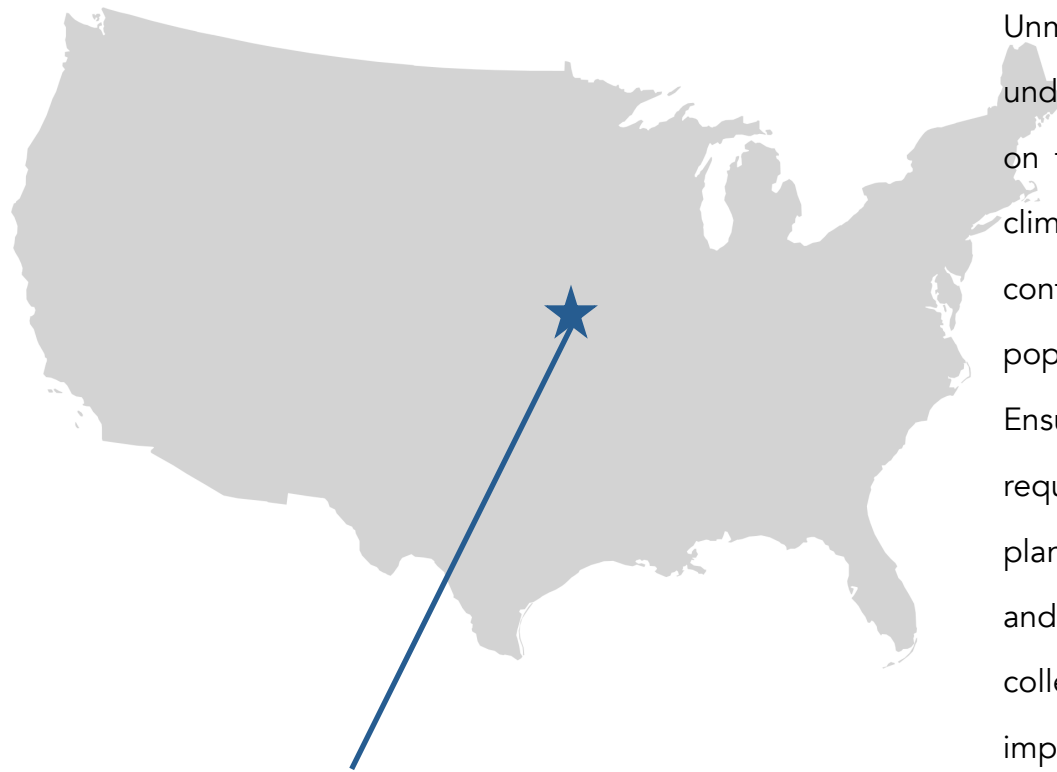




THINKGREEN

A Climate Action Plan
Lee's Summit, MO



Lee's Summit, Missouri, USA

Lee's Summit, Missouri is forward thinking.

Unmistakably, climate change is real and demands undivided attention. While sea level rise may not be on the minds of all Lee's Summit's residents, other climate related issues are. Warming temperatures contribute to heat waves that threaten vulnerable populations—especially the ill, elderly, and children. Ensuring the long-term prosperity of Lee's Summit requires collaboration, technical knowledge, and planning. Members of the public, elected officials, and public and private institutions individually and collectively must take steps to reduce their global impact by reducing greenhouse gas emissions and preparing for local impacts on their city. This document serves as a guide for these initiatives.

TABLE OF CONTENTS

| | |
|---|----|
| 1 INTRODUCTION | 4 |
| 2 IMPORTANCE OF CLIMATE CHANGE PLANNING | 7 |
| 3 EXISTING PLANS & DOCUMENTS | 10 |
| 4 CLIMATE CHANGE MITIGATION | 11 |
| 5 CLIMATE CHANGE ADAPTATION | 20 |
| 6 WORK PLAN | 25 |
| 7 CONCLUSION | 28 |
| 8 APPENDICES | 29 |

INTRODUCTION

Distinguished

As a town of now 67.85 square miles situated in both Cass and Jackson County and 90,770 residents, Lee's Summit sits on fertile, rolling prairie land. Initially drawn to the area because of its terrain, William B. Howard dreamt of a dynamic city. Today, over 93,000 people call Lee's Summit "home." The community is family-oriented, yet progressive. Nationally recognized, Lee's Summit is in the top 10 happiest places to live in Missouri. Through dedication, courage, and quiet determination, the City has become a greatly desirable place to live. The community prides itself on its many awards:

- "Outstanding Collection Program" award for RecycleFEST from the Missouri Recycling Association
- 2013 Mid-Western Institute of Transportation Engineers Transportation Achievement Award for its Neighborhood Traffic Safety Program
- Bronze Bicycle Friendly Community by the League of American Bicyclists
- Bronze Level Walk Friendly Communities Designation by the Pedestrian and Bicycle Information Center
- Complete Streets approach recognition by *Smart Growth America*

Historical

Originally the Town of Strother, founded in 1865, the Town's name was changed to Lee's Summit in 1868, and officially incorporated in 1877. The "Summit" portion of the name was based on the fact that the Town is elevated on the highest point along the railroad between St. Louis and Kansas City. Focused on the City's strong history, its most infamous citizen, Cole Younger, "the last of the great outlaws," lived in the once Town. After his life as an outlaw, Younger returned to Lee's Summit as a model citizen until his death in 1916. His grave sits in Lee's Summit Historic Cemetery.

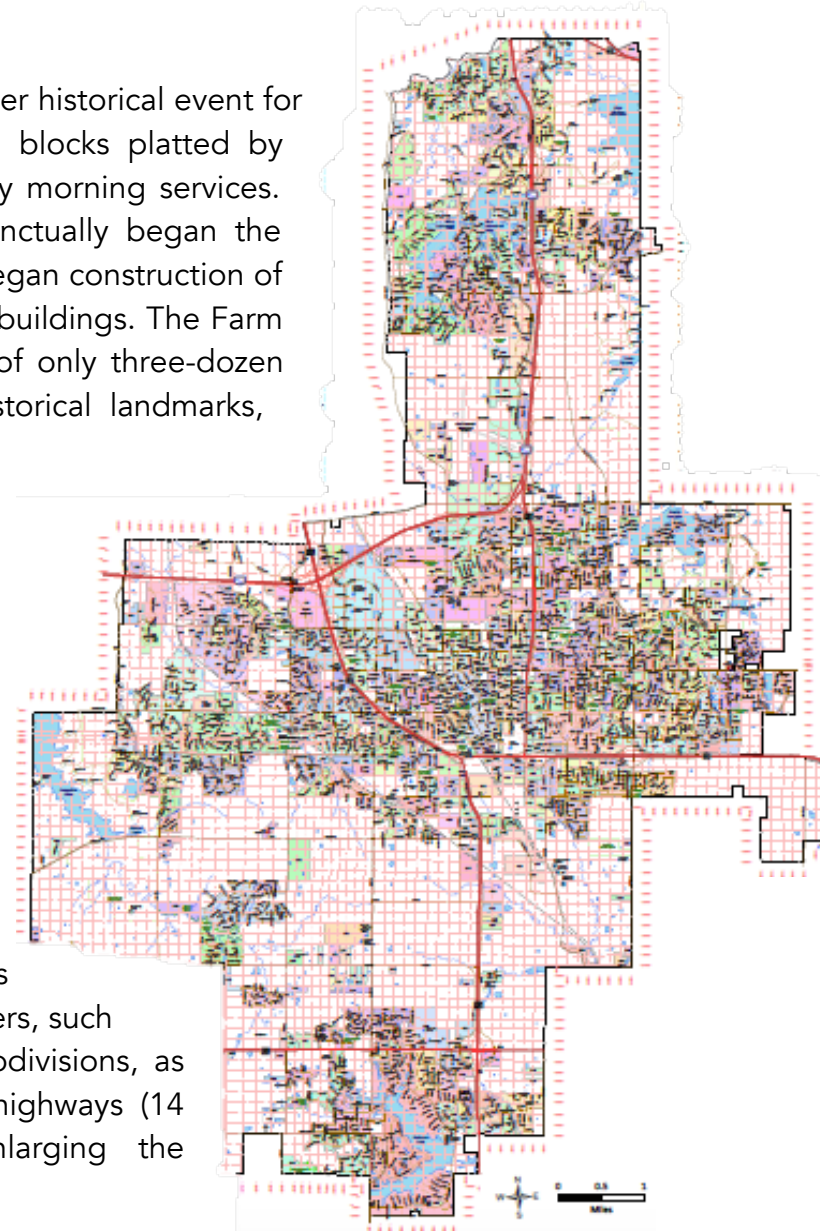


Longview Farm, Lee's Summit, Missouri

Remembered strongly by its citizens, the Fire of 1885 serves as another historical event for the City. Fire exploded in the downtown district (the original 11 blocks platted by Howard) while many of the Town's residents were attending Sunday morning services. Twenty-five buildings were destroyed—yet the Town's citizens punctually began the rebuilding process. Almost 30 years after the famed fire, R.A. Long began construction of Longview Farm on his newly purchased 1,700 acres consisting of 42 buildings. The Farm is internationally known for its horses and livestock, as it was one of only three-dozen "showplace farms." In order to ensure the longevity of these historical landmarks, sustainability must be a focus.

Developing

Despite the tragedies and victories, Lee's Summit citizens continue to press onward. The livable nature of the community keeps it in touch with the values of its residents, but also seeks to progress powerfully into the future through its use of best practices and instilled value in the environment. As a Charter City, Lee's Summit has not managed to restrain its land use. Urban sprawl is still an issue that the City Council must tackle with the aid of the Planning and Codes Administration staff. As one of the suburbs on the edge of the Kansas City metropolitan region, Lee's Summit's development adds to the sprawling nature of the region as a whole. New shopping centers, such as Summit Fair, draw crowds interested in open air shopping. Subdivisions, as shown in the map to the right, follow the main interstates and highways (14 highway interchanges) in the City—continuing southward, enlarging the metropolitan region.



"Subdivision Map," ITS/Mapping Department, Lee's Summit, Missouri

Despite its sprawling nature, Lee's Summit has established several environmentally focused committees, which include: (1) Parks and Recreation Board, (2) Livable Streets Advisory Board, (3) Lee's Summit 360° Implementation Committee, (4) Land Clearance for Redevelopment Authority, (5) Health Education Advisory Board, (6) Beautification Commission, (7) Environment and Natural Resources Committee (City Council committee), and (8) Historic Preservation Commission.

Lively

The City is split into four districts, each represented by two City Council Representatives. The Council Members represent all citizens, with the largest age group of citizens as 45 to 49 years old. Over 75 percent of citizens own their home, the average household size is 2.75 people, and the median household income is \$77,285. Serving a fairly affluent city, the 10 members of the Planning Commission, including the mayor, oversee the comprehensive plan, zoning decisions, and subdivision and development regulations. The City Council serves as the final decision-making body, with much weight placed on the Planning Commission's recommendations. The politics and work processes of the governing bodies are important to consider in climate action planning, as they often make the final decisions on these plans.

“In this time of renewed environmental awareness, a lot of ‘buzz’ words are used. However, words without substance and awareness without action are pointless. The City of Lee’s Summit knows this and through ongoing efforts to serve the people of Lee’s Summit, the City works tirelessly to cultivate a balanced, sustainable culture.”

– Lee’s Summit, Missouri’s website

Lee's Summit's citizens clearly recognize the importance of climate action and, in essence, sustainability. As the entire globe struggles to adapt and mitigate to the unequivocal climate changes, efforts must be widely implemented and deeply felt by all species. While energy efficiency and other similar efforts are necessary, a preservation motivation must be instilled into all global citizens. This behavior should be described in climate action plans and modeled by governments at all levels, but specifically in local governments. Elected official leadership and citizen engagement is key in this climate action planning process for this city. Lee's Summit must continue to plan and act to ensure its long-term viability.

IMPORTANCE OF CLIMATE CHANGE PLANNING

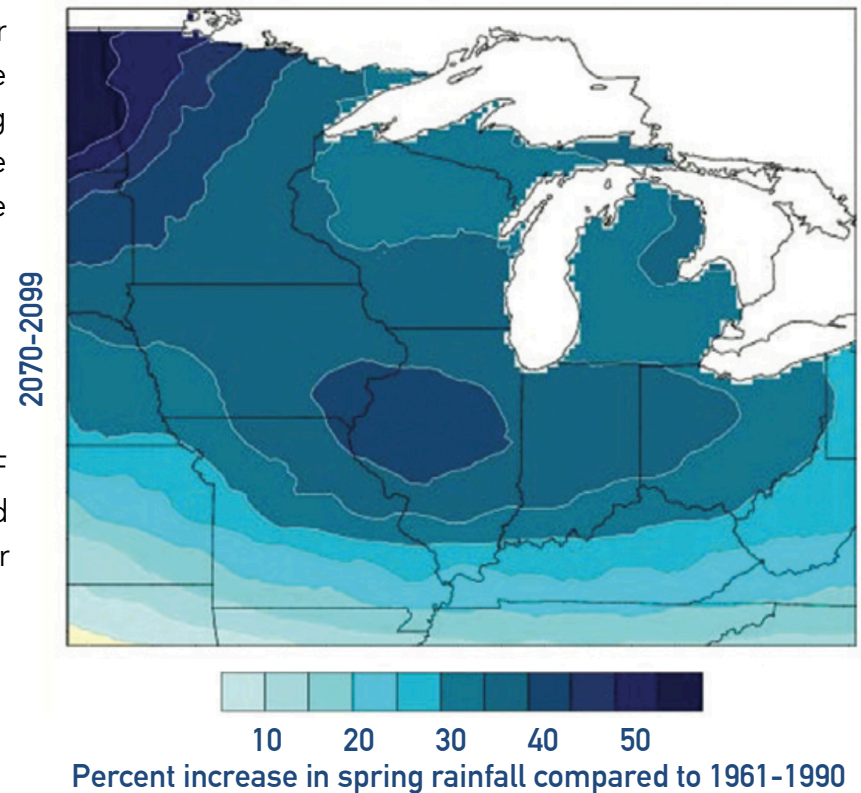
Widespread Agreement

Climate change is one of the most serious issues facing the globe today. A strong consensus finds man-made (or anthropogenic) emissions as the cause of the changes in the globe's climate. Land use actions such as sprawling development, deforestation, and agriculture contribute to the growing levels of greenhouse gases in the atmosphere. The transportation and industrial sectors also increase the levels of methane, carbon dioxide (CO₂), and other heat-trapping gases. Levels of CO₂ have increased by 25 percent in the last 50 years¹. These increases are set to increase average temperatures around the globe in the range of 1 – 1.5 degrees F over the next several decades, and 2 – 4 degrees F in the United States. Hazards, such as floods, heat waves, and droughts, will increase in variability and intensity due to higher temperatures.

Many Effects

Climate change will affect different regions across the globe differently. Greenhouse gases and their impacts cannot be confined to a specific region, therefore all regions must recognize the looming hazards, assess their risks and vulnerabilities, and take steps to mitigate (lessen) and adapt to the coming changes in climate. No nation, state, city, or neighborhood is immune.

Midwest's Higher Emissions Future



¹ Johnston, Sadhu A., and Adele Simmons. *Chicago Climate Action Plan*. Chicago: n.p., 2008. PDF.

While this is a worldwide problem, urban areas contribute 75 percent of all greenhouse gas emissions². Missouri, which does not have a statewide climate action plan, may face increases in natural hazards and:

- Increases in average temperatures, rainfall³, record floods, and extreme heat,
- Average summer temperatures 14 degrees F higher⁴,
- Greater health risks due to heat waves, storms, infectious diseases, declining air quality, and drought, and
- Alterations in river flows

Environmental issues are not the only concerns. Social and economic issues arise with the changing climate. Vulnerable populations must be taken into great consideration, as risks are amplified for those lacking essential services and infrastructure. The Intergovernmental Panel on Climate Change states, with high confidence, the following effects:

- Risk of severe ill-health and disrupted livelihoods for large urban populations due to inland flooding in some regions
- Systemic risks due to extreme weather events leading to breakdown of infrastructure networks and critical services such as electricity, water supply, and health and emergency services
- Risk of mortality and morbidity during periods of extreme heat
- Risk of food insecurity and the breakdown of food systems linked to warming, drought, flooding, and precipitation variability and extremes
- Risk of loss of terrestrial and inland water ecosystems, biodiversity, and the ecosystem goods, functions, and services they provide for livelihoods

The most important innovation in our planning now should be to anticipate an increased capacity for planning itself, for flexibility, for allowing – even enabling – rapid, adaptive and widespread change, social as well as material, in the light of changing circumstances.⁵

² "Cities and Climate Change." *United Nations Environment Programme*. N.p., n.d. Web. 20 June 2015.

³ "Confronting Climate Change in the U.S. Midwest: Missouri." *Union of Concerned Scientists*. N.p., n.d. Web. 20 June 2015.

⁴ "Climate Change and Your Health." *Climate Change Threatens Health: Missouri*. N.p., n.d. Web. 20 June 2015.

⁵ "Transition PDX." *Transition PDX*. N.p., n.d. Web. 29 June 2015.

Motivations

Social, economic, and environmental issues must be considered during this planning process. Oftentimes, consideration of all aspects of sustainability leads to the realization of co-benefits. Lee's Summit has the opportunity to become a green community—something that may create tourism and economic development⁶ due to increased green space and recreational areas. In order to be eligible for various federal grants, a climate action plan must be created. Integrating this climate action plan into the city's comprehensive plan will encourage multi-department sustainable efforts. This plan will also increase public awareness of scientifically sound issues that deserve attention, which will lead to community resiliency. As the Midwest has a highly energy-intensive economy, the region as a whole is faced with the responsibility to decrease resource use (and therefore greenhouse gas emissions).

Public engagement will be vital throughout the planning process, as younger generations step into leadership positions within the city. With valid public participation, this plan will reflect community values. Without public support, implementation and securing funding will be challenging. Most importantly, the citizens' goals for the city should guide the goals and outcomes of the plan. Many cities across the country are developing climate action plans to create a framework for resource efficiency. The development of long-range and comprehensive strategies allows programs and other existing plans to be leveraged and provide a lens through which community priorities are developed. Integration of this plan into existing plans is key. While this plan can serve as a standalone document, its integration into other documents will increase its weight.



*Longview Lake,
Lee's Summit, MO*

KEYTERMS

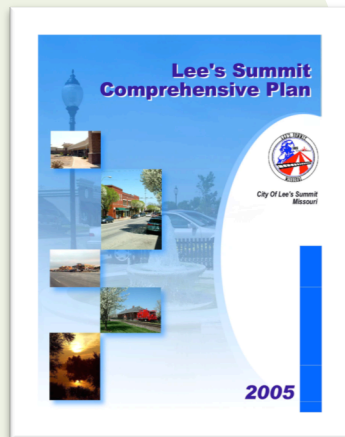
Climate Change Mitigation includes the reduction and prevention of greenhouse gases.

Climate Change Adaptation refers the process of adjustment to actual or expected climate and its effects.

Hazard Mitigation works to reduce and prevent loss of life and property due to natural hazards.

⁶ Boswell, Michael R., Adrienne I. Greve, and Tammy L. Seale. Local Climate Action Planning. Washington, DC: Island, 2012. Print.

EXISTING PLANS & DOCUMENTS



FOCUSPOINTS

1. Orderly development patterns
2. Economic competitiveness
3. High-quality housing and commercial areas
4. Expansion of employment base
5. Downtown revitalization
6. Environmentally safe development

Comprehensive Plan

Lee's Summit 2005 Comprehensive Plan addresses all aspects of physical development in the city, while explaining the social and economic impacts caused by this development. It focuses on future land use, service areas, and necessary public infrastructure to complement future land uses. The community's goals focus on the points in the box to left.

As it is a dynamic document, several sub-plans have been added over the years since adoption. These sub-plans include:

- South M-291 / M-150 Corridor Study
- Old Lee's Summit Development Master Plan
- Historic Preservation Plan
- Current Capital Improvement Projects
- Water Master Plan
- Wastewater Master Plan
- Greenway Master Plan
- Thoroughfare Master Plan
- M-150 Sustainable Corridor Vision and Framework Plan

Hazard Mitigation Plan

Mid-America Regional Council, the regional planning organization in the Kansas City metropolitan area, has prepared a Natural Hazard Mitigation Plan for several counties in Missouri, including Jackson and Cass County. The plan is currently being updated to further develop long-term strategies to reduce disaster losses and stop the cycle of disaster—damage—reconstruction⁷. This plan was adopted pursuant to the Disaster Mitigation Act of 2000.

⁷ Regional Multi-Hazard Mitigation Plan. Kansas City: Mid-America Regional Council, 2015. Print.

Tornadoes, floods, severe winter weather, droughts, and heat waves pose high risks to Cass and Jackson County. The Lee's Summit tornado of May 30, 1879 killed four people⁸, while historical accounts assert this tornado was made up of several tornadoes. Flash floods in 2002 and 2004 caused evacuations of various apartment complexes. Various goals have been stated to lessen impacts from natural hazards such as these. The following selection of proposed mitigation actions were goals that could be implemented by stakeholders and local governments over a five-year period:

- Increase public awareness and understanding of the benefits of "safe rooms"
- Encourage construction of community tornado shelters and building practices that reduce the effects of tornadoes
- Integrate flood mitigation strategies with projects and activities designed to (1) protect, restore, or enhance ecosystems and the environment and/or (2) create recreational opportunities for the community
- Discourage new development in floodplains and flood-prone areas
- Encourage electric and telecommunications utilities to protect existing infrastructure from the effects of severe winter weather
- Ensure local governments and human services agencies are aware of air conditioned facilities across the Kansas City metropolitan area that can be used as shelters in the event of a heat wave

CLIMATE CHANGE MITIGATION

This section includes an initial greenhouse gas emissions inventory and uses this data to set preliminary emission reduction targets. As a plan to achieve these targets, goals, policies, and implementation strategies are set out below.

Greenhouse Gas Emissions Inventory

In order to establish the context within which to measure greenhouse gas (GHG) emissions reduction opportunities in Lee's Summit, a comprehensive community-wide inventory was completed. The inventory was separated into different sectors to best understand its climate change objectives, using 2010 emissions data as the baseline. Identified sources include: energy consumption, transportation, solid waste, wastewater, and clean water consumption. Assuming business-as-usual, 2010 data was then projected to year 2025. While municipal operation reductions provide an opportunity to lead by example, non-municipal emissions reductions present a greater potential for reduction.

⁸Regional Multi-Hazard Mitigation Plan. Kansas City: Mid-America Regional Council, 2015. Print.

Using a bottom-up approach (that does not depend on statewide emissions reporting) provides more precise data that is more easily updated in the future in order to analyze emissions trends and mitigation strategies successes. For example, Lee’s Summit residential, industrial, and electrical emissions data can be gathered from Kansas City Power and Light and Missouri Gas Energy.

Greenhouse Gas Emissions and Targets by Sector

Four emissions sectors are described below. Lee’s Summit’s previous emissions estimates have been estimated and projected into 2025 using regional emissions data from Mid-America Regional Council, estimated for Lee’s Summit’s population⁹. By sector, GHG emissions estimates are as follows: (1) energy at 58.9%, (2) transportation at 38.2%, (3) solid waste at 2.1%, (4) wastewater at 0.05%, and (5) water at 0.03%. Compared to cities of similar size, Lee’s Summit emits approximately 1,750,000 metric tons of carbon dioxide annually. The following graphics represent the four sectors and set forth the emissions reduction goal for 2025 with 2010 as a baseline. Each sector is further described below.



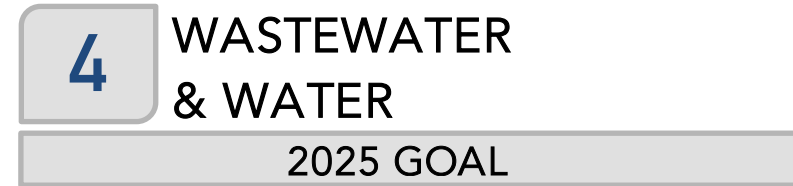
25% below 2010 CO₂ levels by 2025



15% below 2010 CO₂ levels by 2025

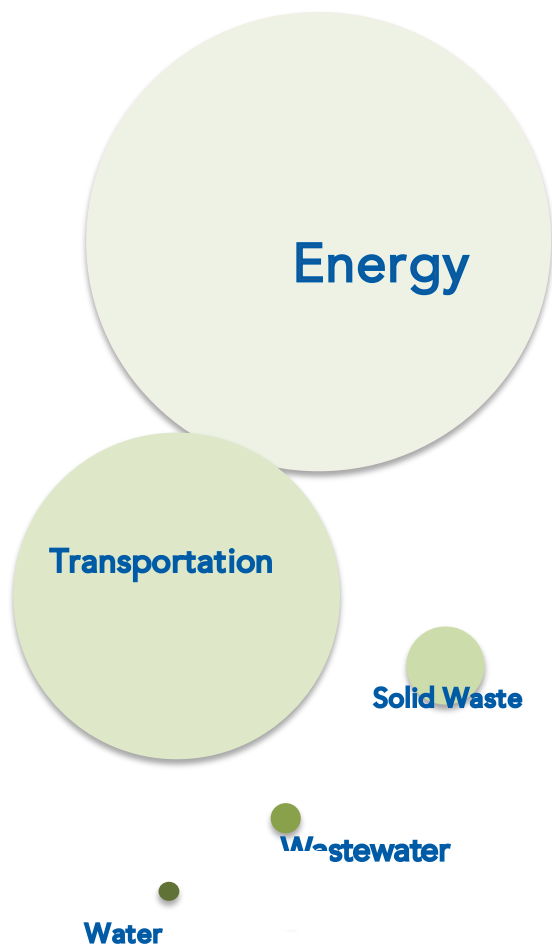


20% below 2010 CO₂ levels by 2025



15% below 2010 CO₂ levels by 2025

⁹ A Clean Air Action Plan. Kansas City: Mid-America Regional Council, 2010. Print.



Energy

Electricity and natural gas consumption in Lee’s Summit, especially during hot summer months and cold winter months, are a large source of GHG emissions. Aggregated by land uses—residential, industrial, and commercial—energy use accounted for approximately 60% of GHG emissions.

Table 1. Emissions by Subsector

| Land Use | Electricity | Natural Gas |
|-------------|-------------|-------------|
| Residential | 41% | 65% |
| Commercial | 25% | 15% |
| Industrial | 34% | 20% |

Transportation

Communitywide vehicle miles traveled (VMT) and municipal fleet operations are included in this sector. Municipal fleet operations data are easily gathered from Lee’s Summit’s Fleet Department, Sanitary Land Fill, and Airport, all of which document vehicle models, miles traveled, and fuel economy. Regional transportation models, utilizing general assumptions about vehicle types and ages, can be used to estimate VMT for Lee’s Summit’s residents. Gasoline-fueled vehicles and diesel-fueled vehicles emit 80% and 20%, respectively.

Solid Waste

The current waste management system—decomposing waste in place and methane management—does not provide complete records of emissions inventory data. Lee’s Summit’s Landfill provides services for other cities; therefore Lee’s Summit specific emissions data is not completely interpretable. Contracting waste haulers’ quarterly reports on haul weights can be used as a proxy.

Wastewater and Water

Wastewater emissions are generated by organic compound breakdown in the treatment of wastewater. The Utilities Department reports emissions through annual gallons of treated wastewater. Water, on the other hand, generates emissions through the distribution of clean water communitywide. The Utilities Department is also able to report gallons of clean water used.

Greenhouse Gas Emissions Projections

In order to estimate the successes of policies and implementation procedures, greenhouse gas emissions must be projected into a future year. To project 2025 business-as-usual emissions, population projections were utilized, as well as projections of retail and commercial space. These growth measures translate into increases in energy use, water consumption, wastewater generation, and solid waste disposal.

Table 2. Projected Emissions by Sector

| Sector | 2010 Emissions | | 2025 Emissions | |
|----------------|---------------------------|------------|---------------------------|------------|
| | MT CO ₂ / Year | % of Total | MT CO ₂ / Year | % of Total |
| Energy | 1,030,700 | 58.9% | 1,250,600 | 58.5% |
| Transportation | 670,400 | 38.2% | 827,450 | 38.7% |
| Solid Waste | 37,550 | 2.1% | 41,739 | 2.0% |
| Wastewater | 10,010 | 0.05% | 12,290 | 0.07% |
| Water | 3,450 | 0.03% | 3,750 | 0.03% |

Goals, Policies, and Implementation Strategies

Many departments and regional bodies will be involved in the implementation of the following proposed steps, including the following groups: Public Works Department, Planning and Code Administration Department, Missouri Department of Transportation, Parks and Recreation Department, Solid Waste Division, Traffic Engineering and Operations, and the Water Utilities Department. Constant communication and coordination between these groups is key.

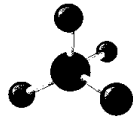
Many co-benefits for the community will arise if proper implementation steps are taken, including, but not limited to:



Electricity Savings



Waste Reduction



Methane Reduction



Natural Gas Savings

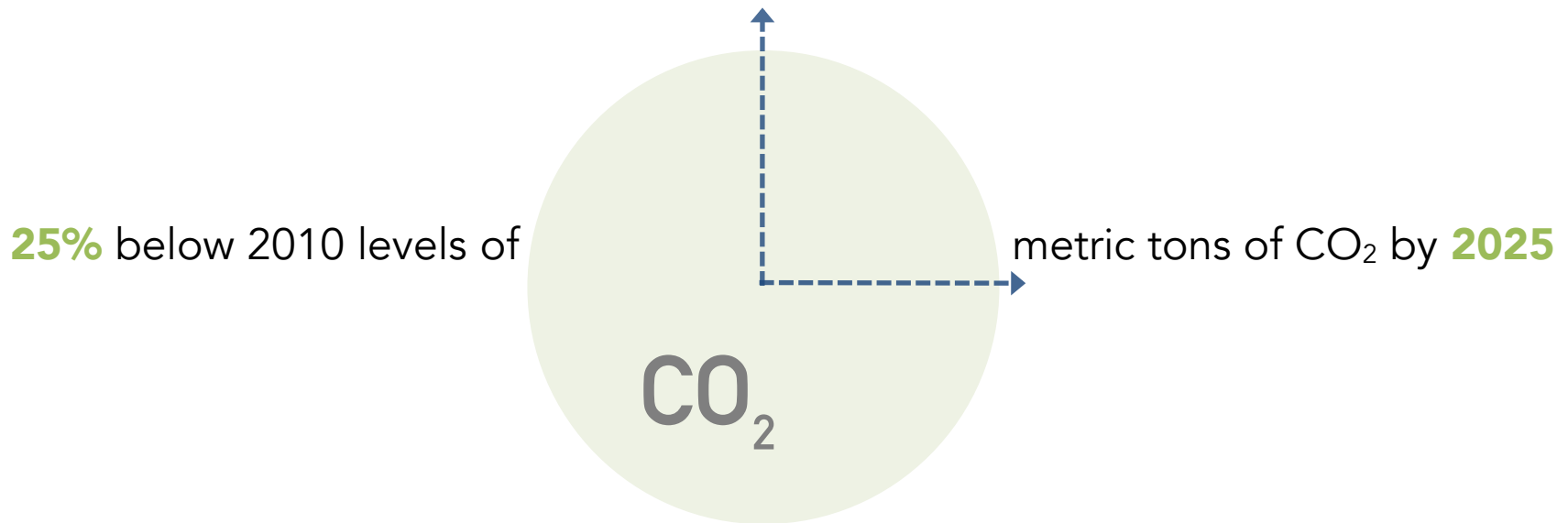


VMT Reduction



Household Water Savings

While the above savings are quantifiable, other equally important community co-benefits should be noted, such as (1) increased property values, (2) improved air and water quality, (3) reduced urban heat island effect and Stormwater runoff, and (4) recognition as regional leader in sustainable practices. Careful analysis of each goal, policy, and implementation strategy is necessary to ensure feasibility, secure funding, and confirm community acceptance. Each implementation strategy notates the head department, estimated cost (low, moderate, or high), and the proposed timespan. The goals provide direction and substance to the **overarching emissions reduction target:**



1 Energy

As a strong area for GHG mitigation that could lead to a 75% reduction in the City’s overall emissions, the majority of strategies should be focused on the reduction of energy use and increasing the usability and amount of renewable energy sources.

Goal 1 – Increase energy efficient buildings and usage of renewable energy sources



Policy 1. Increase energy efficiency in existing structures

- 1.1.1 Promote energy efficiency incentive programs for residential, commercial, and industrial structures through outreach and education (Environment and Planning - low - 2015-2025)
- 1.1.2 Establish new guidelines for renovations that require ENERGY STAR appliances (Planning - low - 2015-2025)



Policy 2. Encourage energy efficient practices in new residential, industrial, and commercial construction

- 1.2.1. Incentivize sustainable construction practices, including high efficiency building materials, passive and active solar design, and green infrastructure throughout developments (Environment, Planning, Public Works, Finance - high - 2017-2025)
- 1.2.2 Establish a tree planting and sustainable infrastructure program for all new buildings and developments, including municipal (Environment, Planning - Public Works - 2025-2025)



Policy 3. Increase amount of heat and electricity generated by renewable energy resources

- 1.3.1. Form sustainability partnership with utility providers to utilize all renewable energy options (Water Utilities, Planning, Environment, Public Works, low, 2015-2025)
- 1.3.2. Incentize developers to install renewable energy options (Planning, Environment - high - 2017-2025)
- 1.2.3. Convert all traffic signals and street lights to LED fixtures (Public Works, Finance - High - 2017-2025)

2 Transportation

The transportation sector contributes 38.2% of Lee’s Summit’s GHG emissions, which is projected to increase to 38.7% by 2025. In this ten-year timespan, the following strategies will reduce this sector’s impact on air and water quality, as well as quality of life.

Goal 2 – Reduce VMT by both municipal fleets and citizens



Policy 1. Increase "Smart Growth" initiatives

- 2.1.1. Integrate recently adopted Livable Streets Policy into development review process through expert staff review (Planning, Environment - moderate - 2015-2025)
- 2.1.2. Complete City's Sidewalk Inventory Analysis to identify barriers and gaps and prioritize safety and connectivity projects (Public Works, Planning - low - 2015-2025)
- 2.1.3. Require developers to ensure connectivity to local food sources, schools, and employment opportunities in development review process (Planning, Public Works, Law - low - 2017-2025)



Policy 2. Reduce GHG emissions from both municipal fleets and changes in transportation infrastructure

- 2.2.1. Analyze and promote connectivity improvements in City's street network to ensure less VMT to highly-visited locations (Planning, Public Works - low - 2015-2025)
- 2.2.2. Convert all municipal fleet vehicles to hybrid or other low-emission vehicles (Fleet Division, Public Works - high - 2020-2025)
- 2.2.3. Synchronize traffic signals to reduce stop-and-go traffic at major intersections communitywide (Public Works - moderate - 2017-2025)

3 Solid Waste

The solid waste sector contributes 2.1% of Lee’s Summit’s GHG emissions. In the proposed ten-year timespan, the following strategies will reduce this sector’s impact on air and water quality.

Goal 3 – Reduce solid waste generation, while simultaneously increasing organic disposal of waste



Policy 1. Increase organic disposal options communitywide

- 3.1.1. Initiate a municipal organic waste pick-up system for residential and commercial food waste and other organic waste (Environment, Fleet Division - moderate - 2017-2025)
- 3.1.2. Develop a public outreach campaign to educate about current organic curbside disposal, such as Missouri Organic Recycling and curbside yard waste collection (Planning, Environment - low - 2015-2025)



Policy 2. Establish a Green Procurement Policy

- 3.2.1 Adopt a policy ensuring purchase of recycled or recycable materials for municipal events (Planning, Administration, Finance - moderate - 2015-2025)
- 3.2.2. Organize friendly recycling competitions between neighborhood associations to increase recycling rates communitywide (Planning - low - 2015-2025)
- 3.2.3. Identify large sources of municipal paper use and initiate a "electronic" campaigns to increase paperless operations (Administration - low - 2017-2025)

4 Wastewater and Water

The wastewater and water sectors contribute 0.05% and 0.03% of Lee’s Summit’s GHG emissions, respectively. In the proposed ten-year timespan, the following strategies will reduce these sectors’ impacts on air and water quality, as well as quality of life.

Goal 4 – Conserve water and reduce wastewater generation



Policy 1. Decrease water usage

- 4.1.1. Develop a water conservation public outreach program to target residential water use (Planning, Environment - low - 2015-2025)
- 4.1.2. Require commercial and residential developers to plant natural landscaping requiring less water (Planning, Public Works, Law - low - 2017-2025)
- 4.1.3. Plant natural landscaping in all city-maintained parks, planters, landscaped islands, and landscaped medians (Planning, Public Works - high - 2017-2025)



Policy 2. Encourage reuse of wastewater as graywater, while managing graywater by natural processes

- 4.2.1. Collaborate with schools, large employment centers, and all municipal departments to install graywater/rainwater collection systems for reuse as landscape irrigation (Planning, Environment - low - 2017-2025)
- 4.2.2. Develop low-impact design guidelines for all commercial, residential, and industrial construction (Planning - low - 2017-2025)

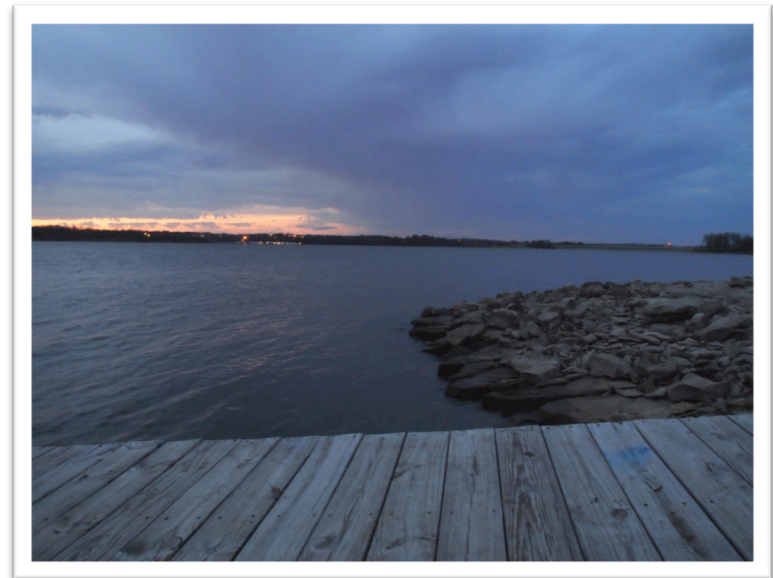
CLIMATE CHANGE ADAPTATION

Overwhelming research concludes that, regardless of mitigation efforts, the world will experience severe impacts from climate change. This section includes an outline of these expected effects of climate change, specific to Lee's Summit. As these changes loom, becoming a resilient community becomes the main intent of this section. Further adaptation goals, policies, and implementation strategies are set forth. Adaptation planning must be locally grounded, based in science, and be participatory. A work plan for mitigation and adaptation goals, including a description of a full emissions inventory, consensus building techniques, and local data resources, follows.

Expected Effects of Climate Change

The expected changes in climate are explained in order to establish the context within which to set Lee's Summit's goals for adaptation. Projected and observed impacts vary across the United States. Importantly, more vulnerable populations—the ill, elderly, children, and lower-income—will face even more troublesome problems. Lee's Summit's region—the Midwest—is projected to face:

- Increased frequency and intensity of heat waves causing:
 - Increased humidity
 - Degraded air and water quality
 - Increased public health risks
- Extreme rainfall events leading to floods causing:
 - Increased erosion
 - Degraded water quality
 - Negative impacts on human health, transportation, agriculture, and infrastructure
- Decreased overall agricultural productivity (surrounding Lee's Summit)



Longview Lake, Lee's Summit, MO

Other ramifications may develop due to the climate's variability. Pests and diseases will be affected, as well as ecosystems, landscapes, and watersheds; systems will be altered. Midwestern urban areas, such as Lee's Summit, will face increased water and air pollution, urban heat island effects, an increasingly variable water cycle, and more widespread exposure to pests and diseases. Aging infrastructure contributes to this increased vulnerability.

The amount of future climate change will still largely be determined by choices society makes about emissions.¹⁰

Goals, Policies, and Implementation Strategies

In light of the expected climate changes and variable natural hazards, Lee's Summit must become a resilient community. As many communities struggle to strike a balance between environmental, economic, and social well-being, the goal of resiliency is increasingly imperative.

Similar to sustainability, resilient communities are environmentally healthy, conserve their resources, and are economically vibrant. "The concept of vulnerability is seen as the 'flip side of vulnerability—a resilient systems or population is not sensitive to climate variability and change and has the capacity to adapt."¹¹ Identification of vulnerable populations communitywide—typically, elderly, and children—is important when understanding the Lee's Summit's vulnerability. Special attention should be given to these populations to ensure communitywide resiliency.

In light of this overarching aim, the following goals aim to further Lee's Summit's adaptation efforts—to realize their adaptive capacity.

¹⁰ Climate Change Impacts in the United States. Rep. N.p.: U.S. Global Change Research Program, 2014. Print.

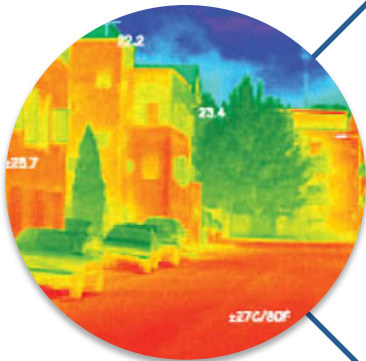
¹¹ Blanco, Hilda, Marina Alberti, Ann Forsyth, et. al. "Hot, Congested, Crowded and Diverse: Emerging Research Agendas in Planning." *Progress in Planning* 71.4 (2009): 153-205. Web. 2 July 2015.

Goal 1 – Manage heat to, in turn, protect air quality and human health



Policy 1. Preserve natural areas as green space and recreational uses

- 1.1.1. Complete a greenway inventory to analyze the green network around the City as a whole, as a benefit for animals, residents, and to maintain green groundcover (Environment, Planning - low - 2015-2025)
- 1.1.2. Increase size of urban forest canopy to provide ample amounts of shade (Planning, Public Works, Environment - moderate - 2016-2025)



Policy 2. Decrease urban heat island effect

- 1.2.1. Incentive commercial, residential, and industrial developers to utilize intensive and/or extensive green roofs (Planning - high - 2017-2025)
- 1.2.2. Increase reflectivity of all structures by installing reflective surfaces and using lighter-colored materials (Environment - moderate - 2017-2025)

Goal 2 – Conserve and naturally manage water resources***Policy 1. Utilize native plantings that use limited resources***

- 2.1.1. Require residential, commercial, and industrial developers, as well as the City, to plant native species in any new development or redevelopment (Planning - low - 2017-2025)
- 2.1.2. Adopt a green infrastructure policy that mandates its use when financially feasible (Planning, Environment - moderate - 2015-2025)

***Policy 2. Manage stormwater runoff sustainably***

- 2.2.1. Reduce flooding through rain barrels and rain gardens communitywide (Environment, Public Works - moderate - 2015-2025)
- 2.2.2. Install permeable pavement in Downtown Lee's Summit as a model for future developments (Environment - high - 2017-2025)

Goal 3 – Recognize and reduce inequalities in the social system



Policy 1. Ensure food security for every resident

- 3.1.1. Prepare heat maps of food availability throughout the community and target community gardens towards low-access areas (Planning, Environment - low - 2015-2025)
- 3.1.2. Collaborate with non-profits to increase healthy eating initiatives from locally grown food; provide free classes (Planning, Environment - moderate - 2015-2025)



Policy 2. Ensure adequate infrastructure and services for every resident

- 3.2.1. Increase synergies with private sector to incentivize affordable housing options (Planning - moderate - 2017-2025)
- 3.2.2. Secure essential healthcare for all residents through various insurance programs (Administration, Development Center, Planning - high - 2017-2025)

WORK PLAN

Mitigation and Adaptation Work Plan

To turn the stated goals, policies, and implementation strategies into actions, checked off one by one, a work plan is described below. In order to establish quantifiable goals, a proper GHG emissions inventory is necessary. Secondly, identification of key departments, specific staff members, and stakeholders will provide technical knowledge and will begin the public outreach process. Lastly, public outreach strategies are outlined to build necessary consensus.

Emissions Inventory

“A typical GHG emissions inventory will report the total annual emissions attributed to the community and a breakdown of their sources.”¹² A communitywide, compared to a municipal-operations inventory, is a best practice. Many reasons exist to encourage communities to complete emissions inventories, as outlined in the following:

Table 3. Purposes of Emissions Inventories

| | |
|---|--|
| 1 | Identify sources of emissions and their magnitude within the community |
| 2 | Identify and assess emissions trends |
| 3 | Establish a foundation for projecting future emissions |
| 4 | Provide a basis for future reduction targets |
| 5 | Set a benchmark for tracking progress toward a reduction target |
| 6 | Quantify the benefits of proposed emissions reduction strategies |
| 7 | Provide a basis for developing a climate action plan ¹³ |

¹² Boswell, Michael R., Adrienne I. Greve, and Tammy L. Seale. *Local Climate Action Planning*. Washington, DC: Island, 2012. Print.

¹³ Boswell, Michael R., Adrienne I. Greve, and Tammy L. Seale. *Local Climate Action Planning*. Washington, DC: Island, 2012. Print.

The basic steps of an emissions inventory are:



The International Council for Local Environmental Initiatives’ (ICLEI) Clean Air and Climate Protection software is an industry standard for emissions inventories across the country. Lee’s Summit will need to become a member of ICLEI in order to use this software that provides accurate and legally defensible data. This software can track emissions and create emissions scenarios that could be interpreted by the Planning Department and the Environmental Department.

Stakeholder Assessment

As previously stated, many City departments will play a role in this plan. Those departments highlighted have key roles.

- | | | | |
|--------------------|-------------------|-----------------------|--------------------------|
| 1. Administration | 4. IT Services | 7. Public Works | 10. Development Center |
| 2. Law | 5. Environment | 8. Finance | 11. Parks and Recreation |
| 3. Water Utilities | 6. Fleet Division | 9. Planning and Codes | |

The Planning and Codes Administration Department will take the lead in the formal process, serving as the coordinating body and technical staff members charged with ensuring timely progression of the plan, including all public outreach efforts. Planning staff members will conduct initial research into other communities’ climate action plans and resulting mitigation and adaption strategies. The Environmental Department will complete continuous monitoring and reporting after completing the emissions inventory. Water Utilities and the Fleet Division, Public Works, and Finance will be involved in the conservation of financial and operational feasibility.

Public Engagement

Other stakeholders include developers, neighborhood groups, elected officials, the school district, agriculture groups, industry representatives, local business owners, and other interested citizens. The identification of stakeholders is the first step in the public outreach process. “Public participation can result in a better plan, legitimize the plan in the eyes of the public, gain ‘buy-in’ from the public, and ultimately build social capital in the community.”¹⁴ As the Midwestern region of the United States tends to be fairly conservative politically and may display some skepticism towards climate change, public outreach is increasingly important in creating a climate action plan. The Planning and Codes Administration Department will be able to evaluate the plan’s audience.

Elected officials can appoint a Green Ribbon Task Force, a set group of community members, representing the various sectors and stakeholders described above. A group of approximately 10 to 40 people will make critical decisions affecting the creation and implementation of the climate action plan. Through other supplementary public engagement techniques, such as public meetings and workshops, charrettes, and collaborative learning sessions, interested members of the public can be involved without having to dedicate large amounts of time to the effort.

Local Data Resources

The attached annotated bibliography provides an extensive list of online sources to continue the climate action planning process. Examples of the resources provide include energy use calculators, scientific reports, public engagement tools, best practices, and emissions inventory assistance. While these sources will aid in the technical and implementation aspects of the plan, it is important to tap into the existing social structures within the community. Meaningful public engagement is important in assessing vulnerabilities and risks, as well as deciding which implementation strategies will be impactful on which populations. Involving the public is not an option nor a requirement, but a true step towards success.

¹⁴ Boswell, Michael R., Adrienne I. Greve, and Tammy L. Seale. *Local Climate Action Planning*. Washington, DC: Island, 2012. Print.

CONCLUSION

In order to become a resilient city, mitigating and adapting to climate change is important. This preliminary plan sought to recognize just this through the following actions:

- Determine Lee's Summit's challenges in the face of a rapidly changing climate
- Preliminarily locate and understand the sources of GHG emissions within the community
- Set goals to reduce emissions and adapt to the changes already affecting residents
- Leverage knowledge of Midwestern climate, projected changes, and challenges to improve social, environmental, and economic aspects of the community
- Draft concrete goals for the municipal government, the involved private sector, and residents

Resilience is all about being able to overcome the unexpected. Sustainability is about survival. The goal of resilience is to thrive.

- Jamais Cascio

RESOURCES

- Blanco, Hilda, Marina Alberti, Ann Forsyth, Kevin J. Krizek, Daniel A. Rodríguez, Emily Talen, and Cliff Ellis. "Hot, Congested, Crowded and Diverse: Emerging Research Agendas in Planning." *Progress in Planning* 71.4 (2009): 153-205. Web. 2 July 2015.
- Boswell, Michael R., Adrienne I. Greve, and Tammy L. Seale. *Local Climate Action Planning*. Washington, DC: Island, 2012. Print.
- "Cities and Climate Change." *United Nations Environment Programme*. N.p., n.d. Web. 20 June 2015.
- "Climate Change and Your Health." *Climate Change Threatens Health: Missouri*. N.p., n.d. Web. 20 June 2015.
- "Climate Change and Your Health." *Climate Change Threatens Health: Missouri*. N.p., n.d. Web. 20 June 2015.
- Climate Change Impacts in the United States*. Rep. N.p.: U.S. Global Change Research Program, 2014. Print.
- "Confronting Climate Change in the U.S. Midwest: Missouri." *Union of Concerned Scientists*. N.p., n.d. Web. 20 June 2015.
- Johnston, Sadhu A., and Adele Simmons. *Chicago Climate Action Plan*. Chicago: n.p., 2008. PDF.
- Regional Multi-Hazard Mitigation Plan*. Kansas City: Mid-America Regional Council, 2015. Print.
- "Transition PDX." *Transition PDX*. N.p., n.d. Web. 29 June 2015.



Annotated Bibliography

This bibliography serves as a future resource for elected officials, members of the public, and city employees. Resources include public engagement tools, emissions inventory assistance, and best practices research compiled from various reputable online sources. Each entry includes a resource, key terms, and a usability description.

"A Brief History of Climate Change - BBC News." *BBC News*. Web. 24 June 2015.

Climate Change, Climate History, and Policy

This timeline can set the historical foundation for climate change. It includes a vast amount of international information organized by year. This source can set the context for a plan and is useful for building a timeline.

"Adaptation Database and Planning Tool (ADAPT)." *ICLEI Local Governments for Sustainability*. N.p., n.d. Web. 24 June 2015.

Climate Adaptation, Mitigation, and Policy

Local Governments for Sustainability provides technical assistance for communities, specifically in emissions inventories and mitigation and adaptation policies. Communities should become members of this international organization to have access to innovative technologies and strong leadership.

"Advancing Climate Change Environmental Education: Resources and Suggestions." *Advancing Climate Change Environmental Education: Resources and Suggestions*. Web. 25 June 2015.

Civic Education and Public Outreach

This is a source for cities interested in implementing a civic education series in climate change. It provides standards, class outlines, and teaching resources. Additionally, it testifies to the importance of civic education.

Bedsworth, Louise W., and Ellen Hanak. "Adaptation To Climate Change." *Journal Of The American Planning Association* 76.4 (2010): 477-495. Web. 24 June 2015.

Climate Risk and Barriers

This article presents a policy synthesis of adaptation planning issues, using California as a case study. The authors examine the institutional and regulatory challenges and tradeoffs that climate change poses in six particularly vulnerable areas: water resources, electricity, coastal resources, air quality, public health, and ecosystem resources. They discuss obstacles to adaptation planning and successes overcoming these barriers, and suggest how planning can incorporate adaptation.

Berke, Philip; Lyles, Ward. "Public Risks and the Challenges to Climate-Change Adaptation: A Proposed Framework for Planning in the Age of Uncertainty". *Cityscape: A Journal of Policy Development and Research*, Volume 15, Number 1 (2013): 181-208 Web. 24 June 2015.

Planning Framework, Local Governance, and Resiliency

The lack of a public constituency concerned about public risks and the traditional planning paradigm that is chronically deficient in addressing public risks are major challenges to climate change adaptation. In this article, the authors present new models that are emerging in research and planning practice that link collaborative governance with anticipatory governance. Coupling the models offers a new approach to planning that simultaneously formulates strategic guidance for current decisions to achieve future resiliency goals, and it builds supportive networks of stakeholders. The authors offer recommendations on how to make the transition to plans that are premised on uncertainty, flexible policies, monitoring, innovation, and feedback.

Boswell, Michael R., Adrienne I. Greve, and Tammy L. Seale. "An Assessment Of The Link Between Greenhouse Gas Emissions Inventories And Climate Action Plans." *Journal Of The American Planning Association* 76.4 (2010): 451-462. Web. 24 June 2015.

Policy Development and Greenhouse Gas Inventory

In this article, the authors review local climate action plans and their associated greenhouse gas (GHG) emissions inventories from 30 U.S cities. They assess the degree to which climate action plans

are informed by such inventories and identify choices and assumptions the inventories require that may influence climate action plan policies and proposed actions. The aim of this article is help planners preparing climate action plans make informed, clear, and defensible choices, as well as optimize policy development and implementation in their communities. In addition, this research will contribute to refining future GHG emissions inventory protocols and climate action planning methods.

"Climate Adaptation Knowledge Exchange." *CAKE: Climate Adaptation Knowledge Exchange*. N.p., 2015. Web. 23 June 2015.

Climate Adaptation and Best Practices

This website serves as an exchange platform upon which planners, members of the public, and public officials can post climate change adaptation tools used in their communities. Sharing knowledge on how to best manage built and natural systems in the face of climate change is the focus. Planners can utilize this website to analyze case studies and vet the information available.

Cook, John. "Science AMA Series: I Am John Cook, Climate Change Denial Researcher, Climate Communication Fellow for the Global Change Institute at the University of Queensland, and Creator of SkepticalScience.com." *Reddit*. 4 May 2015. Web. 11 June 2015.

Climate Communication and Public Outreach

This is an online discussion thread with a climate communication research fellow at Queensland University, John Cook. This resource explores the psychology surrounding climate change.

Deakin, Elizabeth. "Climate Change and Sustainable Transportation: The Case of California." *J. Transp. Eng. Journal of Transportation Engineering* 137.6 (2011): 372-82. Web.

Transportation and Climate Change

This article by Deakin provides insight as to how industrial emissions can be lowered and transportation engines can be more fuel-efficient.

"Develop Greenhouse Gas Inventory." EPA.gov. Environmental Protection Agency, n.d. Web. 10 June 2015.

Emissions Inventory and Reporting Protocols

This resource provides communities in phase one of their CAP development with various greenhouse gas emissions inventory tools. Several templates, diagrams, and guides are provided (e.g. by ICELL, EIA, etc.) to guide communities to better inventories.

"ENERGY CALCULATOR." *Beyond The Bulb*. Mid-America Regional Council, n.d. Web. 10 June 2015.

Energy Efficiency, Co-benefits, and Public Outreach

This interactive resource provides members of the public, as well as decision-makers, with an "Energy Calculator" that empowers homeowners and renters to save money (co-benefit) while working towards a more sustainable planet. This tool could be listed in a CAP and could be incorporated to contests and other public outreach techniques to increase energy use awareness.

"Food Group." *Kroger EDI Web*. Web. 24 June 2015.

Food Production, Self-reliance, and Local Food Systems

This source is for a city that is interested in local food systems planning—a theme that is woven throughout climate action planning. This source shows where Kroger grocery stores source their food supplies. It can begin a conversation about the importance of self-reliance in food production.

"From Vacancy to Vibrancy." *Smart Growth America*. N.p., n.d. Web. 23 June 2015.

Redevelopment, Infill, and Walkability

Smart Growth America provides this resource to help communities mobilize the necessary clean up resources for blighted sites. The guide describes multi-site planning tips in order to turn smaller sites into community assets. By addressing these sites in a neighborhood context, in light of the needs and goals of the city, the public is able to realize economies of scale and mobilize new resources. Through these infill efforts, walkability will become a viable goal.

Gina Cavan, Tom Butlin, Susannah Gill, Richard Kingston, Sarah Lindley. "Web-GIS Tools for Climate Change Adaptation Planning in Cities." *Handbook of Climate Change Adaptation* (2015): pp 2161-2191. Web. 24 June 2015.

Climate Risk, Vulnerability, and Adaptation

This chapter explores state of the art climate change risk, vulnerability, and adaptation assessment tools, with a focus on web-based tools. It details the development and application of two online decision support tools created for climate change adaptation planning in cities – a Risk and Vulnerability Assessment Tool and Surface Temperature and Runoff (STAR) Tools. Both are freely available web-GIS tools that can be used to inform policy, strategy, and development.

"Homeless Shelter Directory." *Lawrence Community Shelter*. Web. 24 June 2015.

Homelessness, Impacts, Vulnerable Populations

This website shows homeless shelter services in a given area. This source can be very helpful for a city that is interested in learning how much capacity their area shelters have in order to plan for future need, especially as climate change may cause displacement of vulnerable populations.

Howe, and Mildenberger. "Yale Climate Opinion Maps." - *The Yale Project on Climate Change Communication*. Yale, 2014. Web. 11 June 2015.

Climate Communication, Risk, and Policy

This is a map that visualizes public opinion on climate change issues that includes beliefs, risk perception and policy support.

"Integrating Hazard Mitigation and Climate Adaptation Planning: Case Studies and Lessons Learned". For the 2015 San Diego County Multi-Jurisdictional Hazard Mitigation Plan Update. ICLEI-Local Governments for Sustainability USA, February 2014. <http://www.icleiusa.org/library/documents/integrating-hazard-mitigation-and-climate-adaptation-planning/n.d>. Web. 11 June 2015.

Best Practices, Hazard Mitigation, and Climate Adaptation

This research seeks to uncover approaches and best practices for integrating climate change adaptation and hazard mitigation planning. This report first provides frameworks for hazard mitigation planning and climate adaptation and case studies on other communities that have integrated climate adaptation and hazard mitigation planning. The purpose of these case studies is to draw lessons from these experiences that may inform the design of technical assistance and stakeholder engagement.

Jabareen, Y. "An Assessment Framework for Cities Coping with Climate Change: The Case of New York City and its PlaNYC2030". *Sustainability* (2014), 6: 5898-5919. Web. 24 June 2015

Sustainability, Planning Framework, and Uncertainty

Climate change and its resulting uncertainties challenge the concepts, procedures, and scope of conventional approaches to planning, creating a need to rethink and revise current planning methods. This paper proposes a new conceptual framework for assessing city plans based on the idea of sustainability and planning countering climate change. The framework consists of eight concepts that were identified through conceptual analyses of the planning and interdisciplinary literature on sustainability and climate change.

June Brundell, David Cobon, Grant Stone (QCCCE) and Neil Cliffe. "The Climate Change Risk Management Matrix." Queensland Climate Change Centre of Excellence Department of Environment and Resource Management, 2011. <https://www.longpaddock.qld.gov.au/products/pdf/climatematrixworkbook.pdf> , n.d. Web. 11 June 2015.

Risk Management, Vulnerability, and Adaptive Responses

An electronic version of the Climate Change Risk Management Matrix is one risk management approach that can help identify the impacts, adaptive responses, risk, and vulnerability associated with climate change. Identifying and analyzing risks and opportunities, using this risk management approach, can help to plan responses to climate variability and change and can enable organizations to be proactive and more effective in adapting to future uncertainty. This workbook, based on Australian climate change impacts and risk management: a guide for business and government.

"Local Climate and Energy Webcasts | State and Local Climate and Energy Program | US EPA." EPA. Environmental Protection Agency. Web. 11 June 2015.

Climate Change, Public Engagement, Energy Efficiency

This resource includes podcasts provided through the EPA about local climate action planning. The topics include adaptation, community design and planning, communications, developing climate action programs, emissions, energy efficiency, funding initiatives, etc.

Mashayekh, Yeganeh, Paulina Jaramillo, Constantine Samaras, Chris T. Hendrickson, Michael Blackhurst, Heather L. Maclean, and H. Scott Matthews. "Potentials for Sustainable Transportation in Cities to Alleviate Climate Change Impacts." *Environmental Science & Technology Environ. Sci. Technol.* 46.5 (2012): 2529-537. Web.

Transportation, Environmental Impacts, Alternative Transportation

This resource provides understanding on climate change and its impacts on the transportation system throughout cities. Alternative modes of transportation are also discussed.

"Models and Guidelines: Urban Growth Boundaries." *Planning.maryland.gov*. Maryland Office of Planning, 1 Aug. 1995. Web. 25 June 2015.

Sustainable Land Use, Urban Growth Boundary, and Delineation

This is a useful document for cities interested in implementing an Urban Growth Boundary. The document provides models and guidelines to assist cities in delineating the boundary.

Morelli, Toni Lyn; Yeh, Sharon; Smith, Nikola M.; Hennessy, Mary Beth; Millar, Constance I. 2012. "Climate project screening tool: an aid for climate change adaptation."

http://www.fs.fed.us/psw/publications/documents/psw_rp263/Res. Pap. PSW-RP-263. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, n.d. Web. 11 June 2015.

Climate Screening, Climate Adaptation, and Management Partnerships

The Climate Project Screening Tool (CPST) is made for integrating climate change considerations into project planning as well as for developing concrete adaptation options for land managers. CPST is a part of the Westwide Climate Initiative project, which seeks to develop adaptation options for addressing climate change through science/management partnerships. The CPST lists projected climate trends for the target region and questions to be considered when designing projects in different resource areas.

Olga V Wilhelmi and Mary H Hayden. "Connecting people and place: a new framework for reducing urban vulnerability to extreme heat." *Environmental research letters* (2010): pp 1-7. Web. 24 June 2015.

Climate Vulnerability, Built Environment, and Urban Heat Stress

Analysis of societal vulnerability to extreme heat events requires an interdisciplinary approach that includes information about weather and climate, the natural and built environment, social processes and characteristics, interactions with stakeholders, and an assessment of community vulnerability at a local level. In this letter, the authors explore the relationships between people and places, in the context of urban heat stress, and present a new research framework for a multi-faceted, top-down and bottom-up analysis of local-level vulnerability to extreme heat. This framework aims to better

represent societal vulnerability through the integration of quantitative and qualitative data that go beyond aggregate demographic information.

O'Sullivan, Francis. "Mit ClimateColab Proposals Portlet Mit ClimateColab Proposals Portlet." *Energy-Water Nexus*. MIT, 2015. Web. 11 June 2015.

Crowdsourcing, Innovation, Collaborative Learning

This resource is a crowdsourcing platform from MIT to create proposals on what to do about climate change--a good resource for innovative solutions. They are currently taking proposals for climate action plans, here: <http://climatecolab.org/web/guest/plans/-/plans/contestId/1302001>.

"Plans & Studies." *Plans & Studies - Environment*. Mid-America Regional Council, n.d. Web. 10 June 2015.

Regional Plans, Air Quality, and Green Networks

This resource page provides various environmental plans and studies for the Kansas City region. They can serve as a model for future CAPs in the general geographic area. MARC's environmental initiatives involve air quality, energy, green networks, natural resources, solid waste management, forestry, and water quality. Best practices are mentioned for the various topics.

"Policy Guide on Planning and Climate Change." *American Planning Association*. N.p., 11 Apr. 2011. Web. 23 June 2015.

Transportation, Land Use, Energy, Green Development, and Hazards Policy

This resource provides a planning framework for planners focusing on both mitigation and adaptation. Further, it suggests climate change policies in several areas—transportation, land use, energy, green development, hazards management, and public health. This general resource will provide direction to planners in the beginning stages of a climate action plan.

Pyke, Christopher, Meredith P. Warren, Thomas Johnson, James Lagro, Jeremy Scharfenberg, Philip Groth, Randall Freed, William Schroeer, and Eric Main. "Assessment of Low Impact Development for Managing Stormwater with Changing Precipitation Due to Climate Change." *Landscape and Urban Planning* 103.2 (2011): 166-73. Web.

Stormwater Management, Environmental Impacts, and Climate Mitigation

This resource assesses new methods of stormwater management in relation to Urban Planning. Stormwater management issues can be touched on in both climate mitigation, adaptation, and hazard adaptation plans.

Ramin, Brodie, and Tomislav Svoboda. "Health of the Homeless and Climate Change." *Journal of Urban Health : Bulletin of the New York Academy of Medicine*. Springer US. Web. 24 June 2015.

Homelessness, Vulnerable Populations, and Risk

This study shows how homeless populations will be uniquely vulnerable to the effects of climate change. This study could be helpful for cities that want to focus a section of their climate plan on public health and homelessness.

Rui Wang. "Adopting Local Climate Policies: What Have California Cities Done and Why?" *Urban Affairs Review* (July 2013) vol. 49: 4 593-613 Web. 24 June 2015.

Policy, Modeling, and Local Governance

Climate action at the local level represents an important and unique complement to global and national-level policies. This study provides one of the first systematic analyses of local climate actions in the State of California by comparing cities' adoption of alternative policies and statistical modeling of local choices of climate actions. The pattern of adopting different climate actions incrementally suggests that cities prefer certain actions to others. Coastal location, instead of the usual predictors of local mitigation actions, is found to affect cities' adaptation actions. Whether a city is more likely to keep its commitment to mitigate climate change depends on the nature of the commitment.

"Teaching Climate." NOAA Climate. Climate.gov, n.d. Web. 10 June 2015.

Public Engagement, Public Education, and Interactive Tools

This resource provides several informational videos about the science of climate change. As behaviors and values are difficult to change, demonstrating the sound science of climate change first and foremost is key. Living in a fairly politically conservative area that will not be the first region to dramatically feel the effects of climate change, ensuring the public's faith in the CAP's policies and programs will be vital. Videos, visuals, and interactive tools provided on this site will aid in phase one of the planning process.

"The Demand for Greenhouse Gas. Emissions Reduction Investments: An Investor's Marginal Abatement. Cost Curve for Ukraine." NERA Economic Consulting, January 2012.

http://www.ebrd.com/downloads/research/economics/publications/specials/Ukraine_MACC_report_ENG.pdf , n.d. Web. 11 June 2015.

Emissions Inventory, Private Sector, and Economic Costs

This report investigates the possibilities for reducing greenhouse gas emissions in Ukraine, over the period 2010-2030, and estimates their cost, across a range of sectors of the economy. In contrast to other studies of this kind, this analysis is from the point of view of a private investor interested in profitable investment opportunities that also reduce emissions. We estimate investment opportunities, and calculate the respective costs and benefits of reducing emissions from the perspective of a commercially driven investor.

"The Fiscal Implications of Development Patterns." Smart Growth America. N.p., n.d. Web. 23 June 2015.

Economic Analysis, Political Feasibility, and Smart Growth

Smart Growth America created a model designed to help communities understand the financial performance of their development patterns. This tool outlines strategies to generate greater revenue in the future. Specifically, this resource describes how a smart growth approach to development could help improve the bottom line.

"What Is HEAT?" *HEAT*. Web. 24 June 2015.

Energy Reduction, Public Engagement, and Visualization

This site allows individuals to enter their addresses and visualize the amount of energy they use. This site could be useful for a city that would like to engage their residents in reaching energy reduction goals.



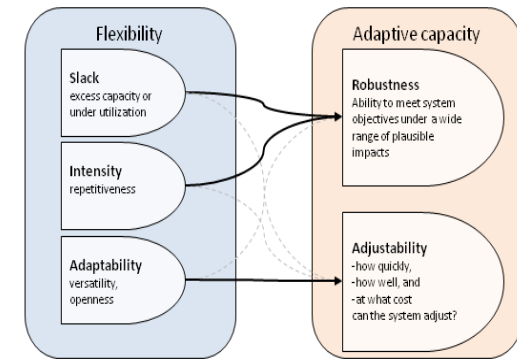
Illustrated Glossary

This glossary serves as a tool for elected officials, members of the public, and city employees to understand common terminology used in climate action planning. Examples include best practices, climate science terminology, and implementation options compiled from various reputable online sources. Each entry includes a graphic and explanation of its relation to climate action planning.

Active Transportation

Adaptation

Adaptive Capacity



This refers to human-powered transportation, such as cycling or walking. It is promoted as a sustainable planning technique as it reduces traffic congestion and the need for large road infrastructure, while providing public health co-benefits.

4 Ways to Make a Bikeable City. Digital image. *California Active Transportation Safety Information Pages*. University of California, 22 May 2013. Web. 17 June 2015. Retrieved from: <http://catsip.berkeley.edu/4-ways-make-bikeable-city>

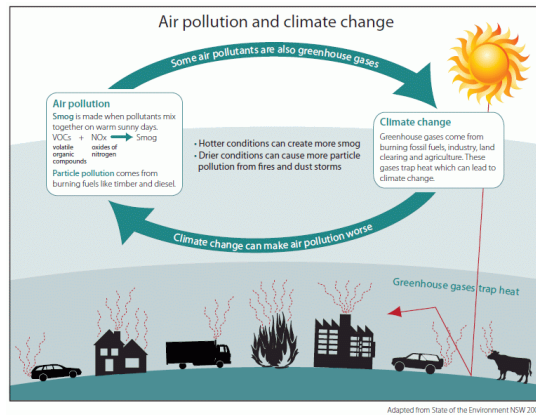
Adaptation is the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.

Agard, John, and Lisa Schipper. "WGII AR5 Glossary." *Ippc.ch*. International Panel on Climate Change, 31 Mar. 2014. Web. 19 June 2015.

The ability of a system to adjust to climate change (including climate variability and extremes) in order to moderate potential damages, take advantage of opportunities, or cope with the consequences is referred to as adaptive capacity.

US Environmental Protection Agency: Glossary of Climate Change Terms. Web. 19 June 2015. Retrieved from: http://rivers.bee.oregonstate.edu/sites/default/files/imagecache/flexibility_adapt_conceptual_diagram.png

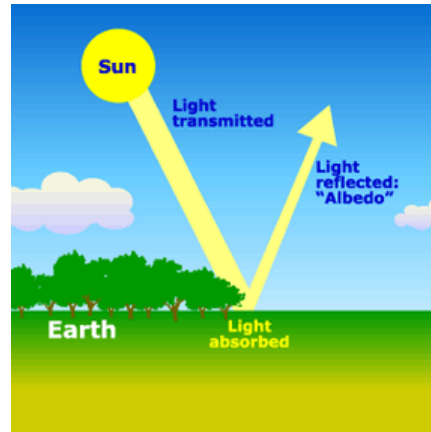
Air Quality



The degree to which the ambient air is pollutant-free depends on the amount of emissions. Air quality and climate change are intermingled. Heat increases create public health issues.

Air Pollution and Climate Change. Digital image. *Climate Change and Human Health*. Cool Heads for Hot Planet, 12 Mar. 2012. Web. 18 June 2015. Retrieved from: <https://coolheadsforahotplanet.wordpress.com/2012/03/04/climate-change-human-health/>

Albedo Effect



The Albedo Effect is the measure of how much incoming energy from the sun is absorbed or deflected by a surface or object. This is an important term to understand in Urban Planning due to the variety of surfaces used in modern society.

"Urban Heat Island and Mitigation Strategies at City and Building Level." *Advances in the Development of Cool Materials for the Built Environment* (2013): 3-32. EPA - Albedo Effect. Environmental Protection Agency. Web. 18 June 2015.

Anthropogenic Emissions



Anthropogenic emissions of greenhouse gases, greenhouse gas precursors, and aerosols are caused by *human* activities. These activities include the burning of fossil fuels, deforestation, land use changes, livestock production, fertilization, waste management, and industrial processes.

Agard, John, and Lisa Schipper. "WGII AR5 Glossary." *Ippc.ch*. International Panel on Climate Change, 31 Mar. 2014. Web. 19 June 2015.

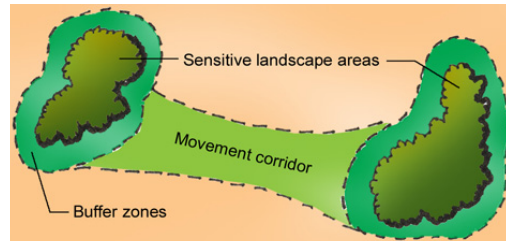
Brownfield



Urban sites that have been previously developed hold potential as a brownfield. Typically, brownfield have been contaminated by various industrial or commercial land uses, necessitating cleanup efforts, yet providing redevelopment opportunities.

Whelan, Matt. Austin Converts Brownfield to Blackland (Prairie, That Is). Digital image. *Brownfield Renewal*. N.p., n.d. Web. 18 June 2015. Retrieved from: https://www.brownfieldrenewal.com/story-news-features_regional_report_austin_converts_brownfield_to_blackland__prairie__that_is_-209.html

Buffer Zone



Buffer zones are areas that provide protection from air pollution, noise pollution, and water pollution. Buffer zones protect sensitive landscapes by providing a barrier between the sensitive area and the source of pollution.

"USDA National Agroforestry Center." Buffers and Corridors. United States Department of Agriculture, n.d. Web. 17 June 2015.

Climate



A climate is determined over a measure of time. It is determined by the atmosphere's behavior, not by the current conditions of the atmosphere. The climate is changing its typical long-term averages. Sustainability includes the long-term lens--one through which we must plan.

McKenzie, Amanda. Climate Change is Happening Now. Digital image. *Climate Change Is Happening Now*. Climate Council, 7 July 2014. Web. 18 June 2015. Retrieved from: <https://www.climatecouncil.org.au/happening-now>

Climate Change Mitigation



Climate change mitigation works to reduce and prevent greenhouse gas emissions. This can come in the form of energy efficiency efforts, different management practices, renewable energies, and changing individual behaviors—all which can be worked towards in policies.

Transition to a Green Future. Digital image. *Connect 4 Climate*. N.p., n.d. Web. 21 June 2015.

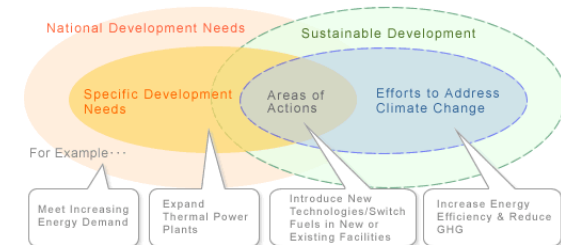
Climate Action Plan



Climate action plans are strategic plans that establish policies and programs for reducing (or mitigating) a community's greenhouse gas (GHG) emissions and adapting to the impacts of climate change.

Boswell, Michael R., Adrienne I. Greve, and Tammy L. Seale. *Local climate action planning*. Island Press, 2012. (Chapter 1, page 6) Retrieved from: http://www.coolcalifornia.org/sites/coolcalifornia/files/CAP_6_step.gif

Co-benefits



The co-benefits approach to climate change planning means integrated efforts to address climate change issues, while meeting normal development needs. Examples include increasing green space for stormwater management, while also increasing opportunities for recreation.

Process of Co-benefits Approach to Climate Change. Digital image. *Co-benefits Approach: Aligning Climate and Development*. N.p., n.d. Web. 21 June 2015.

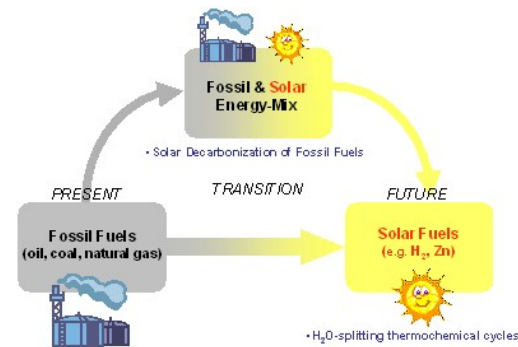
Comprehensive Plan



A comprehensive plan sets forth a long-term vision for a community—normally 15 to 20 years in the future—focused on land use, infrastructure, and community well being. It is a guiding document that is dynamic. As it addresses economic, social, and environmental community issues, climate change mitigation and adaption can be easily integrated into overall community goals.

Lee's Summit Comprehensive Plan. Digital image. *Lee's Summit, Missouri*. N.p., 2005. Web. 21 June 2015.

Decarbonization



Decarbonization (i.e. reducing the carbon intensity of) of electricity generation is a key component of cost-effective mitigation strategies in achieving low-stabilization levels (430–530 ppm CO₂eq). In most integrated modeling scenarios, decarbonization happens more rapidly in electricity generation than in the industry, buildings, and transport sectors.

IPCC Fifth Assessment Report: Mitigation of Climate Change – Summary for Policymakers (page 20). Retrieved from: <http://mitigation2014.org/report/summary-for-policy-makers>

Disaster



Natural disasters are sudden events that cause major damage and great losses of life. Examples include floods, hurricanes, and landslides. As the number of natural disasters increases every year due to climate change, emergency management processes must be put in place. Important mitigation techniques (lessening the impact), specifically land use solutions, will be vital in coming decades.

Disaster Preparedness. Digital image. *Emergency Services*. Broome County, New York, n.d. Web. 18 June 2015.

Environmental Justice



Environmental justice consists of fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, in the development, implementation, and enforcement of environmental laws, regulations, and policies. Its goal is to provide all communities and persons across the nation with the same degree of protection from environmental and health hazards and equal access to decision making processes. This results in healthy environments for all in which to live, learn, and work.

US Environmental Protection Agency:
<http://www.epa.gov/environmentaljustice/>
 Web. 19 June 2015. Picture retrieved from:
<http://www.colorado.edu/center/sites/default/files/styles/grid-4/public/Justice3.jpg>

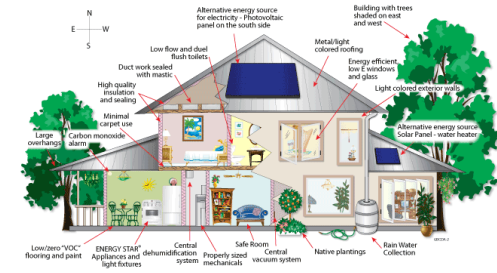
Exposure



Exposure is the presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected.

Agard, John, and Lisa Schipper.
 "WGII AR5 Glossary." *Ipcc.ch*.
 International Panel on Climate Change, 31 Mar. 2014. Web. 19 June 2015.

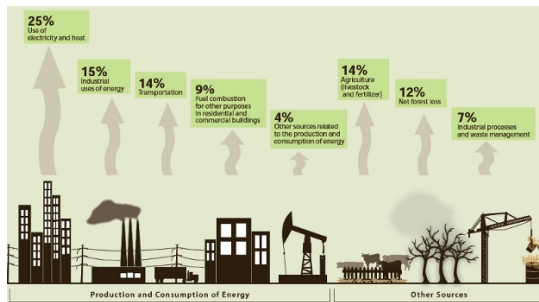
Green Building



Green, or sustainable, building is the practice of creating and using healthier and more resource-efficient models of construction, renovation, operation, maintenance and demolition—a modern approach to building sustainably.

"Green Building." EPA - Green Building. Environmental Protection Agency, n.d. Web. 17 June 2015.

Greenhouse Gases



Gases that absorb solar radiation, such as methane and carbon dioxide, and have long lifetimes in the atmosphere are referred to as greenhouse gases, as they warm the planet. These gases are warming the planet—changing the climate.

Global Emissions of Greenhouse Gases. Digital image. Capitol Shorts. American Society for Engineering Education, n.d. Web. 21 June 2015.

Green Infrastructure



This is a natural approach to water management that focuses on protection and restoration of genuine water cycles. Many co-benefits arise by enhancements in quality of life and water, which leads to public health advancements.

Tepper, Laura. *A Guide to Green Infrastructure*. Digital image. *Curbed*. N.p., 10 July 2013. Web. 17 June 2015. Retrieved from: http://sf.curbed.com/archives/2013/07/10/proposed_wastewater_system_to_transform_valencia_street_in_la_lengua.php#more

Hazard



Hazards are the potential occurrence of a natural or human-induced physical event, trend, or physical impact that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources.

Agard, John, and Lisa Schipper. "WGII AR5 Glossary." *Ipcc.ch*. International Panel on Climate Change, 31 Mar. 2014. Web. 19 June 2015.

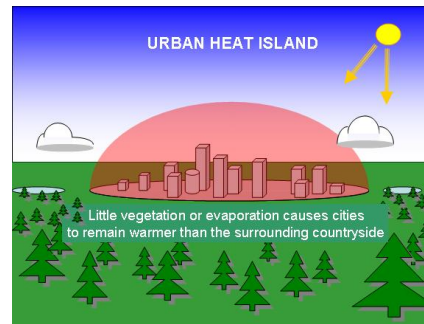
Hazard Mitigation Plan



Communities engage in hazard mitigation planning by organizing resources (interested persons and technical skills), assessing hazards and impacts, prioritize, and implement. This planning process works to reduce and prevent loss of life and property to natural hazards. The Disaster Mitigation Act of 2000 requires state and local governments to plan for hazards as a condition of grant assistance.

Hazard Mitigation Planning Overview. Digital image. FEMA. N.p., n.d. Web. 21 June 2015.

Heat Island



A heat island is an urban area characterized by temperatures higher than those of the surrounding non-urban area. As urban areas develop, buildings, roads, and other infrastructure replace open land and vegetation. These surfaces absorb more solar energy, which can create higher temperatures in the urban area.

US Environmental Protection Agency: Glossary of Climate Change Terms. Web. 19 June 2015. Retrieved from: <http://www.epa.gov/climatechange/glossary.html#num5> Picture retrieved from: http://www.weatherquestions.com/urban_heat_island

Heat Wave



Heat waves are periods of abnormally and uncomfortably hot weather. They are predicted to become more common as the climate continues to change over the coming decades. Increased heat waves will affect public health, specifically vulnerable populations, agriculture, water quantity and quality, etc.

Agard, John, and Lisa Schipper. "WGII AR5 Glossary." *lpcch.ch*. International Panel on Climate Change, 31 Mar. 2014. Web. 19 June 2015.

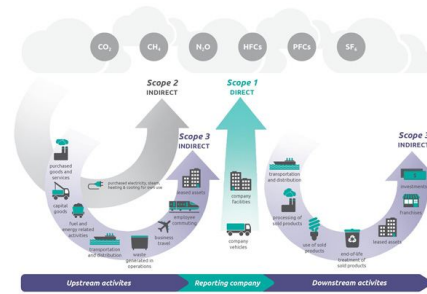
Impacts

Indirect Emissions

LEED Certification



Figure [1.1] Overview of GHG Protocol scopes and emissions across the value chain



Impacts are the effects on natural and human systems of extreme weather and climate events and of climate change. Impacts generally refer to effects on lives, livelihoods, health, ecosystems, economies, societies, cultures, services, and infrastructure due to the interaction of climate changes or hazardous climate events.

Agard, John, and Lisa Schipper. "WGII AR5 Glossary." *Ipcc.ch*. International Panel on Climate Change, 31 Mar. 2014. Web. 19 June 2015.

Indirect emissions from a building, home, or business are those emissions of greenhouse gases that occur as a result of the generation of electricity used in that building. These emissions are referred to as "indirect," as the actual emissions occur at the power plant, which generates the electricity, not at the building using the electricity.

US Environmental Protection Agency: Glossary of Climate Change Terms. Retrieved from: <http://www.epa.gov/climatechange/glossary.html#num5> Picture retrieved from: <http://www.carbontrust.com/ImageGen.ashx?image=/media/64417/ghg-protocol-scopes-value-chain.jpg&format=jpg&compression=80&width=588&constrain=true>

Leadership in Energy and Environmental Design certifications recognizes buildings that utilize best practices in energy efficiency. LEED certified buildings are important in lessening reliance on traditional energy sources (mitigation).

LEED Certifications. Digital image. *LEED*. Green Building Alliance, n.d. Web. 18 June 2015. Retrieved from: <https://www.usgbc.org/resources/leed/>

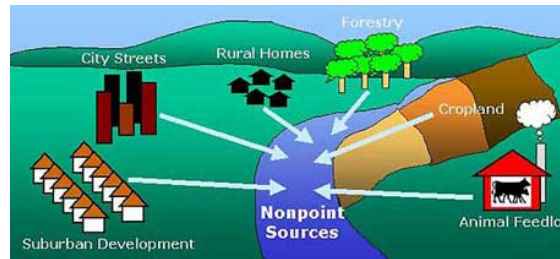
Local Uncertainty



Local uncertainty results from many factors that interact to determine how the climate of one specific location, such as Austin, will respond to global-scale change over the coming century.

"Toward a Climate Resilient Austin." Austintexas.gov. Office of Sustainability Austin Energy Austin Water Utility Watershed Protection Department Transportation Department Public Works Department Parks and Recreation Department Austin/Travis County Health and Human Services Department Austin Fire Department, 1 May 2014. Web. 22 June 2015.

Non-point Source Pollution



Nonpoint source pollution generally results from land runoff, precipitation, atmospheric deposition, drainage, seepage, or hydrologic modification. The term "nonpoint source" is a source of water pollution that does not meet the legal definition of "point source."

"What Is Nonpoint Source Pollution?" What Is Nonpoint Source Pollution? Environmental Protection Agency, n.d. Web. 18 June 2015.

Point Source Pollution



Point source pollution is any single, identifiable source of pollutant that is discharged from a pipe, drain, smokestack, or similar avenue. As the industry sector releases large amounts of greenhouse gases, it is important to locate point sources in every community and put proper precautions in place, specifically for climate change mitigation planning.

"Nonpoint Source Pollution." NOAA's National Ocean Service Education: National Oceanic Atmospheric Administration, n.d. Web. 17 June 2015.

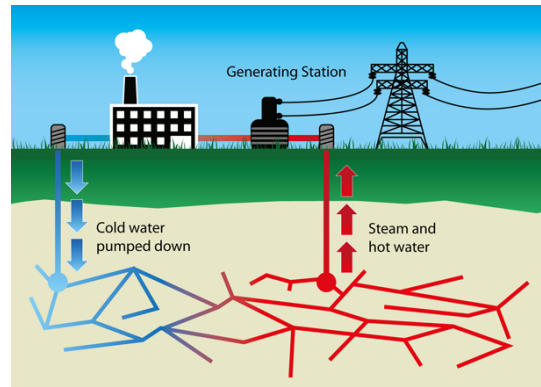
Public Engagement



This refers to the processes that bring people together, including the general public, elected officials, and experts, in order to deliberate, dialogue, and enact change on public issues that are mutually cared about. Several different techniques, while they may fall under different categories of the pyramid, include focus groups, public hearings, charrettes, and collaborative learning.

Rosenblatt, Gideon. Public Engagement Pyramid. Digital image. *Idealware*. N.p., Nov. 2010. Web. 17 June 2015. Retrieved from: <http://www.idealware.org/articles/engagement-pyramid-six-levels-connecting-people-and-social-change>

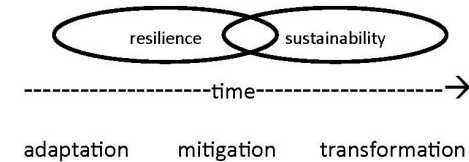
Renewable Energy



Renewable energy resources are naturally replenishing such as biomass, hydro, geothermal, solar, wind, ocean thermal, wave action, and tidal action.

US Environmental Protection Agency: Glossary of Climate Change Terms. Web. 19 June 2015. Retrieved from: <http://www.epa.gov/climatechange/glossary.html#num5> Picture retrieved from: <http://26763abd288ab07b59d5-cefce366aab9afbfeefa95ff74977a22.r18.cf3.rackcdn.com/Geothermal.png>

Resilience



Resilience is the capacity of social, economic, and environmental systems to cope with a hazardous event, trend, or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation.

IPCC Fifth Assessment Report: Impacts, Adaptation and Vulnerability – Summary for Policymakers (page 5). Retrieved from: http://ipcc-wg2.gov/AR5/images/uploads/WG2A_R5_SPM_FINAL.pdf

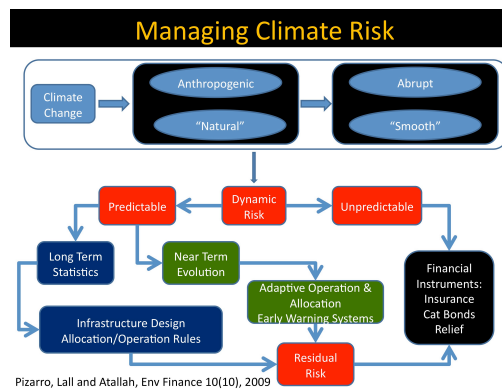
Riparian Habitat



Riparian areas are lands that occur along watercourses and water bodies. Typical examples include floodplains and stream banks. They are distinctly different from surrounding lands because of unique soil and vegetation characteristics that are strongly influenced by the presence of water.

"Natural Resources Conservation Service." Riparian Areas Environmental Uniqueness, Functions, and Values. United States Department of Agriculture, n.d. Web. 18 June 2015.

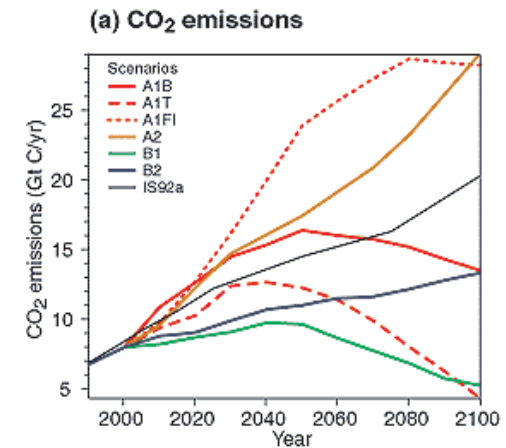
Risk



Climate risk is the potential for consequences where something of value is at stake. It is the probability of the occurrence of hazardous events; outcomes are uncertain. Risk assessments are important for hazard and mitigation planning. Community acceptance of risks is key.

Hitz, Julia. Managing Climate Risk. Digital image. *State of the Planet*. N.p., 22 Dec. 2010. Web. 22 June 2015.

Scenarios



Climate scenarios are plausible descriptions of what the climate may be like in the future, utilizing key driving force indicators and consistent and logical assumptions. Cities may use predictions generated by climate models based on differing emissions levels, such as the one above, in order to plan necessary steps for each scenario.

CO2 Emissions Predictions. Digital image. *GHG Online*. N.p., n.d. Web. 22 June 2015.

Scientific Uncertainty



Scientific uncertainty recognizes it is still uncertain exactly how much the earth will warm in response to human emissions. Scenario or human uncertainty recognizes that future climate change will occur largely in response to emissions from human activities that have not yet occurred.

"Toward a Climate Resilient Austin." Austintexas.gov. Office of Sustainability Austin Energy Austin Water Utility Watershed Protection Department Transportation Department Public Works Department Parks and Recreation Department, 1 May 2014. Web. 22 June 2015.

Smart Growth



Increasing cities' livability through increases in pedestrian traffic and mass traffic, preservation of open space and protection of the environment, direction of development toward town centers, and mitigation of natural hazards.

Smart Growth Diagram. Digital image. *Sustainability of New York*. WordPress, n.d. Web. 17 June 2015.
Retrieved from:
<https://megacitysustainability.files.wordpress.com/2011/11/nyc7.gif>

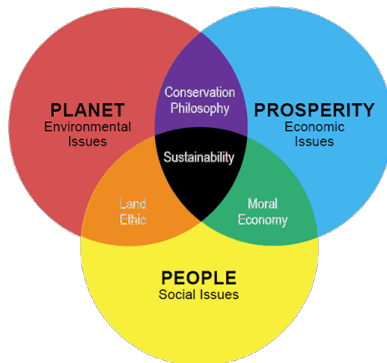
Stormwater Management



The purpose of stormwater management is to provide a process of directing stormwater runoff from roads, driveways, parking lots, and other impervious surfaces in order to control runoff in a manner that will not impair local water sources.

"Stormwater Management and Green Infrastructure." *Overview // Cornell Professional Studies*. N.p., n.d. Web. 17 June 2015.

Sustainability



This Venn diagram represents the three P's: People, Planet, and Prosperity. True sustainability is found when all three are balanced. Present needs are met without sacrificing the future generation's needs.

Yates, Joshua. (2012). *Abundance on Trial: The Cultural Significance of "Sustainability"*. *The Hedgehog Review Critical Reflections on Contemporary Culture*.

Vulnerability



Vulnerability is the propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

Agard, John, and Lisa Schipper. "WGII AR5 Glossary." *Ipcc.ch*. International Panel on Climate Change, 31 Mar. 2014. Web. 19 June 2015.

Weather



Weather is the state of atmosphere—cloudy, rainy, hot, or cold. Weather is different from climate in that it can be seen as single, short-term events. Weather will vary as the climate changes, and most likely in extreme ways.

"Cloudy Weather Clipart | Clipart Panda - Free Clipart Images." *Cloudy Weather Clipart | Clipart Panda - Free Clipart Images*. N.p., n.d. Web. 21 June 2015.

Index

| | | | |
|---------------------------|----|----------------------------|----|
| Active Transportation | 44 | Hazard Mitigation Plan | 51 |
| Adaptation | 44 | Heat Island | 51 |
| Adaptive Capacity | 44 | Heat Wave | 51 |
| Air Quality | 45 | Impacts | 52 |
| Albedo Effect | 45 | Indirect Emissions | 52 |
| Anthropogenic Emissions | 45 | LEED Certification | 52 |
| Brownfield | 46 | Local Uncertainty | 53 |
| Buffer Zone | 46 | Non-point Source Pollution | 53 |
| Climate | 46 | Point Source Pollution | 53 |
| Climate Change Mitigation | 47 | Public Engagement | 54 |
| Climate Action Plan | 47 | Renewable Energy | 54 |
| Co-benefits | 47 | Resilience | 54 |
| Comprehensive Plan | 48 | Riparian Habitat | 55 |
| Decarbonization | 48 | Risk | 55 |
| Disaster | 48 | Scenarios | 55 |
| Environmental Justice | 49 | Scientific Uncertainty | 56 |
| Exposure | 49 | Smart Growth | 56 |
| Green Building | 49 | Stormwater Management | 56 |
| Greenhouse Gases | 50 | Sustainability | 57 |
| Green Infrastructure | 50 | Vulnerability | 57 |
| Hazard | 50 | Weather | 57 |

ThinkGreen

A Climate Action Plan
Lee's Summit, MO