focus on the shared and place-based identities within the city of Fort Collins and Larimer County. Tactics must aim to answer the 'what' (what idea/component of the CAP is covered?), the 'why' (why do we have a Climate Action Plan and why is this a necessary part of it?), and communicate a call to action (read about it, learn about it,

think about what role 'you', as a member of the public, can play in helping to achieve these goals).

Piloting Strategies through EcoDistrict or Neighborhood Scale Sustainability Programs

Many cities are realizing the value of implementing climate strategies at the neighborhood scale in order to holistically integrate changes in land use, buildings and transportation infrastructure with the community development assets and social networks required to affect change. The City can lead coordination of key neighborhood stakeholders and organizations, property developers, local institutions and businesses, and utilities in the development of district scale projects that realize carbon benefits. The projects should leverage advances made through Fort ZED partnerships and explore development opportunities that innovate and integrate sustainability strategies.

The purpose of an EcoDistrict is to provide a platform where citizens, institutions, businesses, municipal leaders and utility providers work together to develop innovative district scale projects that meet sustainability objectives. The EcoDistrict framework includes principles involving economic, social and environmental sustainability, which aligns with the City's triple bottom line principles and community involvement in decision making. The EcoDistrict performance requirements establish specific goals and targets in the areas of equitable development, community identity, access and mobility, energy and water efficiency, habitat and ecosystem function, materials management, and health and wellbeing. These, in turn, align with the City's seven strategic planning outcome areas.

CHAPTER 4

Triple Bottom Line Considerations

PRELIMINARY COSTS AND SAVINGS ESTIMATES

Technological and social innovations exist to support accelerated GHG emissions reduction in Fort Collins. A carbon-free future provides a compelling value proposition on many levels. However, the question remains – do the benefits outweigh the costs?

The preliminary analysis completed as part of this plan suggests that the benefits could outweigh the anticipated costs in the long run. Despite the need for upfront investment, projections indicate long-term benefits can accrue to the community from accelerating emissions reductions.

The CAP framework analysis evaluates the aggregate costs of improvements identified in the strategies and the resulting energy and fuel savings, and estimates the cumulative cost, savings, and net through the 2050 planning horizon. There are a variety of factors to consider in any financial analysis, from what financial discount rate to use to accounting for uncertainty in future costs and savings. These estimates should be viewed as preliminary, order-of-magnitude estimates.

Figure 12 below identifies a range of cumulative costs, savings, and net costs/savings associated with discount rates ranging from 2.5% percent to 5%, suggesting that the net cumulative implementation costs may be about $300 million in 2020 yet may yield between $2-6 billion in cumulative savings in 2050.

FIGURE 12. PRELIMINARY COSTS, SAVINGS AND NET CUMULATIVE IMPACTS (2.5%-5% DISCOUNT RATE)

	2020	2030	2040	2050
Cumulative Implementation Cost from 2015($M)				
Min	$600	$2,000	$2,800	$3,300
Max	$600	$2,500	$3,700	$4,600
Cumulative Cost Savings from 2015 ($M)				
Min	$300	$1,700	$3,800	$5,000
Max	$300	$2,300	$5,900	$10,800
Net Cumulative Cash Flow from 2015 ($)M				
Min	$300	$200	$800	$2,500
Max	$300	$300	$2,200	$6,200

There are a number of important caveats that must be made to provide a "disclaimer" on these preliminary costs and savings estimates.

- Some cost estimates were not included in this analysis because it is exceedingly difficult to estimates costs with any level of confidence now, given rapid evolution of technologies and market conditions.

The following costs are not estimated on the distribution side:

- Distribution system modeling
- Infrastructure enhancements costs
- Reliability sensitivity analysis
- Energy storage options

The following costs are not estimated on the generation system side:

- Stranded fixed costs for the existing systems, such as decommissioning of coal units/ fuel supply agreements
- New electric storage resources

- Actual future energy costs may not follow the assumptions embedded in this analysis. The assumptions are based on predictions made by the U.S. Energy Information Administration.

- Program and infrastructure cost estimates are based on recent averages and do not reflect the continuing drop in prices as technologies come to scale (especially solar PV), and may be over-estimated.

- As the City of Fort Collins' request, Platte River Power Authority completed initial modeling under the IGA with the City. This process has revealed the complex nature of interdependencies between the Platte River modeled results and the CAP model. The results in this analysis represent a best approximation of anticipated carbon reductions and cost implications. We believe the results are directionally correct, but more work will need to be done in the future to more fully analyze options and associated costs for making large-scale changes to the electric generating system.

- The estimates do not include potential indirect benefits that can accrue from the proposed strategies, including:
  - Improved public heath resulting from more active modes of transportation (walking and bicycling);
  - Improved public health resulting from reductions in air pollution and emissions;
  - Indirect economic and social benefits to the community through increased resiliency to predicated climate change impacts;
  - Job creation and resulting wages from Climate Action research and program implementation;
  - Indirect economic benefit to the community from increased investment in local power generation (e.g., increased solar and distributed energy installation).

FINANCING OPPORTUNITIES

The City of Fort Collins has begun to explore a range of innovative financing methods already being used by other communities and businesses to address the near term investments required. A menu of available and existing funding mechanisms is provided below (not an exhaustive list). Many of the available mechanisms achieve two essential goals: (a) spread the costs and benefits over time, and (b) provide greater access to individuals and benefits. These financing mechanisms can, in some cases, fundamentally change the flow of services and capital, represent potential new revenue streams and service models, and alter the ways different parties can benefit from the new goals. The mechanisms fall into three main categories:

Individual and Business Financing

These mechanisms provide access to borrowing or funds that individuals and businesses can use to make investments in energy efficiency, distributed power, and other similar investments. In general, these financing mechanism aid individuals and businesses in amortizing initial costs in improvements over time to reduce the upfront costs. In some cases, the government, whether it is municipal, county, or state, can aggregate the investments into a larger pool to reduce borrowing costs (e.g., On-bill financing, Property Assessed Clean Energy Bonds or Tax Increment Financing).

Government Financing

These mechanisms involve the government borrowing funds, whether it is municipal, county, or state, directly to support investments in utility scale energy efficiency, solar rebates, transit infrastructure, and other similar investments. The intent is to use the borrowing power of the government to accelerate adoption of key strategies, reduce risk to private lenders of consumer lending programs, and make key investments in municipal infrastructure (e.g., public transit) to support carbon reduction goals. In many cases, the borrowing still requires a funding source to justify the debt which can range from the existing revenues (e.g., taxes and/or fees) available to the government to new revenues (e.g., new taxes and/or fees).

Other Sources of Funds

The last category captures a series of potential funding sources that do not logically fall into the other two categories. These may include new governmental revenue sources (e.g. User Fees, Development Exactions, and Public Benefit Funds) or donations from private parties interested in furthering carbon reduction goals.

FIGURE 13. POTENTIAL FINANCING APPROACHES FOR CAP FRAMEWORK STRATEGIES

Borrower Category	Financing Mechanism	How it Works	Examples	Comments
Individuals and Business Financing	**Traditional Borrowing**	Customer applies for loan from traditional source; underwriting determines borrowing amount	Bank loan, Consumer lending (Credit Cards), Mortgage/Home Equity Loans	Require borrower to have capacity to borrow, reasonable credit rating, and/or collateral
	Savings Dependent Financing	Customer applies for a loan with projected energy savings as the collateral; savings determine borrowing amount	Energy Efficiency Loans, MEETS, On-Bill Financing	Can be delivered by either the private market or through a utility (publicly or privately owned)
Government Financing	**Direct Borrowing**	Governmental entity uses existing revenue, new revenue, or other collateral to borrow funds	General Obligation Bonds, Green Bonds, QCEBs, Social Impact Bonds, Pooled Bond Financing	The governmental entity is on the hook to repay borrowed funds; can relend funds to individual users or use the proceeds for governmental costs
	Public Private Partnership	Governmental entity uses funds to enhance the credit rating of a private lender	Loan Loss Reserves, Debt Service Reserves, Loan Guarantees	Government uses its funds (from any number of sources) to mitigate the risk to a private lender; enables greater capital access for the community and broader rate of utilization (wider credit scores and underwriting practices)
Other	**Philanthropic**	A foundation provides funding to achieve a specific purpose	PRIs, Foundations, Smart Growth Funds, etc. Leverage STAR	Often tied to a very specific project or objective; depends on the foundation or donor
	Government Grants	A governmental entity provides grant monies to achieve a specific objective	Department Of Energy, State of Colorado, Housing and Urban Development, etc.	Competitive funding source with no guarantee of award; amount depends on governmental entity and purpose

INCREASED RESILIENCY

The Fort Collins community has been focusing on the reduction of greenhouse gas emissions as part of a climate action plan since 1999. While the role of mitigating the sources of emissions has been the primary objective for years, it is clear that to ensure the ongoing quality of life in the Fort Collins community, adapting to the impacts of climate change is also an important need.

What does this mean in terms of mitigating or slowing our future greenhouse gas emissions? More action now to avoid reduce emissions will help contribute to a safer, less hot and more stable climate that our infrastructure, buildings and community systems are built to support. A climate action plan that supports aggressive goals and action is one of our best climate adaptation strategies for the future. However, we are already experiencing a changing climate and need to plan and act to ensure we are able to minimize damage and recover more quickly from the types of events such as drought, floods, and fire our community has already experienced.

As Fort Collins explores a more aggressive path to reducing our carbon emissions, there are many recognized co-benefits to increasing the overall resiliency of the built environment, transportation, energy and water systems and local economy. There will be long term challenges we will face as the climate warms and extreme events, that we already occasionally experience, will continue to impact our way of life. The following strategic areas offer qualities that will assist in increasing community resiliency and adaptation to a warming climate.

Building Efficiency

- During extreme heat events, occupants will have safer, healthier options for refuge and protection from the elements
- More efficient buildings offer reduced cooling and heating demands to energy systems and provide a more comfortable and productive environment for occupants

Use of Alternative Transportation and Increased Electric Vehicle Adoption

- Increased use of fuel efficient and electric vehicles would significantly assist in reducing air pollutants such as nitrogen oxide and carbon monoxide and help support state and regional air quality strategies
- With an increased number of hot days or heat waves, improved air quality will result in health benefits for vulnerable populations including children, elderly and those with respiratory ailments

Increased Distributed and Renewable Energy Sources

- Combining the use of distributed and renewable energy resources with microgrid or “islanding” technology can assist in protecting valuable community services such as hospitals, police and other emergency management facilities during extreme events

Waste Reduction and Diversion

- Strategies to divert waste from landfills during recovery from extreme events can assist in preserving landfill capacity
- If extreme events result in large amounts of unrecoverable waste, preserved capacity could be utilized as needed

Carbon Sequestration and an Increased Urban Forest

- Increased urban forest can assist in the reduction of the urban heat island effect and provide localized cooling to buildings and other areas
- Promotion of sustainable building practices and green streets includes the use of low impact development structures that provide cooling benefits, divert storm water, improve overall water quality, while reducing water demand and conserving resources

TRIPLE BOTTOM LINE IMPACTS

As part of its evolving commitment to evaluating the "triple bottom line" implications, the City completed a preliminary Sustainability Assessment to evaluate social, environmental, and economic (or TBL) considerations to support the CAP decision-making process. The following potential impacts were identified. Identification of potential negative impacts allows the opportunity for mitigation strategies to be considered and developed as implementation details are developed for the CAP.

Social Impacts

- initial implementation costs that could present challenges to low income groups in meeting basic human needs such as food, shelter, and health care.
- increased building costs or deep building retrofits could negatively impact housing affordability; compromised physical or mental health from financial stresses; and the disproportionate impact of higher initial utility rates on low income groups.
- financial savings with more energy efficient buildings and vehicles.
- savings in building operating expenses
- more transportation options and access,
- more comfort and control over environmental settings in buildings;
- more active modes of transportation with resultant health benefits;
- less vulnerability to fossil fuel prices and carbon regulations,
- public health benefits from reduced air pollution.

Environmental Impacts

- large reductions in greenhouse gas emissions from multiple sources,
- improved indoor and outdoor air quality from reductions in pollutant emissions and use of low volatile organic compound materials;
- reduced impacts to land and water resources;
- increased materials reuse and recycling; waste reduction; and delayed development of new landfills
- increased carbon sequestration
- reduced water use in green buildings
- reducing the heat island effect by planting more trees
- reductions in hazardous wastes associated with fossil fuel extraction and production
- generation of hazardous wastes from the solar industry;
- higher land use intensity for wind and solar power production,
- reliance on rare earth minerals for some renewable energy strategies

Economic Impacts

- some small and lower margin businesses may face a challenge with initial implementation costs in the absence of mitigation measures
- higher City implementation costs
- possible loss of the competitive advantage provided by low utility rates
- financial impacts due to stranded costs
- potential for local job creation in solar, green building construction, and waste reduction and recycling industries

- significant savings from improved institutional and commercial building energy efficiency;
- attraction of innovative industries, new technologies, and research money;
- increased land use and transportation efficiency that can bring business investments.

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SUPPORT FOR CITY STRATEGIC PLAN OBJECTIVES

The City of Fort Collins aspires to provide world-class services to the community. The 2014, the City completed the *2015-2016 City of Fort Collins Strategic Plan* that reflects the input of engaged citizens, community and business partners, Mayor and Council Members, and City staff. The Coty's Strategic Plan has directed the development of current City budget priorities. The strategies identified in the CAP Framework can, through careful implementation, support several of the City's strategic objectives listed below.

COMMUNITY AND NEIGHBORHOOD LIVABILITY: Provide a high quality built environment and support quality, diverse neighborhoods
1.3. Direct and guide growth in the community through appropriate planning, annexation, land use and development review processes.
1.4. Preserve and provide responsible access to nature.
1.5. Preserve and enhance the City's sense of place.
1.6. Promote health and wellness within the community..

CULTURE AND RECREATION: Provide diverse cultural and recreational amenities

2.7 Promote a healthy community and responsible access to nature.

ECONOMIC HEALTH: Promote a healthy, sustainable economy reflecting community values
3.7. Support sustainable infill and redevelopment to meet climate action strategies.

ENVIRONMENTAL HEALTH: Promote, protect and enhance a healthy & sustainable environment
4.3. Implement indoor and outdoor air quality improvement initiatives.
4.4. Reduce Greenhouse Gas (GHG) emissions by creating a built environment focused on green building and mobile emission reductions.
4.5. Demonstrate progress toward achieving net zero energy within the community and the City organization using a systems approach.
4.6. Engage citizens in ways to educate and change behavior toward more sustainable living practices.
4.7. Increase the community's resiliency and preparedness for changes in climate, weather and resource availability.
4.11. Demonstrate progress toward achieving zero waste within the community and the City organization.

SAFE COMMUNITY: Provide a safe place to live, work, learn and play
5.4. Protect life and property with natural, aesthetically pleasing flood mitigation facilities through building codes and development regulations.
5.6. Improve safety for all modes of travel including vehicular, pedestrian and bicycles.
5.10. Provide a high-quality, sustainable water supply that meets or exceeds all public health standards and supports a healthy and safe community.

TRANSPORTATION: Promote a healthy, sustainable economy reflecting community values
6.2. Improve transit availability and grow ridership through extended hours, improved headways, and Sunday service in appropriate activity centers.

6.3. Fill the gaps for all modes of travel and improve the current transportation infrastructure while enhancing the aesthetic environment.
6.6. Support efforts to achieve climate action goals by reducing mobile emissions and supporting multiple modes of transportation.

CHAPTER 5

What Does This Mean for the Community?

Achieving an aspirational goal to reduce community greenhouse gas emissions 80 percent by 2030 will require landmark actions and the participation of the entire community. Households, businesses, and institutions will all be asked to contribute towards achieving this goal by making changes to their behaviors, operations, and facilities. It will require the full spectrum of approaches; new regulations, new incentives, and new education and engagement opportunities. Platte River Power Authority, Fort Collins Utilities, and the City of Fort Collins are critical player, as well.

HOUSEHOLDS

Household's electricity and natural gas usage accounts for 27 percent of the community's greenhouse gas emissions in 2013. Therefore, residents will need to make a significant contribution to achieving the goals contemplated in this plan. How might the typical household contribute? Actions identified in this plan include the following types of changes:

- Improving energy efficiency by increasing insulation, replacing windows, and/or sealing central air ducting;
- Replacing appliances with energy efficient models;
- Converting water heaters and furnaces to electric models such as geothermal heat pumps;
- Replacing air conditioning units with more efficient models;
- Purchasing an electric vehicle and reducing the number of miles traveled; and
- Installing solar panels to generate electricity.

These actions are only possible with the assistance of financing to: a) spread the costs and benefits over time, and (b) provide greater access to individuals and benefits. As the community moves toward implementation there are several principles that should guide the development of new financing tools, especially those geared at encouraging individual or household action. The following principles provide an initial set of guard rails and will be refined through the implementation process:

Draft Financial Guiding Principles for Households

- Access to affordable energy and value-added services.
- Confidence in the energy efficiency results of services provided.
- Experience a streamlined purchase process.
- Experience enhanced customer service.
- An understanding of benefits versus costs that allows each user to make their own determination of value.

BUSINESSES

Commercial and industrial facilities electricity and natural gas currently account for 43% percent of the greenhouse gas emissions in 2013. Achieving the goals contemplated in this plan will required significant action by businesses as well. Unlike households, many businesses do not own their facilities; therefore, the actions that

can be taken by businesses will vary significant from those of households. Businesses will be encouraged to take the following types of action:

- Partner with their landlords on energy efficiency improvements that can be made to their space;
- Replace their fleet vehicles with electric and higher efficiency vehicles;
- Encourage their staff through incentive programs to carpool, ride their bikes, and take mass transit;
- Purchase goods and services from local suppliers; and
- Install solar panels to generate electricity.

The actions identified above will only be possible with the assistance of financing, which should be guided by several principles. The following principles provide an initial set of guard rails and will be refined through the implementation process:

Draft Financial Guiding Principles for Businesses

- Access to information and assistance to select the right investments.
- Minimal impact to business operations.
- Access to capital funds that do not negatively impact their own balance sheet.
- Experience a streamlined purchase process.
- Experience enhanced customer service.
- Opportunities to partner with third parties to improve energy efficiency and reduce on-going costs.

CITY OF FORT COLLINS GOVERNMENT

The City of Fort Collins must play a leadership role in advancing carbon reductions, including those of its own operations. As a responsible steward of taxpayer dollars, the City must maintain transparency in developing programs and working towards goals in alignment with the CAP Framework. The City government also has an important role to play in ensuring the plan's successful implementation by advancing partnerships and coordinating multi-sector efforts, and by tracking and reporting progress annually.

The City government will not be called upon to fund the majority of implementation costs identified in the CAP framework. However, the City can pay an important role in leveraging outside funding to help meet accelerated goals. By developing a strategy that ensures the best use of finite public funds, the City can create an attractive investment environment for private investors to do some of the heavy lifting. Successful programs throughout the nation demonstrate that City governments can take the lead in attracting significant 3rd party private investments while limiting or capping public spending, limiting exposure to losses in City reserves, and maintaining the City's strong credit standing.

In order to protect the City's financial viability, the following guiding principles have been developed to provide an initial set of guard rails. Inevitably these will be clarified and refined as implementation details are developed.

Draft Financial Guiding Principles for City Government

- No significant adverse impact on the City's balance sheet.
- No adverse impact on the City's credit rating.
- The City's investment should catalyze investment in strategies by end-users and the third parties.
- Internally the City's priority is utility rate revenue before general fund revenue.

CHAPTER 6

Actions for 2015 and 2016

PLANNED ACTIONS

Fortunately, Fort Collins already has significant actions underway or planned for the 2015/2016 budget cycle that will serve to reduce emissions while supporting other community objectives such as improved health and resiliency. The list below highlights select key activities that are already planned.

Planning and Policy

- Fort Collins Energy Policy Update will be brought forward for City Council consideration in 2015to support the strategies in the CAP
- Revised energy efficiency and local renewable plan will be developed to meet GHG goals and inform future budget planning
- Platte River Power Authority will continue resource planning efforts during 2015 to support potential changes to fossil-fuel generation, renewable energy and energy efficiency to meet the needs of its member communities.

Buildings

- The City of Fort Collins plans to hire a contractual Green Building Program Coordinator
- Fort Collins Utilities will evaluate piloting Integrated Utility Services Model
- 2015 building code update will consider increased efficiency and compliance needs
- Fort Collins will participate as a semi-finalist in the Georgetown University Energy Prize with the objective to double the amount of energy savings in the residential and municipal/school district sectors in 2015/2016. The winner gains a $5M purse to advance energy efficiency.
- Fort Collins Utilities will continue programs to provide incentives for “above code” commercial and industrial buildings through the “Integrated Design Assistance Program”
- Fort Collins Utilities will continue deployment of the Peak Partners program for smart thermostats, water heater controllers and commercial building automation systems.

Energy Supply

- Expand partnership with Platte River on Efficiency Works programs
- Develop programs that benefit low/fixed income such as Low Income Solar Pilot
- Consider Time-of-Use and low income electric rate structures

Transportation

- Implement Car/Bike/Ride share programs
- Implement Drive Electric Northern Colorado – Work Place Challenge

Road to Zero Waste

- Complete the Community Recycling Center to offer a one-stop-shop for comingled recyclables, residential scale yard waste, and hard to recycle materials such as wood, concrete, asphalt and metal
- Seek to provide recycling to all multi-family residents then to all businesses through consideration of a Universal Recycling Ordinance
- Support a culture change by applying community-based social marketing and other outreach/education
- Conduct a Waste Stream optimization to systematically evaluate waste materials and Sustainable Materials Management
- Advance the municipal organization's readiness to engage in waste-to-energy activities
- Pursue alternatives through regional Zero Waste Plan

RECOMMENDED NEW ACTIONS

In addition to these and other activities planned but not outlined above, additional actions are recommended for the City of Fort Collins in 2015/2016. Additional funding support will be needed to implement these actions, focusing on the two greatest needs for success; community engagement and new financing approaches. A few of these key recommended actions are outlined below.

Develop a 2020 Climate Action Implementation Plan

Compile a plan that identifies the specific steps needed for action between now and the end of 2020 to put Fort Collins on a path to meet community GHG goals. A 2020 implementation plan will leverage the modeling capability, research and analyses already completed as part of this broad framework plan by performing detailed analysis in order to identify which tactics and programs must be implemented by 2020, in what order, and identify anticipated budget needs. The plan must consider challenges and opportunities, and consider impacts to key community metrics such as housing affordability. In order to be successful, the actions identified in the implementation plan must reflect coordination and cohesion among involved City departments as well as community input on preferences or concerns regarding next steps. Community awareness raising and engagement are critical elements in determining the key next steps that go beyond already approved activities.

Community Engagement

If Fort Collins is to meet its GHG goals, increased community engagement, ownership, and action is critical. Funding will be sought to implement a robust awareness raising and engagement campaign. This may include

- Engagement targeted at collaborative problem-solving with the largest users of energy (such as computer server facilities),
- Engagement with large institutions such as Colorado State University to align efforts and optimize the chance for success in meeting similar goals
- Piloting new approaches at the neighborhood scale to test innovative and integrated holistic approaches to energy generation, distribution and use, and
- Broad community-wide awareness raising and engagement campaigns
- Community capacity building to leverage and expand the activities of non-profits, grass roots organizations, businesses, and educational institutions
- Collaboration with Platte River and its member municipalities to advance progress regionally

Research Equitable Financing Mechanisms that support Community Climate Action

Additional staff and/or outside expertise will be needed to investigate new financing approaches that can bring the actions called for in this plan to scale while mitigating potential harmful inequitable impacts. This may involve piloting a public private partnership to leverage outside finance.

CHAPTER 7

Accountability: Plan, Do, Check, Act

A key to achievement of any goal is measurement and accountability. Progress on Fort Collins' community greenhouse gas must be monitored, tracked and reported, as it has been in the past.

ANNUAL REPORT

An annual report will be prepared that tracks progress towards the goals by calculating the annual community greenhouse gas inventory and comparing it to the anticipated trajectory under this framework plan. In addition, progress on major metrics should be tracked and reported annually. A preliminary list of metrics is outlined below. This list may be refined with the development of the CAP 2020 Implementation Plan. The annual report will also identify and quantify major areas of community greenhouse gas reductions that have contributed to changes in communitywide emission levels, and recommend any adjustments to the 2020 implementation plan.

METRICS

The list below identifies a number of metrics that will be tracked and reported. Additional metrics may be identified through the development of detailed implementation plans.

- Percent change in community GHG inventory, relative to the baseline year (2005)
- Percent change in municipal government GHG inventory, relative to the baseline year (2005)
- Percent change in electricity use (kilowatt hours or kWh) per capita compared to 2005 (baseline year)
- Percent renewable energy in Fort Collins electricity portfolio
- Cumulative and annual kWh distributed solar installed in Fort Collins
- Percent population who commute by bike
- Annual % waste diversion
- Annual pounds waste generated/capita
- Percent change in population from 2005
- Percent change in Fort Collins Sales and Use tax from 2005

PERIODIC CAP UPDATE

The goals described in this framework plan are bold and ambitious—and they span a time frame of 5–35 years. The CAP framework does not provide a definitive and inflexible roadmap to specific actions over such a long horizon. Instead, the plan is iterative by design, following the "*Plan, Do, Check, Act*"' model for which Fort Collins is already known. The strategies and programs identified to achieve the goals will require periodic reevaluation and updating, taking into consideration advancements in technology, community feedback and financing approaches. Recognizing that technologies and markets will continue to evolve, financing structure and opportunities may expand, and scientific finding regarding climate change may continue to emerge over time, it would be prudent for the Fort Collins Climate Action Plan be updated by the end of 2019. This would allow updates and prioritized strategies to be considered during 2020 in the context of the 2021/2022 budget decision-making process.

GLOSSARY OF TERMS

Adjusted Business As Usual Greenhouse Gas Forecast – a forecast of local GHG emission that represents the emissions expected to occur when taking into account planned federal actions and potential regional actions. In Fort Collins CAP Framework, the Adjusted Business As Usual forecast considers the impact of the Corporate Average Fuel Efficiency standards and the greenhouse gas reduction that could occur if Platte River decides to proceed toward planning guidelines established by the Platte River board in 2013. These guidelines were established for a study of options that could: (1) reduce emissions 20% below 2005 levels by 2020 and 80% by 2050, (2) achieve 20% energy supply from renewable sources by 2020 (not including existing hydropower), (3) maintaining reliability through minimum 15% reserve margin, and (4) remaining the lowest cost wholesale electric supplier located in Colorado.

Business As Usual Greenhouse Gas Forecast – a forecast of local GHG emission that assumes that future emissions trends follow those of the past and no changes in policies will take place.

Carbon Neutral - refers to a community with net zero greenhouse gas emission, meaning that the community has reduced its greenhouse gas emissions as much as possible and then over-generates renewable energy or invests in carbon offsets to achieve net zero emissions. Or "Having achieved a state in which the net amount of carbon dioxide or other carbon compounds emitted into the atmosphere is reduced to zero because it is balanced by actions to reduce or offset these emissions."

Cost of Carbon - an anticipated future cost that would be added to the price of greenhouse gas-emitting activities such as the burning of fossil fuel. This is in alignment with the Intergovernmental Panel on Climate Change's (IPCC) definition of "*Carbon price": What has to be paid to some public authority as a tax rate, or on some emission permit exchange for the emission of 1 metric tonne of CO_2 into the atmosphere."* (IPCC Glossary, 2007)

Metric ton CO2e – metric tonnes of carbon dioxide equivalent, where the global warming potential of other greenhouse gases are converted into a carbon dioxide equivalent and summed. Fort Collins considers the contribution of methane and nitrous oxide as well as carbon dioxide.

Net Zero Buildings – a building with zero net energy consumption, meaning the total amount of energy used by the building on an annual basis is roughly equal to the amount of renewable energy created on the site.

Strategy - As used in the Climate Action Plan (CAP) framework, a strategy refers to a broad area of carbon reduction. The framework plan has quantified the benefits of eleven strategies.

Tactic - As used in the CAP framework, a tactic refers to a policy, program or action that could support achievement of the reduction strategies. The priority, timing and details of possible tactics has not been identified yet in this framework plan.

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